National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

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NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program plays a key part in helping NASA maintain this important role.

The NASA STI Program provides access to the NASA Aeronautics and Space Database, the largest collection of aeronautical and space science in the world. The STI Program is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or major significant phases of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed of continuing reference value. NASA counterpart of peer-reviewed formal professional papers, but has less stringent limitations on manuscript length and extent of graphic presentations.
- TECHNICAL MEMORANDUM. Scientific and technical findings that are of preliminary or specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.
- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that help round out the STI Program's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results ... even providing videos.

The NASA STI Program is managed by the NASA STI Program Office (STIPO). STIPO is the administrative office at Langley Research Center for the NASA STI Program.

For more information about the NASA STI Program, you can:

- Access the NASA STI Program Home Page at http://www.sti.nasa.gov
- E-mail your question via the Internet to help@sti.nasa.gov
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  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (*STAR*) is an online information resource listing citations and abstracts of NASA and world wide aerospace-related STI. Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related Research & Development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up to date NASA STI, visit the STI Program's website at http://www.sti.nasa.gov.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (TRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability'. When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form or contact help@sti.nasa.gov or telephone the CASI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** (FDLP) to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries http://www.access.gpo.gov/su_docs.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see *categories 02 through 09*. For information related to space vehicles *see 12 Astronautics*.

20030111697 Nebraska Univ., Omaha, NE, USA
The Aeronautics Education, Research, and Industry Alliance (AERIAL) 2002 Report
Bowen, Brent D.; Box, Richard C.; Fink, Mary; Gogos, George; Lehrer, Henry R.; Narayanan, Ram M.; Nickerson, Jocelyn S.; Tarry, Scott E.; Vlasek, Karisa D.; O'Neil, Patrick D.; November 2002; 62 pp.; In English; See also 20030111698 - 20030111700
Report No.(s): UNOAI-02-7; Copyright; Avail: CASI; A04, Hardcopy

The NASA Nebraska Space Grant Consortium (NSGC) & EPSCoR programs at the University of Nebraska at Omaha are involved in a variety of innovative research activities. Such research is supported through the Aeronautics Education, Research, and Industry Alliance (AERIAL) and collaborative seed funds. AERIAL is a comprehensive, multi-faceted, five year NASA EPSCoR initiative that contributes substantially to the strategic research and technology priorities of NASA while intensifying Nebraska s rapidly growing aeronautics research and development endeavors. AERIAL includes three major collaborative research teams (CRTs) whose nexus is a common focus in aeronautics research. Each CRT - Small Aircraft Transportation System (SATS), Airborne Remote Sensing for Agricultural Research and Commercialization Applications (ARS), and Numerical Simulation of the Combustion of Fuel Droplets: Finite Rate Kinetics and Flame Zone Grid Adaptation (CEFD) -has a distinct research agenda. This program provides the template for funding of new and innovative research that emphasizes aerospace technology.
Author
Aeronautics; Remote Sensing; Combustion; Aircraft

20030111724 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: Research on an New Device for Measuring the Snowy Runway Surface Friction
Sotozaki, T.; Kai, T.; Ueda, T.; 2002; 28 pp.; In Japanese
Report No.(s): PB2004-100463; NAL/TR-1443; Copyright; Avail: National Technical Information Service (NTIS)

There has been a need to develop a simple measurement system which can continuously evaluate friction coefficients of a snowy and/or icy runway. A currently used standard proper ground-vehicle can measure continuously, but it is very expensive. On the other hand, a simple decelerometer on a common car with limited types of tires is used at airports where heavy snow is uncommon, but it cannot measure continuously. In response to the requirement, a new system that is easily installed on a usual car was developed, enabling the quick and continuous measurement of friction coefficients of snowy and/or icy runways.
NTIS
Runways; Snow; Measuring Instruments

20030111726 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: Correction of Flutter Boundary of Non-Planar Wing Using Measured Local Mach Number
Kanda, A.; 2002; 34 pp.; In Chinese
Report No.(s): PB2004-100464; NAL/TR-1452; Copyright; Avail: National Technical Information Service (NTIS)

For anti-symmetrical flutter speeds of a tip fin-shaped reentry space vehicle model, numerical predictions using the doublet-point method (DPM) were different from experimental results in a part of the lower supersonic region. The cause of the discrepancy is thought to be local flow over the wing differing from the free stream. Flutter boundary analysis was therefore corrected by using revised Mach numbers on the basis of measured local Mach numbers. In the case of revised Mach numbers calculated by local Mach numbers at places of large mode displacement on the wing, the corrected numerical results showed good agreement with experimental ones. Therefore, it was confirmed that correction using local Mach numbers improves the accuracy of flutter boundary.
NTIS
Mach Number; Flutter

20030111728 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: Experimental Investigations on High Lift Devices for an SST Part 2. Effects of Rounded Leading-Edges
Miyata, K.; Rinoie, K.; Kwak, D. Y.; Noguchi, M.; 2003; 28 pp.; In Japanese
Report No.(s): PB2004-100465; NAL-TR-1456; Copyright; Avail: National Technical Information Service (NTIS)
The effects of rounded leading-edge vortex flaps were investigated on a cranked arrow wing SST configuration, using wind tunnel measurements. Differences in aerodynamic characteristics were discussed for the 'non-rounded' leading-edge flap-an original design, and for the rounded leading-edge flap. The question of how differences in Reynolds number affects the flow around the rounded leading-edge vortex flaps and the flap performance was also discussed. Some benefit from the lift/drag ratio for the wing with the rounded leading-edge vortex flaps was obtained, as compared with those of the 'non-rounded' vortex flaps at a lift coefficient greater than 0.3. Flow patterns over the rounded leading-edge vortex flaps were observed changing as the Reynolds number increased. The spanwise length of the separated region is reduced as the Reynolds number is increased.
NTIS
Aerodynamic Characteristics; Wind Tunnel Tests; Supersonic Transports; Leading Edge Flaps

20030111732
Transactions of Nanjing University of Aeronautics & Astronautics, Vol. 20, No. 1, June 2003
Dewang, L.; Jun. 2003; 136 pp.; In Chinese
Report No.(s): PB2004-100475; Copyright; Avail: National Technical Information Service (NTIS)
Damages and Failures of Smart Structures; Practical Boundary in Helicopter Vortex-Ring State; Enhanced Unsteady and Nonlinear Rotor Wake Model for Real-Time Flight Simulation; Numerical Simulations of Evolutions from Wall Pulse to Turbulent Coherent Structures; ALE Finite Element Analysis of Nonlinear Sloshing Problems Based on Fluid Velocity Potential; Some Algorithms for NC Machining Simulations and Verification; Application of Grey System Theory to Processing of Measuring Data in Reverse Engineering; Genetic Optimization of Hot Filament Parameters in HFCVD System; An Improved Rotation Vector Attitude Algorithm for Laser Strap-Down Inertial Navigation System; Stabilization Effect of Multi-Machine Power System by Using Adjustable Speed Generator; Zero-Current and Zero-Voltage Switching PWM Boost Full-Bridge Converter; Reliable Hysteresis Current Controlled Dual Buck Half Bridge Inverter; Structure Optimization Strategy of Normalized RBF Networks; Simulation Study of Chaos in DC-DC Converter; Piezospectroscopic Study of Residual Stresses around Indentations in SiC/Al2O3 Nanocomposite; Real Time Vibration Suppression of Smart Rotor for Adaptive Filtering Feed Forward Controller; Robust Control of a Class of Nonlinear Systems with Time-Varying Parametric Uncertainties; Telemedicine for Amblyopia Treatment Based on Internet; An Improved SOVA-Based Decoding Scheme for Turbo-STCM; Agent-Based Workflow Coordination for Supply Chain Management; Research of B2B E-Commerce System Model Based on Web Service; Transactions of Nanjing University of Aeronautics and Astronautics.
NTIS
Aeronautical Engineering; Astronautics

20030111875 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics and Astronautics, Volume 33, Number 4, August 2003
Dewang, L.; 2002; 124 pp.; In Chinese
Report No.(s): PB2004-100908; Copyright; Avail: National Technical Information Service (NTIS)
Theory and Implement of Doubly-Salient Machine Digital Control System Based on DSP Control; Adaptive Robust L(sup 2)-Gain Control for a Class of Uncertain Nonlinear Systems; Vessel Attitude System for Multibeam Echosounding;

Variable-Structure Control with Sliding Mode of Spacecraft Attitude Maneuvers; Multiple Model Failure Detection Based on Wavelet Neural Network; Real-Time Control System to Control Water Level of Steam Generator Based on ANFIS; Application of Neutral Stability Techniques in Integrated Fire/Flight Control System; Two-Dimensional Numerical Simulation of a CSP Semiconductor Laser in Steady State; Neural Network Algorithms for DOA Estimation with Compensation of Effects on Mutual Coupling; Reducing Peak-to-Average Power Ratio of Multicarrier CDMA Signal With Golay Complementary Sequences; FDTD Analysis of Three-Dimensional Complex Cavity; Bit Error Performance of Two-Dimensional Spread Spectrum System for AWGN Channels; Improvement of Speckle Reduction Algorithm for SAR Images Based on Mathematical Morphology; Detection of Singular Signal Based on Fractal Technique; Developing E-Governance System Modeling Method on J2EE Platform; Improvement of Packet Scheduling Based on Priority Queue in Multimedia Networks; Control of Robot Arms with Link Flexibility using Singular Perturbation and Neural Network; Thermodynamic Characteristics of Thermally Perfect Gas and Solution of N-S Equations; Equivalent Boundary Integral Equations with Indirect Unknowns for Plane Potential Problems; A New Micro-Mechanics Model for Fibrous Composite; Grey Matrix Game Model Based on Pure Strategy; Process Reeingineering of Supply Chain Order Workflow; Optimum Model of GM(1,1) and its Suitable Range; and Stochastic Gradient Genetic Algorithm for Solving Multiobjective Optimization Problems.
NTIS
Aeronautical Engineering; Astronautics

20030111971 Nebraska Univ., Omaha, NE, USA
The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1
Lee, Yeong-Heok, Editor; Bowen, Brent D., Editor; Tarry, Scott E., Editor; July 2001; 258 pp.; In English; Air Transport Research Society International Conference on Air Transportation Operations and Policy, 19-21 Jul. 2001, Jeju Island, Korea, Republic of; See also 20030111972 - 20030111979
Contract(s)/Grant(s): NCC5-572
Report No.(s): UNOAI-01-6-Vol-1; Copyright; Avail: CASI; A12, Hardcopy

The ATRS held its Annual conference at Jeju Island, Korea in July 2001. The conference was a success with nearly 140 participants including 70 presenters. This report contains presentations from Volume 1 on the following: Airline and Travel Agent Relationships in Asia;Benchmarking Aviation Safety in the Commercial Airline Industry;Impact of Frequent Flyer Program on the Demand for Air Travel; Application of Genetic Algorithm on Airline Schedule;The Effects of Dual Carrier Designation and Partial Liberalization: The Case of Canada;Defense of Air Carriers and Air Agencies in FAA Enforcement proceedin gs - Damage Control Before the Case Arises; Cost Incentives for Airline Mergers? - An examination on the cost impact of U.S. airline mergers and acquisitions;Airport Regulation, Airline Competition and Canada's Airport System; Airline Competition: The Case of Israel's Domestic Doupoly; Non-Financial Indicators of Airline Distress: A Conceptual Approach;and Airport Privatization: An Empirical Analysis of Financial and Operational Efficiency.
CASI
Conferences; Commercial Aircraft; Airline Operations; Flight Safety

20030111987 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory. Experimental Investigation of High Lift Device for SST
Kwak, D. Y.; Miyata, K.; Noguchi, M.; Sunada, Y.; Rinoie, K.; 2002; In Japanese
Report No.(s): PB2004-100479; NAL/TR-1450; Copyright; Avail: National Technical Information Service (NTIS)

Wind tunnel tests were conducted to investigate the aerodynamic characteristics of an SST model with leading-edge and trailing-edge flaps. Force measurement and surface pressure measurement were performed for the SST model with leading-edge flaps or with trailing-edge flaps and with both flaps deflected. Flow patterns on the upper surface of the model were visualized by means of oil-flow and smoke. Lift-to-drag ratio of the model was improved by leading-edge flap deflection. Deflecting the trailing edge flap increased lift, drag and pitch-down moment drastically. When the trailing-edge flap was deflected to ten degrees, lift-to-drag ratio could also be improved. The combined effects of leading-edge and trailing-edge flaps were discussed by comparison with the linearly combined measurement results when the leading-edge and trailing-edge flaps were deflected separately.
NTIS
Supersonic Transports; Vortex Flaps; Trailing Edge Flaps

20030112015 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronuatics and Astronautics, Volume 34, No. 3, June 2002
DeWang, L.; 2002; 116 pp.; In Chinese
Report No.(s): PB2004-100900; Copyright; Avail: National Technical Information Service (NTIS)

An Outlook on the Infinity (I)-From Hausdorff's Intuition and Poincare's Famous Remark to Brouwer's Theater; An Outlook on the Infinity (I)-'Every' and 'All'; A Class of Inverse Eigenvalue Problems for Jacobi Matrices; Three-Dimensional Fracture Method for Predictiing Fatigue S-N Curves; Theoretical Analysis on Forming FRM by V-EPC Process; Experimental Research of Bronze/Plastics Self-Lubricating Bearing TS-100; Effect of Elements Additions on Order Transformation Temperature of Fe3Al-Based Alloys; Effect of Strain Rate on Corrosion Features of LC4CS Aluminum Alloy; Dispersion and Wettability Process of Pretreated SiC Particles in ZA-27 Alloy and Model for Interface Reaction Wettability; Dense Supported Oxygen Permeating Membrane of La2Nio4 + 6 Prepared by Sol-Gel Method; Quenching on High-Carbon Steel Wire Using Polymer Aqueous Solution; Flexural Strength of Pultruded FRP Shapes; Corrosivity of Treated Wastewater on Boiler Steels on Common Use in Oilfield; New Process for Electroless Tin Plating using Catalyst; Bundle Properties of M46J Carbon Fibre Tow Impregnated with QY8911 Resin; Alkaline Recovery from Straw Pulping Black Liquor by Single Cation-Exchange Membrane Electrodialysis; Failure Analysis of Parts of 20CrNi2Mo Gear; Painting with Waterproof for Wall of Cooling Tower; A Damage Cumulative Model Based on Whole Equivalent Damage Field Testing; Measurement of Dynamic Forces and Moments on CAARC Standard High Building Model; Analytical System of Borescopy Based on Stereo Vision and its Application; Performance of Line Antennas Mounted on Metal Objects by Moment Method; and A Kind of Product Family Information Model Supporting Mass Customization Manufacturing.
NTIS
Aeronautical Engineering; Astronautics

20030112016 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics & Astronautics, Volume 35, No 5, October 2003
Dewang, L.; 2003; 130 pp.; In Chinese
Report No.(s): PB2004-100902; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Molecular Dynamics Simulation of Uniaxial Tensile Deformation and Shear Deformation for Nano-Biocrystal Copper; Preparation and Infrared Emittance Study of Nanometer ZnO; One-Dimensional Incremental Constitutive Relation for SMA Fiber Reinforced Smart Composites with Damages; Study on Pressure Processing with Shock Wave in Liquid; Research of Constellation of Regional Satellite Navigation System Covering China Area; Fundamental Techniques and Approach of Fixture Design Based on Case Reasoning; Structural Noise Suppression of Aircraft Cabin using Elastic Wave Control Concept; BP Model of S-N Curve under Service Environment; Dynamic Simulation Model and Parameter Optimization for Landing Gear Impact; Soft Body Impact Testing System for Dynamic Displacement Measuring; Development of Debris Image On-line Monitoring System for Contaminated Fluid; 3D Image Data Compression Algorithm and its Implementation; Application of an H(infinity) Optimal Control Method to Dual-Shaker Random Vibration Decoupling; CORBA-Based Open Architecture Multi-Tiered System; Arbitrary Lagragian-Eulerian Computation for Equations of Hydrodynamics; An Approach for Testing Difference among Data Characterized with Linear Regression; Eigenvalue, Inverse Matrix, Determinant of Generalized Cycle Matrix and its Application in Computation Structures; Parameterization Model for Aircraft Concept Design; Analysis of Moderate Large Deflection of Composite Laminated Plates using Higher-Order Shear Deformation Theory; Research of Multi-View Registration and Integration on Measured Point Cloud Data; Data Measuring Technology Based on Non-Uniform Subdivision Surface Reconstruction; A Judging Condition for Planar Irregular Curve Matching; Research on PLM System Framework and Key Technologies; and Preparation Technology in Metal-Matrix Nanocomposites.
NTIS
Aeronautical Engineering; Astronautics

20030112239 NASA Glenn Research Center, Cleveland, OH, USA
Analysis of Surface and Bulk Behavior in Ni-Pd Alloys
Bozzolo, Guillermo; Noebe, Rondald D.; March 22, 2003; 25 pp.; In English
Contract(s)/Grant(s): WBS-22-708-31-02; No Copyright; Avail: CASI; A03, Hardcopy

The most salient features of the surface structure and bulk behavior of Ni-Pd alloys have been studied using the BFS method for alloys. Large-scale atomistic simulations were performed to investigate surface segregation profiles as a function of temperature, crystal face, and composition. Pd enrichment of the first layer was observed in (111) and (100) surfaces, and enrichment of the top two layers occurred for (110) surfaces. In all cases, the segregation profile shows alternate planes enriched and depleted in Pd. In addition, the phase structure of bulk Ni-Pd alloys as a function of temperature and composition was studied. A weak ordering tendency was observed at low temperatures, which helps explain the compositional oscillations in the segregation profiles. Finally, based on atom-by-atom static energy calculations, a comprehensive explanation for the

observed surface and bulk features will be presented in terms of competing chemical and strain energy effects.
Author
Nickel Alloys; Platinum; Crystals; Low Temperature

20030112355 Nebraska Univ., Omaha, NE, USA
Journal of Air Transportation, Volume 8, No. 2
Bowen, Brent, Editor; Kabashkin, Igor, Editor; Nickerson, Jocelyn, Editor; 2003; ISSN 1544-6980; 161 pp.; In English; See also 20030112356 - 20030112361
Report No.(s): LC-HE761.1-J68; Copyright; Avail: CASI; A08, Hardcopy

The mission of the Journal of Air Transportation (JAT) is to provide the global community immediate key resource information in all areas of air transportation. This journal contains articles on the following:Fuel Consumption Modeling of a Transport Category Aircraft: A FlightOperationsQualityAssurance (F0QA) Analysis;Demand for Air Travel in the USA: Bottom-Up Econometric Estimation and Implications for Forecasts by Origin and Destination Pairs;Blind Flying on the Beam: Aeronautical Communication, Navigation and Surveillance: Its Origins and the Politics of Technology: Part I1 Political Oversight and Promotion;Blind Flying on the Beam: Aeronautical Communication, Navigation and Surveillance: Its Origins and the Politics of Technology: Part 111: Emerging Technologies;Ethics Education in University Aviation Management Programs in the US: Part Two B-Statistical Analysis of Current Practice;Integrating Human Factors into the Human-computer Interface: and How Best to Display Meteorological Information for Critical Aviation Decision-making and Performance.
Derived from text
Air Transportation; Aircraft Communication

20030112522 NASA Glenn Research Center, Cleveland, OH, USA
Frequency Reuse, Cell Separation, and Capacity Analysis of VHF Digital Link Mode 3 TDMA
Shamma, Mohammed A.; Nguyen, Thanh C.; Apaza, Rafael D.; [2003]; 14 pp.; In English; HCNS 2003, 19-22 May 2003, Annapolis, MD, USA
Contract(s)/Grant(s): NAS3-00145; WBS 22-727-01-03; No Copyright; Avail: CASI; A03, Hardcopy

The most recent studies by the Federal Aviation Administration (FAA) and the aviation industry have indicated that it has become increasingly difficult to make new VHF frequency or channel assignments to meet the aviation needs for air-ground communications. FAA has planned for several aggressive improvement measures to the existing systems, but these measures would not meet the projected voice communications needs beyond 2009. FAA found that since 1974 there has been, on the average, a 4 percent annual increase in the number of channel assignments needed to satisfy the air-ground communication traffic (approximately 300 new channel assignments per year). With the planned improvement measures, the channel assignments are expected to reach a maximum number of 16615 channels by about 2010. Hence, the FAA proposed the use of VDL Mode 3 as a new integrated digital voice and data communications systems to meet the future air traffic demand. This paper presents analytical results of frequency reuse; cell separation and capacity estimation of VDL Mode 3 TDMA systems that FAA has planned to implement the future VHF air-ground communications system by the year 2010. For TDMA, it is well understood that the frequency reuse factor is a crucial parameter for capacity estimation. Formulation of this frequency reuse factor is shown, taking into account the limitation imposed by the requirement to have a sufficient Signal to Co-Channel Interference Ratio. Several different values for the Signal to Co-Channel Interference Ratio were utilized corresponding to the current analog VHF DSB-AM systems, and the future digital VDL Mode 3. The required separation of Co-Channel cells is computed for most of the Frequency Protected Service Volumes (FPSV's) currently in use by the FAA. Additionally, the ideal cell capacity for each FPSV is presented. Also, using actual traffic for the Detroit air space, a FPSV traffic distribution model is used to generate a typical cell for channel capacity prediction. Such prediction is useful for evaluating the improvement of future VDL Mode 3 deployment and capacity planning.
Author
Time Division Multiple Access; Very High Frequencies; Aeronautics; Mathematical Models; Frequency Reuse; Data Links

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also *34 Fluid Mechanics and Thermodynamics*.

20030111891 Netherlands Energy Research Foundation, Petten
Aeroelastic Analysis of the LMH64-5 Blade Concept
Lindenburg, C.; Jun. 2003; 56 pp.
Report No.(s): PB2004-101063; ECN-C-03-020; No Copyright; Avail: CASI; A04, Hardcopy

Within the DOWEC project, investigations were performed into the development of large size wind turbines for offshore applications. Many of the studies in this project were performed for a 6MW concept of which the turbine was designed by NEG-Micon Holland and the LMH64-5 blade by LM Glasfiber Holland. One of the tasks within this project was to investigate the aeroelastic stability problems for large size wind turbines which was performed for this 6MW concept. These analyses were done with the program BLADMODE. This document starts with a description of the modelling of the blade in basis of a set of 51 files with the cross sectional layout. For the first bending modes the direction of blade motion 'theta' was calculated for the rotating and non-rotating state, which can be used as input for hinge-spring-damper analysis tools. The operational conditions as function of wind speed for which the aeroelastic stability was investigated, were calculated with the program PHATAS. The aerodynamic damping was calculated for the original LMH64-5 blade concept, and also for some parameter variations on structural and aerodynamic modelling aspects and on the so-called 'Structural Pitch'. Finally a comparison was made of the aeroelastic damping calculated with the original LMH64-5 geometry and a tapered variant.
NTIS
Wind Turbines; Aerodynamics; Turbine Blades; Aeroelasticity

20030111927 Naval Postgraduate School, Monterey, CA
An Experimental Investigation of Flapping Wing Aerodynamics in Micro Air Vehicles
Bradshaw, Christopher J.; Jun. 2003; 111 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417703; No Copyright; Avail: CASI; A06, Hardcopy

Flapping-wing propulsion was studied experimentally through Laser Doppler Velocimetry. Measurements were both time-averaged and unsteady, and were conducted on a Micro- Air Vehicle (MAV) model developed at NPS by Professors Max Platzer and Kevin Jones. The objective of this work was to further understanding of the aerodynamics of flapping-wing propulsion. In specific, this study examined separation control on the leading fixed wing due to entrainment by the trailing flapping wings. Further, a study of wake topology examined differences between the optimal and off-optimal cases. Experimental studies took place in the NPS 5' x 5' low speed wind tunnel. The model was supported on a test stand and LDV measurements of the flow field were taken. Studies were made at varying freestream velocities, angles of attack, and flapping frequencies. The test stand was instrumented with force balances to show forces in both the streamwise and vertical directions.
DTIC
Fixed Wings; Flapping; Low Speed Wind Tunnels; Aerodynamics; Research Aircraft

20030112041 Netherlands Energy Research Foundation, Petten
Aero-Elastic Stability Analysis Tools for Large Wind Turbine Rotor Blades
Lindenburg, C.; Snel, H.; 2003; 10 pp.
Report No.(s): PB2004-101327; ECN-RX-03-051; No Copyright; Avail: CASI; A02, Hardcopy

Although modern large size wind turbines do not operate in stall, the trends associated with scaling of dimensions reduce the stability of edgewise blade vibrations. At ECN Wind Energy the aero-elastic vibrations of rotor blades are investigated by participation in the research projects STABTOOL, DAMPBLADE, and the ongoing STABCON project. The developments within these projects have resulted in some aero-elastic stability analysis codes. The relatively simple but fast code BLADMODE can be used to investigate modifications of the blade structure on the aero-elastic behaviour. These investigations include Structural Pitch, which is a modification of the direction of vibration realised by shifting the UD layers. It was also shown that operation at high lift coefficients gives a reduced damping of the edgewise vibrations because at high lift values, airfoils show an increasing drag coefficient with angle of attack (drag stall).
NTIS
Wind Turbines; Turbine Blades; Aerodynamic Stability; Aeroelasticity

20030112121 NASA Ames Research Center, Moffett Field, CA, USA

Turbulent Plane Wakes Subjected to Successive Strains

Rogers, Michael M.; July 30, 2003; 27 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Six direct numerical simulations of turbulent time-evolving strained plane wakes have been examined to investigate the response of a wake to successive irrotational plane strains of opposite sign. The orientation of the applied strain field has been selected so that the flow is the time-developing analogue of a spatially developing wake evolving in the presence of either a favourable or an adverse streamwise pressure gradient. The magnitude of the applied strain rate a is constant in time t until the total strain e(sup at) reaches about four. At this point, a new simulation is begun with the sign of the applied strain being reversed (the original simulation is continued as well). When the total strain is reduced back to its original value of one, yet another simulation is begun with the sign of the strain being reversed again back to its original sign. This process is done for both initially 'favourable' and initially 'adverse' strains, providing simulations for each of these strain types from three different initial conditions. The evolution of the wake mean velocity deficit and width is found to be very similar for all the adversely strained cases, with both measures rapidly achieving exponential growth at the rate associated with the cross-stream expansive strain e(sup at). In the 'favourably' strained cases, the wake widths approach a constant and the velocity deficits ultimately decay rapidly as e(sup -2at). Although all three of these cases do exhibit the same asymptotic exponential behaviour, the time required to achieve this is longer for the cases that have been previously adversely strained (by at approx. equals 1). These simulations confirm the generality of the conclusions drawn in Rogers (2002) regarding the response of plane wakes to strain. The evolution of strained wakes is not consistent with the predictions of classical self-similar analysis; a more general equilibrium similarity solution is required to describe the results. At least for the cases considered here, the wake Reynolds number and the ratio of the turbulent kinetic energy to the square of the wake mean velocity deficit are determined nearly entirely by the total strain. For these measures the order in which the strains are applied does not matter and the changes brought about by the strain are nearly reversible. The wake mean velocity deficit and width, on the other hand, differ by about a factor of three when the total strain returns to one, depending on whether the wake was first 'favourably' or 'adversely' strained. The strain history is important for predicting the evolution of these quantities.

Author

Turbulent Wakes; Strain Distribution; Strain Rate; Plane Strain; Analogies

20030112130 NASA Glenn Research Center, Cleveland, OH, USA

An Aerodynamic Simulation Process for Iced Lifting Surfaces and Associated Issues

Choo, Yung K.; Vickerman, Mary B.; Hackenberg, Anthony W.; Rigby, David L.; 2003; 15 pp.; In English

Report No.(s): Paper-2003-01-2135; Copyright; Avail: CASI; A03, Hardcopy

This paper discusses technologies and software tools that are being implemented in a software toolkit currently under development at NASA Glenn Research Center. Its purpose is to help study the effects of icing on airfoil performance and assist with the aerodynamic simulation process which consists of characterization and modeling of ice geometry, application of block topology and grid generation, and flow simulation. Tools and technologies for each task have been carefully chosen based on their contribution to the overall process. For the geometry characterization and modeling, we have chosen an interactive rather than automatic process in order to handle numerous ice shapes. An Appendix presents features of a software toolkit developed to support the interactive process. Approaches taken for the generation of block topology and grids, and flow simulation, though not yet implemented in the software, are discussed with reasons for why particular methods are chosen. Some of the issues that need to be addressed and discussed by the icing community are also included.

Author

Ice Formation; Airfoils; Software Development Tools; Grid Generation (Mathematics)

20030112741 NASA Glenn Research Center, Cleveland, OH, USA

Effect of Intercycle Ice Accretions on Airfoil Performance

Broeren, Andy P.; Bragg, Michael B.; Addy, Harold E., Jr.; [2003]; 40 pp.; In English

Contract(s)/Grant(s): DTFA-MB96-6-023; WBS 22-708-20-02; Copyright; Avail: CASI; A03, Hardcopy

This paper presents the results of an experimental study designed to characterize and evaluate the aerodynamic performance penalties of residual and intercycle ice accretions that result from the cyclic operation of a typical aircraft deicing system. Icing wind tunnel tests were carried out on a 36-inch chord NACA 23012 airfoil section equipped with a pneumatic deicer for several different FAR 25 Appendix C cloud conditions. Results from the icing tests showed that the intercycle ice accretions were much more severe in terms of size and shape than the residual ice accretions. Molds of selected intercycle ice shapes were made and converted to castings that were attached to the leading edge of a 36-inch chord NACA 23012 airfoil model for aerodynamic testing. The aerodynamic testing revealed that the intercycle ice shapes caused a significant

performance degradation. Maximum lift coefficients were typically reduced about 60% from 1.8 (clean) to 0.7 (iced) and stall angles were reduced from 17 deg. (clean) to 9 deg. (iced). Changes in the Reynolds number (from 2.0 x 10(exp 6) to 10.5 x 10(exp 6) and Mach number (from 0.10 to 0.28) did not significantly affect the iced-airfoil performance.
Author
Wind Tunnel Tests; Airfoils; Aircraft Icing; Aircraft Performance; Aerodynamics

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety* and *85 Technology Utilization and Surface Transportation*.

20030111699 Nebraska Univ., Omaha, NE, USA
The Small Aircraft Transportation System (SATS): Research Collaborations with the NASA Langley Research Center
Tarry, Scott E.; Bowen, Brent D.; Nickerson, Jocelyn S.; The Aeronautics Education, Research, and Industry Alliance (AERIAL) 2002 Report; 2002, pp. 45-57; In English; See also 20030111697; Copyright; Avail: CASI; A03, Hardcopy

The aviation industry is an integral part of the world s economy. Travelers have consistently chosen aviation as their mode of transportation as it is reliable, time efficient and safe. The out- dated Hub and Spoke system, coupled with high demand, has led to delays, cancellations and gridlock. NASA is developing innovative solutions to these and other air transportation problems. This research is being conducted through partnerships with federal agencies, industry stakeholders, and academia, specifically the University of Nebraska at Omaha. Each collaborator is pursuing the NASA General Aviation Roadmap through their involvement in the expansion of the Small Aircraft Transportation System (SATS). SATS will utilize technologically advanced small aircraft to transport travelers to and from rural and isolated communities. Additionally, this system will provide a safe alternative to the hub and spoke system, giving more time to more people through high-speed mobility and increased accessibility.
Author
Air Transportation; Passenger Aircraft

20030111704 NASA Langley Research Center, Hampton, VA, USA
Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003
Hayhurst, Kelly J., Compiler; Holloway, C. Michael, Compiler; September 2003; 254 pp.; In English; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003, 16-19 Sep. 2003, Williamsburg, VA, USA; See also 20030111705 - 20030111721; Original contains color and black and white illustrations
Contract(s)/Grant(s): WU 23-765-30-10
Report No.(s): NASA/CP-2003-212642; L-18324; NAS 1.55:212642; No Copyright; Avail: CASI; A12, Hardcopy

This publication consists of papers presented at the Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003, sponsored by NASA Langley Research Center and the University of Virginia.
Author
Air Transportation; Aircraft Accident Investigation; Civil Aviation; Computer Programs

20030111706 Rutgers Univ., Piscataway, NJ, USA
Probabilistic Causal Analysis for System Safety Risk Assessments in Commercial Air Transport
Luxhoj, James T.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 17-38; In English; See also 20030111704
Contract(s)/Grant(s): NAS1-03057; FAA-00-G-006; No Copyright; Avail: CASI; A03, Hardcopy

Aviation is one of the critical modes of our national transportation system. As such, it is essential that new technologies be continually developed to ensure that a safe mode of transportation becomes even safer in the future. The NASA Aviation Safety Program (AvSP) is managing the development of new technologies and interventions aimed at reducing the fatal aviation accident rate by a factor of 5 by year 2007 and by a factor of 10 by year 2022. A portfolio assessment is currently being conducted to determine the projected impact that the new technologies and/or interventions may have on reducing aviation safety system risk. This paper reports on advanced risk analytics that combine the use of a human error taxonomy,

probabilistic Bayesian Belief Networks, and case-based scenarios to assess a relative risk intensity metric. A sample case is used for illustrative purposes.
Author
Belief Networks; Civil Aviation; Aircraft Accidents; Air Transportation

20030111707 Humanautics, Henley-on-Thames, UK
Should Reporting Programmes Talk to Each Other?
OLeary, M. J.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 165-176; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

British Airways employs two self-report programmes through which safety issues are communicated to the Safety department and Flight Operations. The primary channel, the Air Safety programme, collects data on technical, environmental, operational and crew issues. The ASR programme is an open reporting system managed by Flight Operations and its database holds the original reports, including crew names, and records whatever actions were undertaken. Naturally enough, whereas crew are more than happy to report technical or environmental problems, human nature makes crew more reticent in reporting issues when crew may have under-performed. The secondary reporting vehicle is the Human Factors Report programme that focuses on human performance and the factors that help or hinder it. The programme is voluntary and confidential and is managed by Safety Services. No crew names are recorded and no individual reports are published. The Safety department communicates relevant issues to Flight Operations. Here the two programmes and their interrelationship is described. A comparison is made of how each programme analyses the issues involved in the go-around manoeuvre. It is argued that the power of the Air Safety analysis combined with Human Factors analysis is a more powerful tool than the simple sum of the two parts.
Author
Flight Operations; Human Factors Engineering; Aircraft Safety; Air Transportation; Computer Programs

20030111708 Massachusetts Inst. of Tech., Cambridge, MA, USA
Applying STAMP in Accident Analysis
Leveson, Nancy; Daouk, Mirna; Dulac, Nicolas; Marais, Karen; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 177-198; In English; See also 20030111704
Contract(s)/Grant(s): NAG2-1843; NSF CCR-00-85829; No Copyright; Avail: CASI; A03, Hardcopy

Accident models play a critical role in accident investigation and analysis. Most traditional models are based on an underlying chain of events. These models, however, have serious limitations when used for complex, socio-technical systems. Previously, Leveson proposed a new accident model (STAMP) based on system theory. In STAMP, the basic concept is not an event but a constraint. This paper shows how STAMP can be applied to accident analysis using three different views or models of the accident process and proposes a notation for describing this process.
Author
Complex Systems; Dynamic Models; Air Transportation; Aircraft Accident Investigation

20030111711 Technische Univ., Delft, Netherlands
Divergence and Convergence, Trends in Accident Investigations
Stoop, John A.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 229-241; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

Transport Safety Boards have seen an incremental development over the past decades, evolving from disciplinary courts and governmental investigation committees into independent safety agencies. New missions, roles and responsibilities have caused a shift in focus in accident investigation, which may lead to a divergence in forms and procedures across such investigations. Simultaneously, a convergence takes place with respect to the establishment of independent safety boards, necessitating the development of a specific methodology. In this methodology, a combination of initiating investigations, fact-finding, safety analysis, drafting recommendations and initiating systems change takes place, defining these agencies as problem providers for safety management and engineering designers. This contribution discusses methodological issues involved in this evolution in accident investigation from a perspective of Transportation Safety Boards.
Author
Accident Investigation; Methodology; Aircraft Safety; Air Transportation

20030111714 Glasgow Univ., UK

Newspaper and Online News Reporting of Major Accidents: Concorde AFR 4590 in The Times, The Sun and BBC Online

Johnson, C. W.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 79-98; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

Many complaints have recently been made against the media reporting of major accidents. It has been argued that undue emphasis is placed on identifying the immediate causes of any failure, including human error or technical failure, in the hours following an adverse event. In consequence, the public can be misinformed about the complex nature of many technological failures. The following pages present what is arguably the first detailed review of media coverage of a major accident. In particular, we consider the way in which a tabloid newspaper, a broadsheet and an Internet news service covered the loss of Concorde flight AFR4590 in July 2000. Our analysis yields some surprising results. The broadsheet speculates most about the causes of the incident, the tabloid publishes the least. The journalists and editorial staff on these new sources present very few direct hypotheses about the potential causes of this accident. In contrast, the majority of the speculation in the media is presented in the form of direct quotations from experts many of whom criticize undue speculation in the aftermath of such adverse events. This provides at least a partial explanation for the relative amount of speculative material in each of the publications that were studied. Experts may have been more inclined to speculate for the more prestigious broadsheet than they were for the mass-market tabloid publication. Alternatively, it can be argued that the editorial staff on the tabloid focused their analysis more directly on the facts that were available in the aftermath of this accident.

Author

Concorde Aircraft; Aircraft Accidents; News Media

20030111716 Naviair, Kastrup, Denmark

The Creation of an Aviation Safety Reporting Culture in Danish Air Traffic Control

Norbjerg, Peter Majgard; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 153-164; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

In 2001, a new law was passed by the Danish Parliament, mandating the establishment of a compulsory, strictly non-punitive, and strictly confidential system for the reporting of aviation incidents. A particular and perhaps unusual feature of this reporting system is that not only are employees (typically Air Traffic Controllers and pilots) ensured strict immunity against penalties and disclosure but also, in fact, any breach against the non-disclosure guarantee is made a punishable offence. This paper will explore the experience gained during the political process of passing such a law, as well as the practical lessons learned, during the implementation phase of the non-punitive confidential reporting culture in Danish Air Traffic Control.

Author

Air Traffic Control; Aircraft Safety; Civil Aviation; Air Law

20030111718 Minnesota Univ., Minneapolis, MN, USA

Causal Determination in Road Accidents: An Application of the Halpern/Pearl Notion of 'Actual Cause'

Davis, Gary A.; Swenson, Tait; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 199-207; In English; See also 20030111704; No Copyright; Avail: CASI; A02, Hardcopy

Determining whether or not an event was a cause of a road accident often involves determining the truth of a counterfactual conditional, in which what happened is compared to what would have happened had the putative cause been absent. Using structural equation models, Pearl and his associates have recently developed a rigorous method for posing and answering causal questions, and this approach is especially well-suited to the analysis of road accidents. Following a general discussion of causal analysis, we apply these methods to a freeway rear-end collision. The results suggest that not only were the actions of the drivers actually involved in the collision causes of the accident, but so were the actions of drivers ahead of them.

Author

Mathematical Models; Accidents; Highways; Motor Vehicles

20030111721 Virginia Univ., Charlottesville, VA, USA

Risk-based Classification of Incidents

Greenwell, William S.; Knight, John C.; Strunk, Elisabeth A.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 39-50; In English; See also 20030111704

Contract(s)/Grant(s): NAG1-2290; NAG1-02103; No Copyright; Avail: CASI; A03, Hardcopy

As the penetration of software into safety-critical systems progresses, accidents and incidents involving software will inevitably become more frequent. Identifying lessons from these occurrences and applying them to existing and future systems is essential if recurrences are to be prevented. Unfortunately, investigative agencies do not have the resources to fully investigate every incident under their jurisdictions and domains of expertise and thus must prioritize certain occurrences when allocating investigative resources. In the aviation community, most investigative agencies prioritize occurrences based on the severity of their associated losses, allocating more resources to accidents resulting in injury to passengers or extensive aircraft damage. We argue that this scheme is inappropriate because it undervalues incidents whose recurrence could have a high potential for loss while overvaluing fairly straightforward accidents involving accepted risks. We then suggest a new strategy for prioritizing occurrences based on the risk arising from incident recurrence.
Author
Aircraft Accidents; Aircraft Accident Investigation; Risk; Computer Programs

20030111869 National Aerospace Lab., Amsterdam
Integrated Free Flight and 4-D Gate-To-Gate Air Traffic Management, Possibilities, Promises and Problems
Abbink, F. J.; 2003; 70 pp.; In English
Report No.(s): PB2004-101059; No Copyright; Avail: CASI; A04, Hardcopy

In the 20th century air transport has developed into a safe, reliable and economic means of transportation for passengers, cargo and mail. In the next two decades, the air transport is forecasted to double. To enable this expansion to occur within the limited airspace, with the limited number of airports and runways and with the increasing requirements with respect to safety, noise and emissions, new technological developments are necessary. The use of satellite-based Communication, Navigation and Surveillance (CNS) systems combined with further steps towards computerassisted and automated Air Traffic Management (ATM) with digital datalink between ATM and aircraft computer systems, will be necessary. The introduction of new forward-looking warning systems, the increase of precision on approach and landing systems and the improvement of procedures and training levels will be required to improve the safety level. The availability of on board 'traffic displays' will allow the flight crew to take care of maintaining safe separation between aircraft, even in reduced visibility conditions. The human will become more and more a system operator who monitors the correct operation of airborne and ground-borne systems. Improved Man-Machine interfaces will have to be introduced to present the data in an organized, natural and intuitive way. This paper describes the development of aviation into today's reliable air transport system and the developments and research required to enable the growth forecasted for the next decades to be realized.
NTIS
Air Traffic Control; Free Flight; Flight Management Systems; Air Transportation

20030111963
Post-Disaster Dynamic Routing of Emergency Vehicles. Development of Emergency Response Model for Orlando International Airport
Mollaghasemi, M.; Abdel-Aty, M.; Oct. 2003; In English
Report No.(s): PB2004-100167; No Copyright; Avail: National Technical Information Service (NTIS)

With the advances in traffic simulation during the last decade, it is now possible to model many traffic problems, such as signal control optimization, testing of Intelligent Transportation System technologies, and emergency management. These problems are difficult to solve using the traditional tools, which are based on analytical methods. The September 11th disaster has raised the consciousness of transportation professionals, for better emergency response. Advances in the traffic simulation technology can be used to model and test the disaster management strategies. This thesis presents the use of a microscopic traffic simulation model to evaluate the emergency vehicle routing strategies in case of an emergency. A detailed framework outlining the model building and calibration of the model using microscopic traffic simulation model PARAMICS is provided.
NTIS
Routes; Emergencies; Airports; Safety; Safety Management

20030111974 Nebraska Univ., Omaha, NE, USA
Benchmarking Aviation Safety in the Commercial Airline Industry
Bowen, Brent D.; Lu, Chien-Tsung; Tarry, Scott E.; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001, pp. 1-54; In English; See also 20030111971; Copyright; Avail: CASI; A04, Hardcopy

Concern for flight safety is at the forefront of attention for government, airlines, and the flying public. Although the U.S.

Congress has passed several aviation safety-related bills in the 1990s, the Federal Aviation Administration s (FAA) lack of capacity in airline safety inspection, as well as the agency s reluctance to release more essential safety data, have combined to make airline safety information still inaccessible. This initial research project - the Airline Safety Rating (ASR) - not only adopted the similar processing concepts and calculation formula from the national Airline Quality Rating (AQR), but also applies the Analytic Hierarchy Process (AHP) paradigms to generate its unique format of a paired-variable survey questionnaire, calculate weighted values, and consequently provide a safety ranking. The Delphi methodology is utilized to retrieve judgmental selected expert opinion without gathering all the participants together simultaneously. The study tools allow comparison of safety factors among 10 U.S. major airlines in targeted factors such as the rate of accident and fatality, operational violations, critical financial ratios, and enforcement actions. The initial results indicate that Southwest Airlines had the best overall safety performance. The resulting safety benchmark achieved by the ASR provides a predictive model for forecasting airlines at risk while identifying gaps in the architecture of current aviation infrastructure.
Author
Aircraft Safety; Commercial Aircraft

20030111986 Transportation Research Board, Washington, DC
Airport Research Needs: Cooperative Solutions
2003; 120 pp.; In English
Report No.(s): PB2003-107394; TRB/SR-272; No Copyright; Avail: CASI; A06, Hardcopy

More than 5,000 airports are open for public use in the USA. They range in size from small GA airports handling a few airplanes per day to large commercial-service airports handling hundreds of aircraft and thousands of passengers per hour. Together they form the national airport system, which is a key element of the nations air transportation system. Nevertheless, they are very much a collection of autonomous entities mostly owned and operated by local governments. Recognizing the importance of airports in the national airspace system, the federal government regulates many aspects of their operations and provides them with funds for capital improvements. Airports are thus subject to many national requirements and standards governing their design, operations, safety performance, security, and finances. Airports are also subject to national environmental regulations. Hence, airport operators have much in common with one another and face many of the same problems and research needs. However, they lack a way to address these shared problems and needs that balances the many separateand sometimes conflicting requirements that they face. Through FAA, NASA, and other agencies, the federal government sponsors and performs research related to airports. With the advent of TSA, additional research related to airport securityand thus to facility design and planning can be expected.
NTIS
Airports; Research; Cooperation

20030112020 Nebraska Univ., Omaha, NE, USA
Technology for the Improvement of General Aviation Security: A Needs Assessment
Schaaf, Michaela M.; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; 18 pp.; In English; See also 20030112018; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

In the days, weeks, and months which transpired since September 1 1,2001, the focus on general aviation as an area for security attention has not wavered. Actions were taken immediately to address the real and perceived threats to the nation s security that could be achieved through general aviation.To adequately address security needs for the general aviation community, it is beneficial to know how fixed base operators (FBOs) perceive general aviation security. Since the September 11 attacks drew more attention to the issue, it would be even more telling to look at data prior to the attacks and compare those results with data following the attacks. Methodology The top 50 FBOs in the nation, according to the 1998 Professional Pilot Magazine, and their corresponding airport managers were queried in 1998 regarding descriptive information on best practices in general aviation security. A subsequent survey was then administered to the same panel in 2001 to determine if the changed environment as a result of the September 11 attacks had an effect on the previous responses. The survey was faxed to 86 airport and FBO managers in 1998. The intent of the open-ended questions was to collect descriptive information on best practices in general aviation security, an often overlooked element of aviation security. The survey was again faxed to the sample in 2001 following the terrorist attacks. The survey responses were coded using the qualitative software EZTEXT. The software allowed for the separation of airport and FBO manager responses, as well as 1998 and 2001 responses.
Derived from text
Airports; Security; Surveys

20030112242 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
What Aircrews Should Know About Their Occupational Exposure to Ionizing Radiation
Friedberg, Wallace; Copeland, Kyle; October 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FAA-AM-B-03-TOX-204
Report No.(s): DOT/FAA/AM-03/16; No Copyright; Avail: CASI; A03, Hardcopy

Aircrews are occupationally exposed to ionizing radiation, principally from galactic cosmic radiation. A main source of galactic cosmic radiation is believed to be supernovae. On infrequent occasions, the sun contributes to the ionizing radiation received during air travel. Ionizing radiation consists of subatomic particles that, on interacting with an atom, can cause the atom to lose one or more orbital electrons or even break apart its nucleus. Such events occurring in body tissues may lead to health problems. For aircrews, and their children irradiated in utero, the principal health concern is a small increase in the lifetime risk of fatal cancer. For both of these groups, exposure to ionizing radiation also leads to a risk of genetic defects in future generations. The FAA recommends limits for aircrews in their occupational exposure to ionizing radiation and provides computer software for estimating the amount of galactic cosmic radiation received on a flight.
Author
Flight Crews; Radiation Dosage; Ionizing Radiation

20030112649 Air Force Research Lab., Wright-Patterson AFB, OH
A System to Prevent Mid Air Collisions
Swihart, Donald E.; Griffin, Edward; Brannstrom, Bertil; Rosengren, Ragnar; Doane, Paul; Oct. 2003; 8 pp.; In English
Report No.(s): AD-A418101; AFRL-VA-WP-TP-2003-340; No Copyright; Avail: CASI; A02, Hardcopy

Tomorrow's Air Force will use Unmanned Air Vehicles (UAV) for a number of missions. High-risk missions in which pilot losses are unacceptable are ideal candidates for such vehicles. This paper describes the program for a safety system that prevents air-to-air collisions. It is currently in early stages of development and has application for both military and commercial.
DTIC
Collision Avoidance; Pilotless Aircraft

20030112699 Air Force Research Lab., Wright-Patterson AFB, OH
Autonomous Collision Avoidance for Air-To-Air Operations
Swihart, Donald E.; Braennstroem, Bertil; Griffin, Edward; Rosengren, Ragnar; Doane, Paul; Oct. 2003; 8 pp.; In English
Report No.(s): AD-A418078; AFRL-VA-WP-TP-2003-337; No Copyright; Avail: CASI; A02, Hardcopy

The use of Unmanned Air Vehicles (UAVs) over the past several years has become an important concept for military operations. Currently, multiple UAV flights are not performed due to the difficulty in the control algorithms and the lack of redundancy to handle failures. This paper describes the program for a safety system that prevents air-to-air collisions.
DTIC
Military Operations; Pilotless Aircraft; Collision Avoidance

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation, 17 Space Communications, Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar*.

20030111903 Federal Aviation Administration, Oklahoma City, OK, USA, Federal Aviation Administration, Washington, DC, USA
FAA Strategies for Reducing Operational Error Casual Factors
Pounds, Julia; Ferrante, Anthony S.; November 2003; 14 pp.; In English
Contract(s)/Grant(s): HRR-524
Report No.(s): DOT/FAA/AM-03/19; No Copyright; Avail: CASI; A03, Hardcopy

The FAA has historically tried to understand and mitigate the incidence of operational error (OEs), focusing on the critical component of the system - the closest person to the air traffic situation and the last point of prevention - the air traffic controller. With the human element as the foundation of such a complex system, several initiatives by the FAA Office of Evaluations and Investigations Staff include: have focused on human performance within, and interacting with, the larger system. These have

included implementing a coordinated system of investigations to identify causal factors, fielding automation to re-create events, developing metrics to categorize OE severity, and sponsoring unique performance enhancement programs.
Author
Air Traffic Control; Human Performance; Errors; Air Traffic Controllers (Personnel)

20030112144 NASA Ames Research Center, Moffett Field, CA, USA
Neighboring Optimal Aircraft Guidance in a General Wind Environment
Jardin, Matthew R., Inventor; July 29, 2003; 13 pp.; In English
Patent Info.: Filed 14 Aug. 2001; US-Patent-6,600,991; US-Patent-Appl-SN-932566; NASA-Case-ARC-14554-1; No Copyright; Avail: CASI; A03, Hardcopy

Method and system for determining an optimal route for an aircraft moving between first and second waypoints in a general wind environment. A selected first wind environment is analyzed for which a nominal solution can be determined. A second wind environment is then incorporated; and a neighboring optimal control (NOC) analysis is performed to estimate an optimal route for the second wind environment. In particular examples with flight distances of 2500 and 6000 nautical miles in the presence of constant or piecewise linearly varying winds, the difference in flight time between a nominal solution and an optimal solution is 3.4 to 5 percent. Constant or variable winds and aircraft speeds can be used. Updated second wind environment information can be provided and used to obtain an updated optimal route.
Official Gazette of the U.S. Patent and Trademark Office
Aircraft Guidance; Optimal Control; Wind (Meteorology)

20030112356 Embry-Riddle Aeronautical Univ., Prescott, AZ, USA
Blind Flying on the Beam: Aeronautical Communication, Navigation and Surveillance: Its Origins and the Politics of Technology, Part 3, Emerging Technologies the Radio-Range - The Radio Beacon and Visual Indicator
Johnson, Randy; Journal of Air Transportation, Volume 8, No. 2; 2003, pp. 79-104; In English; See also 20030112355; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Part 111: Emerging Technologies-The third paper in the series analyzes the effect of the continued Federal oversight during the Great Depression and the progress of aeronautical telecommunications research and the deployment of such technologies in support of aviation. Herbert Hoover had become the President of the USA and continued to play an active role in the development of communication, navigation and surveillance. It was during his administration the aeronautical telecommunications infrastructure was defined and it became the cornerstone of modem communication, navigation and surveillance technologies.
Author
Aircraft Communication; Telecommunication

20030112357 Embry-Riddle Aeronautical Univ., Prescott, AZ, USA
Blind Flying on the Beam: Aeronautical Communication, Navigation and Surveillance: Its Origins and the Politics of Technology, Part 2, Political Oversight and Promotion
Johnson, Randy; Journal of Air Transportation, Volume 8, No. 2; 2003, pp. 57-78; In English; See also 20030112355; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Part 11: Promotion and Political Oversight-The second paper considers the effect of Federal regulatory and administrative policy on the development of aeronautical communication and navigation in the USA. It was not until Herbert Hoover became the Secretary of Commerce in 1921 that any attempt at coordinating aeronautical telecommunications research was begun. By 1926, armed with a legislative mandate, Secretary Hoover achieved two very important political objectives in relation to aeronautical telecommunications and thereby insured interagency coordination. The Air Commerce Act of 1926 placed all research and development of communication and navigation within the jurisdiction of the Department of Commerce. This was followed by the Federal Radio Act of 1927 that provided the necessary Federal oversight of frequency allocation and protection for aeronautical frequencies.
Author
Aircraft Communication; Policies

20030112358 Witiw (Michael R.), Sammamish, WA, USA
Integrating Human Factors into the Human-computer Interface: How Best to Display Meteorological Information for Critical Aviation Decision-making and Performance
Witiw, Michael R.; Lanier, Richard C.; Cook, C'Anne; Crooks, Kerry A.; Journal of Air Transportation, Volume 8, No. 2; 2003, pp. 129-138; In English; See also 20030112355; Copyright; Avail: CASI; A02, Hardcopy

Weather is the single largest contributor to delays and a major factor in aircraft accidents and incidents. Real-time weather information has become critical for hazardous weather avoidance. Technological advances like the Geostationary Operational Environmental Satellites (GOES) have had a profound impact on now- casting and forecasting of meteorological variables. Author

Human-Computer Interface; Microbursts (Meteorology); Display Devices

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information see also *18 Spacecraft Design, Testing and Performance*; and *39 Structural Mechanics*. For land transportation vehicles see *85 Technology Utilization and Surface Transportation*.

20030111768 Army Research Lab., Aberdeen Proving Ground, MD

Assessment of the RAH-66 Comanche Pilot-Crew Station Interface for the Force Development Test and Experimentation I (FDTE I)

Durbin, David B.; Havir, Thomas J.; Kennedy, Joshua S.; Pomranky, Regina A.; Sep. 2003; 130 pp.; In English; Original contains color illustrations

Report No.(s): AD-A417885; ARL-TR-3027; No Copyright; Avail: CASI; A07, Hardcopy

Crew workload, crew situational awareness, usability characteristics of the crew station controls, displays, and subsystem interface, and simulator sickness were assessed during the RAM-66 Comanche Force Development Test and Experimentation I (FDTE I). Pilots who participated in FDTE I reported that they typically experienced moderate levels of workload and situational awareness during missions. They noted several problems with usability of the controls, displays, and subsystem interface, which should be resolved. Pilots experienced very mild to moderate simulator sickness symptoms during missions. The discomfort they felt did not significantly affect their performance. A panel of subject matter experts observed each mission and reported that the pilots typically experienced moderate levels of workload and low to moderate levels of situational awareness during missions.

DTIC

Flight Crews; Display Devices; Aircraft Design; Crew Workstations

20030111778 NASA Marshall Space Flight Center, Huntsville, AL, USA

Orbital Space Plane Program Flight Demonstrators Status

Turner, Susan G.; [2003]; 1 pp.; In English; 54th International Astronautical Congress, 29 Sep. - 3 Oct. 2003, Bremen, Germany; No Copyright; Avail: Other Sources; Abstract Only

Under the Orbital Space Plane Program, NASA is currently pursuing the maturation of technologies via three flight demonstrators - DART (Demonstration of Autonomous Rendezvous Technology), X-37, and PAD (Pad Abort Demonstrator). Flight demonstrators provide the opportunity to test key technologies in their actual working environment. These flight demonstrators are required at this stage to mature technologies needed to support full-scale development design of a future competitively selected Orbital Space.

Derived from text

Flight Tests; Flight Simulators; Autonomy; Aerospace Planes

20030111784

See and Avoid Sensor System Design Part 2 - System Reliability & Cost/ Benefits

Chen, Won-Zon; Portilla, Eric; Clough, Bruce; Molnar, Thomas J.; Jan. 2003; 17 pp.; In English

Contract(s)/Grant(s): F33615-01-C-3147; Proj-2403

Report No.(s): AD-A417893; AFRL-VA-WP-TR-2003-332-PT-2; No Copyright; Avail: CASI; A03, Hardcopy

Under the USAF-sponsored Autonomous Flight Control Sensing Technologies (AFCST) program, Northrop Grumman investigated 'see and avoid' (S&A) sensing requirements and preferred system designs along with other military scenarios such as autonomous formation flight and visual landing for future advanced unmanned air vehicles (UAVs). In the first part of the two-paper series, an S&A sensor coverage assessment method and the associated field-of-view (FOV) and time-to-go (TTG) modeling tools developed are described. In this second part, the use of the coverage models and modeling results to

assess the overall system reliability of a number of sensor system configurations and their cost/benefit trades are discussed. DTIC

Autonomy; Flight Control; Air Navigation; Reliability Analysis; Remotely Piloted Vehicles; Detection

20030111826 NASA Glenn Research Center, Cleveland, OH, USA

Numerical Prediction of SERN Performance using WIND code

Engblom, W. A.; [2003]; 14 pp.; In English; 39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA

Contract(s)/Grant(s): NASA Order C-31035-T

Report No.(s): AIAA Paper 2003-4410; No Copyright; Avail: CASI; A03, Hardcopy

Computational results are presented for the performance and flow behavior of single-expansion ramp nozzles (SERNs) during overexpanded operation and transonic flight. Three-dimensional Reynolds-Averaged Navier Stokes (RANS) results are obtained for two vehicle configurations, including the NASP Model 5B and ISTAR RBCC (a variant of X-43B) using the WIND code. Numerical predictions for nozzle integrated forces and pitch moments are directly compared to experimental data for the NASP Model 5B, and adequate-to-excellent agreement is found. The sensitivity of SERN performance and separation phenomena to freestream static pressure and Mach number is demonstrated via a matrix of cases for both vehicles. 3-D separation regions are shown to be induced by either lateral (e.g., sidewall) shocks or vertical (e.g., cowl trailing edge) shocks. Finally, the implications of this work to future preliminary design efforts involving SERNs are discussed.

Author

Numerical Analysis; Transonic Flight; Nozzle Design; Aircraft Models; Aircraft Performance; Computer Programs

20030111884

Bureau of Land Management, 2003 National Aviation Plan

Nov. 2002; In English

Report No.(s): PB2004-101107; No Copyright; Avail: National Technical Information Service (NTIS)

The Bureau of Land Management (BLM) Aviation Program provides leadership, direction and expertise to all BLM programs utilizing aircraft. It ensures the safe and efficient utilization of aircraft to accomplish land management objectives. The National Aviation Office NAO will provide clear and timely guidance to the field regarding aviation policy, fiscal responsibility and operational procedures. The BLM Aviation Program is committed to interagency cooperation. Developments of highly skilled and motivated aviation personnel at all levels are paramount in enhancement of the BLM Aviation Program.

NTIS

Management Planning; Safety Management; Aeronautics

20030111905 Naval Postgraduate School, Monterey, CA

Reliability Analysis of the 4.5 Roller Bearing

Miller, Cole; Jun. 2003; 83 pp.; In English; Original contains color illustrations

Report No.(s): AD-A417534; No Copyright; Avail: CASI; A05, Hardcopy

The J-52 engine used in the EA-6B Prowler has been found to have a faulty design which has led to in-flight engine failures due to the degradation of the 4.5 roller bearing. Because of cost constraints, the Navy developed a policy of maintaining rather than replacing the faulty engine with a re-designed engine. With an increase in Prowler crashes related to the failure of this bearing, the Navy has begun to re-evaluate this policy. This thesis analyzed the problem using methods in reliability statistics to develop policy recommendations for the Navy. One method analyzed the individual times to failure of the bearings and fit the data to a known distribution. Using this distribution, we estimated lower confidence bounds for the time which 0.0001% of the bearings are expected to fail, finding it was below fifty hours. Such calculations can be used to form maintenance and replacement policies. Another approach analyzed oil samples taken from the J-52 engine. The oil samples contain particles of different metals that compose the 4.5 roller bearing. Linear regression, classification and regression trees, and discriminant analysis were used to determine that molybdenum and vanadium levels are good indicators of when a bearing is near failure.

DTIC

Aircraft Engines; Roller Bearings; Engine Failure

20030111920 Air Force Research Lab., Wright-Patterson AFB, OH
The Evolution, Revolution, and Challenges of Handling Qualities
Mitchell, David G.; Doman, David B.; Key, David L.; Klyde, David H.; Leggett, David B.; Sep. 2003; 27 pp.; In English
Report No.(s): AD-A417898; AFRL-VA-WP-TP-2003-328; No Copyright; Avail: CASI; A03, Hardcopy

The need for good aircraft handling qualities has been apparent since the days of the Wright Flyer. In the past decade, there has been a perception that this need has lessened as advanced concepts have evolved, in parallel with acquisition reform. The former has led those who are unfamiliar with the field of handling qualities to conclude that quantitative requirements are not necessary, as the latter has resulted in the elimination of the military specifications for handling qualities. This paper reviews the evolution of handling qualities and their specifications. It presents some ongoing challenges in the field to illustrate that handling qualities are still a critical issue for future aircraft.
DTIC
Specifications; Military Technology; Aircraft Engines; Controllability

20030111924 Naval Postgraduate School, Monterey, CA
A Three-Dimensional Flutter Theory For Rotor Blades With Trailing-Edge Flaps
Couch, Mark A.; Jun. 2003; 237 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417565; No Copyright; Avail: CASI; A11, Hardcopy

This dissertation develops the equations of motion for the structural and aerodynamic forces and moments of a rotor blade with a trailing-edge flap using eight degrees of freedom. Lagrange's equation is applied using normal modes to find the flutter frequency and speed similar to the classic fixed-wing method developed by Smilg and Wasserman. However, rotary-wing concerns are addressed including different freestream velocities along the blade (variation of reduced frequency along the span of the rotor blade) and the influence of previously shed vortices on the aerodynamic forces and moments (Loewy's returning wake). While Loewy Ref 49 did not explicitly state that his 2-D theory would apply to rotor blades with trailing-edge flaps, the manner in which the theory was developed allows it to be applied in this manner. Comparisons to classic lDOF 2DOF and 3DOF flutter theories are made to validate this theory in the limiting cases. Flutter analyses, including g-Omega plots, of an example rotor blade with five degrees of freedom are performed for various rigid body flap frequencies. Classic methods of rotor blade design of ensuring freedom from flutter are to collocate the center of gravity (c.g.), elastic axis (e.a.), and aerodynamic center (a.c) at the 25% chord. With the development of rotor blades with trailing-edge flaps, it is shown that this current design practice is not valid when a trailing-edge flap is incorporated.
DTIC
Aerodynamic Forces; Rotor Blades

20030111942 Wyoming Univ., Laramie, WY
Hybrid Control of Jet Flows
Naughton, Jonathan W.; Smith, Douglas R.; Jul. 31, 2003; 29 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0255; Proj-3484
Report No.(s): AD-A417777; UWAL-2003-01; AFRL-SR-AR-TR-03-0413; No Copyright; Avail: CASI; A03, Hardcopy

The use of swirl and synthetic jet actuators in a hybrid control scheme is described. The results here are limited to the characterization of (1) swirling jet flows and (2) synthetic jets in a two-dimensional mixing layer. Jets with swirl numbers of 0.10 and 0.23 with different tangential velocity profiles were studied. The lower swirl jets behaved similarly to non-swirling jets, whereas the higher swirl jets enhanced mixing significantly, up to 40% for the cases studied here. At the nozzle exit, higher turbulence levels were observed in the swirling jets, and the investigation of the effect of swirl on turbulent structure continues. Synthetic jet actuators on the trailing edge of a splitter plate were studied in two orientations - aligned spanwise to the flow and aligned with the flow. The actuator oriented spanwise to the flow enhanced the streamwise vortices in the mixing layer yielding an increase in non-dimensional mixing layer growth rate of 53%, whereas the other orientation produced little change in the streamwise vortices and only produced a 19% increase.
DTIC
Jet Flow; Fluid Mechanics; Velocity Distribution; Mixing Layers (Fluids); Actuators; Jet Control

20030111981 Barron Associates, Inc., Charlottesville, VA
Intelligent Control of Unmanned Air Vehicles: Program Summary and Representative Results
Ward, D. G.; Sharma, M.; Richards, N. D.; DeLuca, J.; Mears, M.; Sep. 2003; 12 pp.; In English
Contract(s)/Grant(s): F33615-01-C-3108; Proj-2401
Report No.(s): AD-A417904; AFRL-VA-WP-TR-2003-330; No Copyright; Avail: CASI; A03, Hardcopy

In early 2001, AFRL and NAVAIR issued a PRDA requesting proposals to develop an intelligent controller (IC) for unmanned combat air vehicles. Two key requirements of the IC were (1) a learning approach that could go beyond current adaptive controllers and 'remember' what it had learned across flight conditions and (2) a reconfigurable path planner that accounted for changes in the inner-loop behavior and generated near-optimal trajectories in real time. This paper presents a summary of the resulting IC program and some initial technical results.
DTIC
Pilotless Aircraft; Adaptive Control; Artificial Intelligence; Controllers

20030112249 NASA Glenn Research Center, Cleveland, OH, USA
Boundary-Layer Separation Control under Low-Pressure Turbine Airfoil Conditions using Glow-Discharge Plasma Actuators
Hultgren, Lennart S.; Ashpis, David E.; [2003]; 10 pp.; In English; IEEE Minnowbrook IV: Workshop on Transition and Unsteady Aspects of Turbomachinery FLows, 17-20 Aug. 2003, Blue Mountain Lake, NY, USA; No Copyright; Avail: CASI; A02, Hardcopy

Modem low-pressure turbines, in general, utilize highly loaded airfoils in an effort to improve efficiency and to lower the number of airfoils needed. Typically, the airfoil boundary layers are turbulent and fully attached at takeoff conditions, whereas a substantial fraction of the boundary layers on the airfoils may be transitional at cruise conditions due to the change of density with altitude. The strong adverse pressure gradients on the suction side of these airfoils can lead to boundary-layer separation at the latter low Reynolds number conditions. Large separation bubbles, particularly those which fail to reattach, cause a significant degradation of engine efficiency. A component efficiency drop of the order 2% may occur between takeoff and cruise conditions for large commercial transport engines and could be as large as 7% for smaller engines at higher altitude. An efficient means of of separation elimination/reduction is, therefore, crucial to improved turbine design. Because the large change in the Reynolds number from takeoff to cruise leads to a distinct change in the airfoil flow physics, a separation control strategy intended for cruise conditions will need to be carefully constructed so as to incur minimum impact/penalty at takeoff. A complicating factor, but also a potential advantage in the quest for an efficient strategy, is the intricate interplay between separation and transition for the situation at hand. Volino gives a comprehensive discussion of several recent studies on transition and separation under low-pressure-turbine conditions, among them one in the present facility. Transition may begin before or after separation, depending on the Reynolds number and other flow conditions. If the transition occurs early in the boundary layer then separation may be reduced or completely eliminated. Transition in the shear layer of a separation bubble can lead to rapid reattachment. This suggests using control mechanisms to trigger and enhance early transition. Gad-el-Hak provides a review of various techniques for flow control in general and Volino discusses recent studies on separation control under low-pressure-turbine conditions utilizing passive as well as active devices. As pointed out by Volino, passive devices optimized for separation control at low Reynolds numbers tend to increase losses at high Reynolds numbers, Active devices have the attractive feature that they can be utilized only in operational regimes where they are needed and when turned off would not affect the flow. The focus in the present paper is an experimental Separation is induced on a flat plate installed in a closed-circuit wind tunnel by a shaped insert on the opposite wall. The flow conditions represent flow over the suction surface of a modem low-pressure-turbine airfoil ('Pak-B'). The Reynolds number, based on wetted plate length and nominal exit velocity, is varied from 50,000 to 300,000, covering cruise to takeoff conditions. Low (0.2%) and high (2.5%) Gee-stream turbulence intensities are set using passive grids. A spanwise-oriented phased-plasma-array actuator, fabricated on a printed circuit board, is surface- flush-mounted upstream of the separation point and can provide forcing in a wide frequency range. Static surface pressure measurements and hot-wire anemometry of the base and controlled flows are performed and indicate that the glow-discharge plasma actuator is an effective device for separation control. of active separation control using glow discharge plasma actuators.
Author
Boundary Layer Separation; Low Pressure; Turbines; Airfoils; Active Control; Actuators

20030112253 NASA Langley Research Center, Hampton, VA, USA
An Analysis of Measured Pressure Signatures From Two Theory-Validation Low-Boom Models
Mack, Robert J.; October 2003; 24 pp.; In English
Contract(s)/Grant(s): 23-706-92-02
Report No.(s): NASA/TM-2003-212423; L-18318; NAS 1.15:212423; No Copyright; Avail: CASI; A03, Hardcopy

Two wing/fuselage/nacelle/fin concepts were designed to check the validity and the applicability of sonic-boom minimization theory, sonic-boom analysis methods, and low-boom design methodology in use at the end of the 1980is. Models of these concepts were built, and the pressure signatures they generated were measured in the wind-tunnel. The results of these

measurements lead to three conclusions: (1) the existing methods could adequately predict sonic-boom characteristics of wing/fuselage/fin(s) configurations if the equivalent area distributions of each component were smooth and continuous; (2) these methods needed revision so the engine-nacelle volume and the nacelle-wing interference lift disturbances could be accurately predicted; and (3) current nacelle-configuration integration methods had to be updated. With these changes in place, the existing sonic-boom analysis and minimization methods could be effectively applied to supersonic-cruise concepts for acceptable/tolerable sonic-boom overpressures during cruise.
Author
Sonic Booms; Wind Tunnel Models; Measure and Integration; Optimization; Overpressure

20030112300 Air Force Research Lab., Wright-Patterson AFB, OH
Characterization of Pulsed Vortex Generator Jets for Active Flow Control
Tillman, Carl P.; Langan, Kevin J.; Betterton, John G.; Wilson, Mark J.; Oct. 2003; 14 pp.; In English
Contract(s)/Grant(s): Proj-2304
Report No.(s): AD-A418147; AFRL-VA-WP-TP-2003-336; No Copyright; Avail: CASI; A03, Hardcopy

The flowfields produced by several active and passive flow control devices are being investigated experimentally and numerically as part of co-operative effort between the US Air Force Research Laboratory and the UK's Defense Evaluation & Research Agency (DERA). This manuscript reports the results of an experimental investigation of pulsed vortex generator jets (PVGJs) conducted at DERA's Boundary Layer Facility in Bedford. The focus of these tests was to investigate the influence of jet velocity, pulsing frequency, and duty cycle on the mean characteristics of the flowfield produced by a PVGJ in a turbulent boundary layer. The experiments were conducted in a zero-pressure-gradient flow at a freestream velocity of 32 m/s. The flowfield was explored using a three-component laser Doppler anemometry system, and the information is used to calculate local field properties such as velocity and vorticity as well as global parameters like total circulation. The data give insight into the effectiveness of the VOs in terms of location, strength, and persistence of the generated vortices and their influence on the boundary layer. While the planned computational simulation effort is in its infancy, preliminary steady-jet computational results are compared with the flow field data that has been acquired in the boundary layer facility.
DTIC
Flow Distribution; Vortex Generators; Pulsed Jet Engines; Aircraft Design

20030112388 Veridian, Dayton, OH, USA
Optimal vs. Heuristic Assignment of Cooperative Autonomous Unmanned Air Vehicles
Rasmussen, Steven; Chandler, Phillip; Mitchell, Jason W.; Schumacher, Corey; Sparks, Andrew; Jul. 2003; 11 pp.; In English
Contract(s)/Grant(s): F33615-01-D-3105; Proj-2403
Report No.(s): AD-A416576; AFRL-VA-WP-TP-2003-320; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes investigation of algorithms that generate vehicle and task assignments for autonomous UAVs in cooperative missions. In previous work many algorithms have been examined to solve the problem of assignment of autonomous UAVs to tasks based on their ability to perform those tasks. Because of the complexity of this problem, these algorithms have been based on heuristic solutions to the problem.
DTIC
Algorithms; Autonomy; Heuristic Methods; Pilotless Aircraft; Drone Vehicles

20030112422 Northrop Grumman Information Technology, Inc., Fairborn, OH, USA
Maintenance Mentor
Jacobs, John T.; Whitaker, Randall; Byler, Dave; Lemery, David A.; Tidball, Brian E.; Sep. 2003; 220 pp.; In English
Contract(s)/Grant(s): F33615-99-D-6001; Proj-4923
Report No.(s): AD-A418249; AFRL-HE-WP-TR-2003-0133; No Copyright; Avail: CASI; A10, Hardcopy

Maintenance Mentor (MXM) is a research effort conducted by a joint AFRL/ HESR and Northrop Grumman Information Technology team to identify the basic, high-level requirements necessary for improving flight line diagnostic capabilities. The effort was initially focused on identifying specific informational and visual requirements and needs of the maintainer for a specific avionics diagnostics task on a specific aircraft. Soon after its start, however, redirection of the project began to move it from a single task approach to one of documenting the basic flight line troubleshooting and maintenance process and identifying the requirements that, if satisfied, could significantly enhance the maintainers' efficiency and effectiveness in turning aircraft mission- capable much faster than is currently possible. With the redirection of the project, the initial predisposition to emphasize a single weapon system approach that might later be broadened evolved into a higher-level,

multi-weapon system view. This program was felt to be particularly timely since statistics clearly show that most aircraft fix rates have not markedly improved in recent years and many have declined. Although this is certainly a multifaceted problem, it is apparent that one element of the solution is that the maintainer's ability to troubleshoot and diagnose problems requires enhancement. The MXM research is aimed at helping bring that about.
DTIC
Information Systems; Aircraft Maintenance

20030112445 NASA Glenn Research Center, Cleveland, OH, USA
Recent Progress in Engine Noise Reduction for Commercial Aircraft Applications
Huff, Dennis L.; [2003]; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 22-781-30-12; No Copyright; Avail: CASI; A03, Hardcopy

Considerable progress has been made over the past ten years developing technologies for reducing aircraft noise. Engine noise continues to be a dominate source, particularly for aircraft departing from airports. Research efforts have concentrated on developing noise prediction methods, experimental validation, and developing noise reduction concepts that have been verified through model scale and static engine tests. Most of the work has concentrated on fan and jet components for commercial turbofan engines. In this seminar, an overview of the engine noise reduction work that was sponsored by NASA s Advanced Subsonic Technology Noise Reduction Program will be given, along with background information on turbofan noise sources and certification procedures. Concepts like 'chevron' nozzles for jet noise reduction and swept stators for fan noise reduction will be highlighted. A preliminary assessment on how the new technologies will impact future engines will be given.
Author
Noise Reduction; Engine Noise; Commercial Aircraft; Aircraft Noise; Turbofan Engines; Prediction Analysis Techniques

20030112544 Air Force Occupational Measurement Center, Randolph AFB, TX
USA Air Force Job Inventory: A-10, F-15 and U-2 Avionics Systems
Jul. 2002; 19 pp.; In English
Report No.(s): AD-A418123; No Copyright; Avail: CASI; A03, Hardcopy

This publication contains an occupational survey of the A-10, F-15, and U-2 Avionics Systems career ladder that was developed by the Occupational Analysis Program, Air Force Occupational Measurement Squadron. The survey will be administered to Air Force personnel to provide current job and task data for routine updating of the occupational survey database. The survey asks subjects the base and MAJCOM or agency to which they are assigned followed by 17 questions that reveal information about the subject's satisfaction with the job, whether or not the job utilizes his or her talents and training, the subject's plans for reenlistment, factors that influenced the decision to reenlist or separate from the service, the number of deployments the subject completed in the previous 12 months, the amount of time the subject spent on temporary duty in the previous 12 months, the organizational level of the subject's present assignment, the job title that best describes the subject's present job, the work area that best describes where the subject spends most of his or her time in the present job, the aircraft on which the subject maintains avionics systems in his or her present job, the test equipment or special tools the subject uses in his or her present job, and the support equipment the subject uses in his or her present job. The survey also asks whether the subject performs the following activities in the course of his or her job: general avionic systems maintenance; attack control systems maintenance; instrument and flight control systems maintenance; communications, navigation, and penetration aids systems maintenance; general aircraft or cross-utilization training activities; maintenance management activities; general administrative and technical order system activities; general supply and equipment activities; mobility and contingency activities; training activities; and management/supervisory activities.
DTIC
Avionics; Armed Forces (United States); Aircraft Maintenance

20030112629 Air Force Research Lab., Wright-Patterson AFB, OH, USA
Communication Delays in the Cooperative Control of Wide Area Search Munitions Via Iterative Network Flow
Mitchell, Jason W.; Schumacher, Corey; Chandler, Phillip R.; Rasmussen, Steven J.; Oct. 2003; 10 pp.; In English
Report No.(s): AD-A417990; AFRL-VA-WP-TP-2003-333; No Copyright; Avail: CASI; A02, Hardcopy

A communication model is incorporated into the MultiUAV simulation package for wide area search munitions. This model is used to study the effect of communication delays on the performance of an iteractive network flow optimization model that results in a sequence of linear programs for the optimal allocation of consecutive assignments. Fixed

communication delays are considered. The resulting delayed system performance is compared to the performance of a system with a perfect communications model for a set of vehicle-target scenarios to determine the effect on attack and verify task completion.
DTIC
Traffic; Communication Equipment; Targets

20030112644 Duke Univ., Durham, NC
Dynamics and Control of Nonlinear Fluid-Structure Interaction
Dowell, Earl H.; Clark Jr., Robert L.; Virgin, Lawrence N.; Jul. 2003; 16 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0030; Proj-2302
Report No.(s): AD-A418098; AFRL-SR-AR-TR-03-0361; No Copyright; Avail: CASI; A03, Hardcopy

Experimental and theoretical studies of the nonlinear dynamics and control of aeroelastic systems including airfoils and wings have been conducted. Nonlinear geometric stiffness and freeplay have been considered specifically and good theoretical / experimental correlation obtained. Active control systems have been designed, built and tested to increase flutter speed and reduce limit cycle oscillations (LCO). Our most recent work includes theoretical studies of aerodynamic nonlinearities in the transonic range and their effect on flutter and LCO.
DTIC
Flutter; Airfoils; Wings; Nonlinear Systems

20030112673 NASA Glenn Research Center, Cleveland, OH, USA
Flutter Calculations for an Experimental Fan
Bakhle, Milind A.; Srivastava, Rakesh; Keith, Theo G., Jr.; Stefko, George L.; Panovsky, Josef; [2003]; 12 pp.; In English; CEAS/AIAA/NVvL International Forum of Aeroelasticity and Structural Dynamics, 4-6 Jun. 2003, Amsterdam, Netherlands
Contract(s)/Grant(s): NAS3-01116; Copyright; Avail: CASI; A03, Hardcopy

During testing, an experimental forward-swept fan encountered flutter at part-speed conditions. A three-dimensional propulsion aeroelasticity code, based on a computational fluid dynamics (CFD) approach, was used to model the aeroelastic behavior of this fan. This paper describes the flutter calculations and compares the results to the experimental measurements. Results of sensitivity studies are also presented that show the relative importance of different aspects of aeroelastic modeling.
Author
Computational Fluid Dynamics; Flutter; Fan Blades; Unsteady Aerodynamics; Three Dimensional Models

20030112691 North Carolina State Univ., Raleigh, NC, USA
Calibration and Optimization of Constant Voltage Hot-Wire Anemometer in Hypersonic Flows
Chokani, Ndaona; Oct. 2003; 58 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0244
Report No.(s): AD-A418066; AFRL-SR-AR-TR-03-0446; No Copyright; Avail: CASI; A04, Hardcopy

Freestream and boundary layer measurements are made in a supersonic flow using both constant temperature (CTA) and constant voltage (CVA) anemometry. The performance of both anemometers is systematically made by operating the same hot-wire under identical conditions and applying post- test software corrections to the fluctuating measurements. In the case of the CVA the in situ time constant of the hot wire is measured to compensate the measured CVA output. The measurements show that when the signal-to-noise ratio is greater than one for both systems, the results are in very good agreement. The measurements of turbulence intensities are also in good agreement with previous studies. However the frequency at which noise dominates is lower for the CTA. Thus the CVA bandwidth is very much larger than that of the CTA. The amplitude roll-off at high frequencies is as theoretically expected. Thus it is desirable to obtain new quantitative turbulence measurements with larger bandwidth using the CVA. A rapid and automated stepping of the wire overheats is also developed for the CVA. This is an advancement over previous works that employed CTA, as the latter approach has a different bandwidth at each overheat, whereas the CVA has a fixed bandwidth. The rapid scanning method is then used to obtain calibrated measurements in a short duration wind tunnel.
DTIC
Anemometers; Hypersonic Flow; Calibrating; Correction; Optimization; Electric Potential

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power; 28 Propellants and Fuels*; and *44 Energy Production and Conversion*.

20030109434 Toledo Univ., OH, USA
Multi-Stage Aeroelastic Analysis for Propulsion
Keith, Theo G., Jr.; Bakhle, Milind A.; June 2003; 3 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-717; No Copyright; Avail: CASI; A01, Hardcopy

High-Cycle Fatigue (HCF) failure, caused by forced response vibrations, is the predominant problem in new aircraft engines. In the future, high-speed engines will have fewer turbomachinery stages with higher loadings to reduce weight. The increased interactions between compressor and turbine stages due to reduced blade row spacing will lead to increased forced vibration response problems that will result in more HCF failures. Numerical modeling is the key to understanding and avoiding such multi-stage aeroelastic problems in the design and development stage. In the future, to reduce launch costs of reusable launch vehicles, rocket turbopumps will be built to withstand many flights before requiring major maintenance or overhauling. An accurate prediction of the unsteady loads and dynamic stresses on the blading will be necessary to correctly predict the HCF life of these turbomachinery components. The first step in the current effort was to assess the existing capability to perform aeroelastic calculations for a turbomachinery stage. With this objective, an industry configuration was identified which had encountered aeroelastic problem during initial design. This was a high-pressure (HP) turbine that experienced high dynamic stresses in an initial design. The stresses were reduced to acceptable levels in the final design by increasing the axial gap.
Derived from text
Aeroelasticity; Aircraft Engines; Stress Analysis; Forced Vibration; Dynamic Loads

20030111725 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: Effect of Integration of Scramjet into Airframe on Engine Performance and Payload
Akihisa, D.; Kanda, T.; Tani, K.; Kudo, K.; Masuya, G.; 2002; 36 pp.; In Japanese
Report No.(s): PB2004-100458; NAL/TR-1440T; Copyright; Avail: National Technical Information Service (NTIS)

There are three typical configurations for integrating the scramjet into the airframe of aerospace planes. They are (1) the whole engine is on the windward ramp surface of the airframe, (2) the engine is located downstream of the forebody ramp where the surface of the airframe is parallel to the airframe axis, and (3) the inlet entrance is on the ramp surface with the following engine parts parallel to the airframe axis. To examine the effect of the integrating forms on the engine performance, several types of the inlet models were testing in a wind tunnel, and simulations on the scramjet engine and the flight of the aerospace plane were conducted.
NTIS
Supersonic Combustion Ramjet Engines; Airframes; Payloads

20030111731 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: RJTF Mach 8 Testing of a Scramjet Engine Model of a Contraction Ratio of 8.3 with a Strut
Kanda, T.; Kudo, K.; Izumikawa, M.; Sakuranaka, N.; Ono, F.; 2002; 24 pp.; In English
Report No.(s): PB2004-100462; NAL/TR-1442T; Copyright; Avail: National Technical Information Service (NTIS)

In order to improve combustion performance in a hydrogen-fueled scramjet research engine model for the Mach 8 flight condition, a thick strut was attached and the contraction ratio was increased to 8.3. According to the results of the gas-sampling at the exit of the model, a combustion efficiency of 90% was attained for the fuel flow rate equivalence ratio of injected hydrogen fuel=0.8. Normal fuel injection into the low-velocity region on the top wall, in which the recovery temperature was high, was found to be effective for ignition. The high pressure in the combustor caused by the thick strut was also found to be effective for combustion. The thrust increase from the no-fueled condition was 420 N for equivalence ratio of injected hydrogen fuel =1.2. The relatively low thrust level was caused by the Rayleigh heating loss and the base drag of the strut. Small amounts of fuel injection upstream of the step changed the combustion condition significantly, however controlled

engine operation was difficult to achieve. Parallel fuel injection resulted in very poor combustion for this engine model. NTIS

Supersonic Combustion Ramjet Engines; Struts

20030111761 ATK-Thiokol Propulsion, Brigham City, UT, USA

Reusable Solid Rocket Motor Nozzle Joint 5 Redesign

Lui, R. C.; Stratton, T. C.; LaMont, D. T.; [2003]; 8 pp.; In English; 35th International SAMPE Technical Conference, 28 Sep. - 2 Oct. 2003, Dayton, OH, USA

Contract(s)/Grant(s): NAS8-97238; No Copyright; Avail: CASI; A02, Hardcopy

Torque tension testing of a newly designed Reusable Solid Rocket Motor nozzle bolted assembly was successfully completed. Test results showed that the 3-sigma preload variation was as expected at the required input torque level and the preload relaxation were within the engineering limits. A shim installation technique was demonstrated as a simple process to fill a shear lip gap between nozzle housings in the joint region. A new automated torque system was successfully demonstrated in this test. This torque control tool was found to be very precise and accurate. The bolted assembly performance was further evaluated using the Nozzle Structural Test Bed. Both current socket head cap screw and proposed multiphase alloy bolt configurations were tested. Results indicated that joint skip and bolt bending were significantly reduced with the new multiphase alloy bolt design. This paper summarizes all the test results completed to date.

Author

Torque; Bolts; Prestressing; Housings; Joints (Junctions)

20030111806 Ohio Aerospace Inst., Brook Park, OH, USA

Megawatt Electromagnetic Plasma Propulsion

Gilland, James; Lapointe, Michael; Mikellides, Pavlos; June 9, 2003; 26 pp.; In English; Technology and Systems Options Towards Megawatt Level Electric Propulsion Workshop, 9-10 Jun. 2003, Lerici, Italy

Contract(s)/Grant(s): NCC3-860; No Copyright; Avail: CASI; A03, Hardcopy

The NASA Glenn Research Center program in megawatt level electric propulsion is centered on electromagnetic acceleration of quasi-neutral plasmas. Specific concepts currently being examined are the Magnetoplasmadynamic (MPD) thruster and the Pulsed Inductive Thruster (PIT). In the case of the MPD thruster, a multifaceted approach of experiments, computational modeling, and systems-level models of self field MPD thrusters is underway. The MPD thruster experimental research consists of a 1-10 MWe, 2 ms pulse-forming-network, a vacuum chamber with two 32 diffusion pumps, and voltage, current, mass flow rate, and thrust stand diagnostics. Current focus is on obtaining repeatable thrust measurements of a Princeton Benchmark type self field thruster operating at 0.5-1 gls of argon. Operation with hydrogen is the ultimate goal to realize the increased efficiency anticipated using the lighter gas. Computational modeling is done using the MACH2 MHD code, which can include real gas effects for propellants of interest to MPD operation. The MACH2 code has been benchmarked against other MPD thruster data, and has been used to create a point design for a 3000 second specific impulse (Isp) MPD thruster. This design is awaiting testing in the experimental facility. For the PIT, a computational investigation using MACH2 has been initiated, with experiments awaiting further funding. Although the calculated results have been found to be sensitive to the initial ionization assumptions, recent results have agreed well with experimental data. Finally, a systems level self-field MPD thruster model has been developed that allows for a mission planner or system designer to input Isp and power level into the model equations and obtain values for efficiency, mass flow rate, and input current and voltage. This model emphasizes algebraic simplicity to allow its incorporation into larger trajectory or system optimization codes. The systems level approach will be extended to the pulsed inductive thruster and other electrodeless thrusters at a future date. Derived from text

Electromagnetic Propulsion; Plasma Propulsion; Magnetoplasmadynamic Thrusters; Mathematical Models

20030112360 Saint Louis Univ., Cahokia, IL, USA

Fuel Consumption Modeling of a Transport Category Aircraft: A Flight Operations Quality Assurance(F0QA)Analysis

Stolzer, Alan J.; Journal of Air Transportation, Volume 8, No. 2; 2003, pp. 3-18; In English; See also 20030112355; Copyright; Avail: CASI; A03, Hardcopy

Flight Operations Quality Assurance (F0QA)-derived data was used to develop parsimonious model(s) for fuel consumption on a Boeing 757 airplane using regression analysis. Using the model(s), it should be possible to identify outliers (specific flights) with respect to fuel consumption, which will enable the air carrier to investigate the cause of excessive fuel consumption and remedy the problem A major air carrier provided the database used for the study. Fuel flow was predicted

by calibrated airspeed, gross weight, and n2 (ENG[1 or 2ln2). The models containing these three variables explained approximately 85% of the variation in fuel flow. A reporting routine using these models and FOQA data should be incorporated into the ongoing quality assurance program of the air carrier.
Author
Fuel Consumption; Boeing 757 Aircraft

20030112368 ATK-Thiokol Propulsion, Brigham City, UT, USA
Characterization of Space Shuttle Reusable Rocket Motor Static Test Stand Thrust Measurements
Cook, Mart L.; Gruet, Laurent; Cash, Stephen F., Technical Monitor; January 06, 2003; 31 pp.; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS8-97238
Report No.(s): AIAA Paper 2003-0280; Copyright; Avail: CASI; A03, Hardcopy

Space Shuttle Reusable Solid Rocket Motors (RSRM) are static tested at two ATK Thiokol Propulsion facilities in Utah, T-24 and T-97. The newer T-97 static test facility was recently upgraded to allow thrust measurement capability. All previous static test motor thrust measurements have been taken at T-24; data from these tests were used to characterize thrust parameters and requirement limits for flight motors. Validation of the new T-97 thrust measurement system is required prior to use for official RSRM performance assessments. Since thrust cannot be measured on RSRM flight motors, flight motor measured chamber pressure and a nominal thrust-to-pressure relationship (based on static test motor thrust and pressure measurements) are used to reconstruct flight motor performance. Historical static test and flight motor performance data are used in conjunction with production subscale test data to predict RSRM performance. The predicted motor performance is provided to support Space Shuttle trajectory and system loads analyses. Therefore, an accurate nominal thrust-to-pressure (F/P) relationship is critical for accurate RSRM flight motor performance and Space Shuttle analyses. Flight Support Motors (FSM) 7, 8, and 9 provided thrust data for the validation of the T-97 thrust measurement system. The T-97 thrust data were analyzed and compared to thrust previously measured at T-24 to verify measured thrust data and identify any test-stand bias. The T-97 FIP data were consistent and within the T-24 static test statistical family expectation. The FSMs 7-9 thrust data met all NASA contract requirements, and the test stand is now verified for future thrust measurements.
Derived from text
Reusable Rocket Engines; Static Tests; Thrust Measurement; Test Stands; Space Shuttle Boosters; Propulsion System Performance

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

20030111773 Lockheed Martin Aeronautics Co., Fort Worth, TX, USA
Validation & Verification of Intelligent and Adaptive Control Systems
Buffington, James M.; Crum, Vince; Krogh, Bruce; Plaisted, Clinton; Prasanth, Ravi; Oct. 2003; 12 pp.; In English
Contract(s)/Grant(s): F33615-02-C-3206; Proj-2403
Report No.(s): AD-A417890; AFRL-VA-WP-TP-2003-334; No Copyright; Avail: CASI; A03, Hardcopy

Emerging military aerospace system operational goals, such as autonomy, will require advanced safety-critical control systems consisting of unconventional requirements, system architectures, software algorithms, and hardware implementations. These emerging control systems will significantly challenge current verification and validation (V&V) processes, tools, and methods for flight certification. Ultimately, transition of advanced control systems that enable transformational military operations will be decided by affordable V&V strategies that reduce costs and compress schedules for flight certification. This paper describes a comprehensive plan and preliminary results for a study of V&V needs for emerging safety-critical control systems in the context of military aerospace vehicle flight certification.
DTIC
Adaptive Control; Aerospace Systems; Computer Programs; Program Verification (Computers)

20030111895 NASA Marshall Space Flight Center, Huntsville, AL, USA

Use of Soft Computing Technologies For Rocket Engine Control

Trevino, Luis C.; Olcmen, Semih; Polites, Michael; [2003]; 2 pp.; In English; 22nd Digital Avionics Systems Conference, 12-16 Oct. 2003, Indianapolis, IN, USA; No Copyright; Avail: Other Sources; Abstract Only

The problem to be addressed in this paper is to explore how the use of Soft Computing Technologies (SCT) could be employed to further improve overall engine system reliability and performance. Specifically, this will be presented by enhancing rocket engine control and engine health management (EHM) using SCT coupled with conventional control technologies, and sound software engineering practices used in Marshall s Flight Software Group. The principle goals are to improve software management, software development time and maintenance, processor execution, fault tolerance and mitigation, and nonlinear control in power level transitions. The intent is not to discuss any shortcomings of existing engine control and EHM methodologies, but to provide alternative design choices for control, EHM, implementation, performance, and sustaining engineering. The approaches outlined in this paper will require knowledge in the fields of rocket engine propulsion, software engineering for embedded systems, and soft computing technologies (i.e., neural networks, fuzzy logic, and Bayesian belief networks), much of which is presented in this paper. The first targeted demonstration rocket engine platform is the MC-1 (formerly FASTRAC Engine) which is simulated with hardware and software in the Marshall Avionics & Software Testbed laboratory that

Author

Rocket Engine Control; Applications Programs (Computers); Fault Tolerance; Fuzzy Systems

20030112625 Air Force Research Lab., Wright-Patterson AFB, OH

Current Flying and Handling Qualities Simulations in AFRL/VA

Clark, Curtis S.; Slutz, Jeff; Sep. 2003; 13 pp.; In English

Report No.(s): AD-A417999; AFRL-VA-WP-TR-2003-329; AFRL-VA-WP-TR-2003-329; No Copyright; Avail: CASI; A03, Hardcopy

There has been renewed interest in recent years by the Air Force and collaborative partners in industry, academia, and other government agencies in conducting real-time, pilot-in-the-loop, motion-based simulations exploring Flying and Handling Qualities (FHQ) of future aircraft concepts. This field of study, prematurely declared by a few as a 'sunset science', has returned to relevance and importance as modern methods of control law design are used to maximize performance of highly unconventional air vehicle designs.

DTIC

Flight Simulators; Flight Simulation

20030112754 Naval Postgraduate School, Monterey, CA

Secure Ground-Based Remote Recording and Archiving of Aircraft 'Black Box' Data

Schoberg, Paul R.; Sep. 2003; 194 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418284; No Copyright; Avail: CASI; A09, Hardcopy

Aircraft accident investigation centers upon the analysis at all available information about the accident flight in the period leading up to the final catastrophe. Key among the sources at information is date captured and recorded in the flight data recorder and cockpit voice recorder, which are often referred to as the aircraft black boxes'. Par some accidents, this flight data may he lest entirely or partially damaged and largely unusable. The aircraft flight data recorders are the only place where flight data is recorded. This single recording paint is a vulnerability to the availability at flight data that can be addressed by creating another place where the data is stored. This thesis examines the feasibility at and discusses the technical framework necessary tar a system that transmits flight data tram an aircraft to a ground recording station. The focus will be upon the requirements tar security and assurance at the information flow, so that the confidentiality, integrity, availability and authenticity at the data are ensured.

DTIC

Data Recorders; Ground Stations; Voice Communication; Aircraft Safety

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For astronautical facilities see *14 Ground Support Systems and Facilities (Space)*.

20030111727 National Aerospace Lab., Tokyo

Technical Report of National Aerospace Laboratory. System Design of Renewed Transonic Flutter Testing Facility at NAL

Kikuchi, T.; Ejiri, H.; Morita, T.; Tamayama, M.; Nakamichi, J.; 2002; 34 pp.; In Japanese

Report No.(s): PB2004-100459; NAL/TR-1454; Copyright; Avail: National Technical Information Service (NTIS)

This report describes renewal of the Transonic Flutter Testing Facility (Flutter Wind Tunnel) at NAI, conducted from FY1993-FY1996. Chapters 1, 2, 3 and 4 are grouped together as Part I. These chapters outline the performance of the previous as well as the new system. Chapter 2 provides an overview of the previous system constructed in 1959. In Chapter 3, the purpose of the renewal and specifications and plans for the new system are shown. The proposed specifications are summarized. Chapter 4 describes the design of the new system performance. Part II corresponds to Chapter 5 and describes the design concept and technical investigations of various issues concerning the renewal design including the design of the pressure control valve, the high pressure tubes, the chambers, test section and prinum chamber. These compounds are considered not only from an aerodynamical but also from a structural dynamical perspective. Part III consists of Chapters 6, 7 and four appendices, and Chapter 6 gives an overview of the measurement systems in the present facility. Chapter 7 describes the flutter examination plan for the future as settling. The four appendices assist in understanding the design routings of the present wind tunnel.

NTIS

Flutter; Wind Tunnels; Test Chambers

20030111907 NASA Marshall Space Flight Center, Huntsville, AL, USA

NASA's Next Generation Launch Technology Program - Strategy and Plans

Hueter, Uwe; [2003]; 10 pp.; In English; 54th International Astronautical Congress, 29 Sep. - 3 Oct. 2003, Bremen, Germany

Report No.(s): 1AC-03-V.5.01; No Copyright; Avail: CASI; A02, Hardcopy

The National Aeronautics and Space Administration established a new program office, Next Generation Launch Technology (NGLT) Program Office, last year to pursue technologies for future space launch systems. NGLT will fund research in key technology areas such as propulsion, launch vehicles, operations and system analyses. NGLT is part of NASA s Integrated Space Technology Plan. The NGLT Program is sponsored by NASA s Office of Aerospace Technology and is part of the Space Launch Initiative theme that includes both NGLT and Orbital Space Plane. NGLT will focus on technology development to increase safety and reliability and reduce overall costs associated with building, flying and maintaining the nation s next-generations of space launch vehicles. These investments will be guided by systems engineering and analysis with a focus on the needs of National customers.

Author

Aerospace Engineering; Aerospace Planes; Spacecraft Launching

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20030111871

Hangtian Yixue Yu Yixue Gongcheng) Volume 16, Number 3, June 2003

Wei, J. H.; 2003; 88 pp.; In Chinese

Report No.(s): PB2004-100898; No Copyright; Avail: CASI; A05, Hardcopy

Contents include the following: A Novel Method of Normal Estimation for Visualization of Medical Images (in English); Influence of Simulated Weightlessness on the Morphology of Nerve Endings of Muscle Spindle in Rat Soleus Muscle; Stimulative Effects of LDR Induced Proteins on Human Peripheral Blood Lymphocyte Subsets; Effects of Body Position

Changes on Frequency Domain Correlative Cardiogram in Pilots; Study on Relationship between Emotional Stability in Flight and Nerve System Excitability; Expression Changes of Nitric Oxide Synthase mRNA of Hypothalamus after Sleep Deprivation in Rats; Encapsulation of Atrial Natriuretic Peptide (ANP) cDNA Transfection Cells and ANP Circadian Expression; Effects of Spirulina on Serum Lipids, Erythrocyte Membrane Fluidity and Vascular Endothelial Cells in Tail-suspended Rats; A Robot Measurement System for Spacesuit Joint Torque; Development of a Measurement and Control System of Human Centrifuge; Preliminary Experimental Analysis of Myocardial Function Evaluation Based on Integrated Backscatter; Automatic Navigation for Virtual Endoscope; A Fast Tri-linear Interpolation Algorithm for Volume Rendering of Medical Images; 3D Rotation Rendering Method in Medical Volume Visualization; Studies on Speaker Recognition Based on Complexity; Effect of Push-pull Maneuver on Distribution DNA and NO Content in Rats' Brain Tissue; Review of Visual Display System in Flight Simulator; Effects of Microgravity on the Gene Expression and Cellular Function of Osteoblasts; and Some Problems about Detecting the Suspected Cases of SARS according to the Local Skin Temperatures on Face.
NTIS
Aerospace Medicine; Physiological Responses

20030111872 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: Real-Time Recognition of Flat Areas for Lunar Landing Using the Shape-From-Shading Techique
Gomi, H.; Sasa, S.; Yamaguchi, I.; Ninomiya, T.; Hamada, Y.; 2002; 28 pp.; In Japanese
Report No.(s): PB2004-100901; NAL-TR-1447; Copyright; Avail: National Technical Information Service (NTIS)
The shape-from-shading technique is surveyed for application to obstacle avoidance for lunar landing. Tsai and Shah's algorithm is accurate, but it is time-consuming and sensitive to its boundary condition. Pentland's algorithm is robust and fast; however, it produces artifacts in reconstruction. The authors propose a real-time scheme of extracting flat areas instead of obstacles with Pentland's method.
NTIS
Lunar Landing; Image Processing

20030111934 Purdue Univ., West Lafayette, IN, USA
1ST Air Force Workshop on Multifunctional Aerospace Materials
Sun, C. T.; Oct. 2002; 405 pp.; In English
Contract(s)/Grant(s): F4962O-O2-1-0432
Report No.(s): AD-A417632; AFRL-SR-AR-TR-03-03-0350; No Copyright; Avail: CASI; A18, Hardcopy
The 'Microstructure Testing and Analysis Laboratory' is a new facility for the mechanical testing of small specimens, soft material, and small structures. The main components of the laboratory are a low force electrodynamically actuated test frame for axial/torsion and combined loading, a digital image correlation system for the measurement of displacement fields, and a stereovision system for investigations of fracture surface. The facilities have been used successfully in research projects on carbon-carbon composites, and in investigations of porous polymeric materials, as well as for projects in a graduate course on 'Micromechanics of Materials.' In all experiments performed so far the experimental facilities have performed in a satisfactory manner.
DTIC
Composite Materials; Spacecraft Components; Micromechanics; Aircraft Construction Materials; Spacecraft Construction Materials

20030112018 Nebraska Univ., Omaha, NE, USA
Proceedings of the NASA Aerospace Technology Symposium 2002
Bowen, Brent D., Editor; Fink, Mary M., Editor; Schaaf, Michaela M., Editor; March 2002; 139 pp.; In English; NASA Aerospace Technology Symposium 2002, 3-5 Mar. 2002, Las Cruces, NM, USA; See also 20030112019 - 20030112025; Original contains black and white illustrations
Report No.(s): UNOAI- 02-4; Copyright; Avail: CASI; A07, Hardcopy
Reports are presented from the NASA Aerospace Technology Symposium 2002 on the following: Geo-Referenced Altitude Hold For Latex Ballons; NASA Spaceport Research: Opportunities For space Grant and EPSCoR Involvement; Numerical Simulation Of The Combustion Of Fuel Droplets: Applications, Aircraft/Spacecraft Flight Control, Guidance Navigation; Expertise In System Dynamics and Control, Control Theory and Aerospace Education Ooutreach Opportunities;

and Technology For The Improvement Of General Aviation Security: A Needs Assessmemt.
Derived from text
Aerospace Sciences; Spacecraft Control

20030112669 Columbia Accident Investigation Board, Arlington, VA, USA, Federal Aviation Administration, Cambridge, MA, USA, NASA Ames Research Center, Moffett Field, CA, USA, Department of the Navy, Washington, DC, USA
Columbia Accident Investigation Board Report. Volume Five
Gehmann, H. W.; Barry, J. L.; Deal, D. W.; Hallock, J. N.; Hess, K. W.; Oct. 2003; In English
Report No.(s): PB2004-100870; No Copyright; Avail: National Technical Information Service (NTIS)

Volume V of the Report contains appendices that were not cited in VolumeI. These consist of documents produced by NASA and other organizations, which were provided to the Columbia Accident Investigation Board in support of its inquiry into the February 1, 2003 destruction of the Space Shuttle Columbia The contents include:. Appendix G.1 Requirements and Procedures for Certification of Flight Readiness; Appendix G.2 Appendix R, Space Shuttle Program Contingency Action Plan; Appendix G.3 CAIB Charter, with Revisions; Appendix G.4 Group 1 Matrix Brief on Maintenance, Material, and Management; Appendix G.5 Vehicle Data Mapping(VDM) Team Final Report, Jun 13, 2003; Appendix G.6 SRB Working Group Presentation to CAIB; Appendix G. 7 Starfire Team Final Report, Jun 3, 2003; Appendix G.8 Using the Data and Observations from Flight STS-107, Executive Summary; Appendix G.9 Contracts, Incentives, and Safety/Technical Excellence; Appendix G.10 Detailed Summaries: Rogers Commission Report, ASAP Report, SIAT Report; Appendix G.11 Foam Application and Production Chart; Appendix G.12 Crew Survivability Report; and Appendix G.12 Aero/Aerothermal/ Thermal/Structures Team FinalReport, August 6, 2003.
NTIS
Space Shuttles; Project Planning; Certification; Accident Investigation

13
ASTRODYNAMICS

Includes powered and free flight trajectories; orbital and launching dynamics.

20030111730 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory. Yawing Mode Flutter of Non-Planar Wing
Kanda, A.; 2002; 22 pp.; In Japanese
Report No.(s): PB2004-100471; NAL-TR-1451; Copyright; Avail: National Technical Information Service (NTIS)

If a winged reentry space vehicle with non-planar wings such as a tip-fin is attached atop a launch rocket, lateral mode oscillation due to an attachment between the vehicle and the rocket and/or the rocket may have an effect on the flutter characteristics of the wings. A particular supporting system was developed for wind tunnel tests, which had a yawing elasticity as a lateral mode. Flutter experiments were conducted in NAL/TWT. Flutter characteristics were also compared by with the doublet-point method (DPM). Numerical results are consistent with experimental results.
NTIS
Reentry Vehicles; Wind Tunnel Tests; Flutter; Yaw

20030111896 Naval Postgraduate School, Monterey, CA
Optimization of Low Thrust Trajectories With Terminal Aerocapture
Josselyn, Scott B.; Jun. 2003; 173 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417512; No Copyright; Avail: CASI; A08, Hardcopy

This thesis explores using a direct pseudospectral method for the solution of optical control problems with mixed dynamics. An easy to use MATLAB optimization package known as DIDO is used to obtain the solutions. The modeling of both low thrust interplanetary trajectories as well as aerocapture trajectories is detailed and the solutions for low thrust minimum time and minimum fuel trajectories are explored with particular emphasis on verification of the optimality of the obtained solution. Optimal aerocapture trajectories are solved for rotating atmospheres over a range of arrival V- infinities. Solutions are obtained using various performance indexes including minimum fuel, minimum heat load, and minimum total aerocapture mass. Finally, the problem formulation and solutions for the mixed dynamic problem of low thrust trajectories with a terminal aerocapture maneuver is addressed yielding new trajectories maximizing the total scientific mass at arrival. This thesis explores using a direct pseudospectral method for the solution of optimal control problems with mixed dynamics. An easy to use MATLAB optimization package known as DIDO is used to obtain the solutions. The modeling of both low

thrust interplanetary trajectories as well as aerocapture trajectories is detailed and the solutions for low thrust minimum time and minimum fuel trajectories are explored with particular emphasis on verification of the optimality of the obtained solution. Optimal aerocapture trajectories are solved for rotating atmospheres over a range of arrival V-infinities. Solutions are obtained using various performance indexes including minimum fuel, minimum heat load, and minimum total aerocapture mass. Finally, the problem formulation and solutions for the mixed dynamic problem of low thrust trajectories with a terminal aerocapture maneuver is addressed yielding new trajectories maximizing the total scientific mass at arrival.
DTIC
Interplanetary Trajectories; Interorbital Trajectories; Trajectory Optimization; Optimal Control

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20030111839 Naval Postgraduate School, Monterey, CA
Design And Simulation of a Three-Axis Stabilized Satellite and Kalman Filter Rate Estimator
Vitalich, John; Jun. 2003; 114 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417587; No Copyright; Avail: CASI; A06, Hardcopy

Design requirements for a small satellite (NPSAT- l) Attitude Determination and Control Subsystem (ADCS) is a three-axis stabilized spacecraft which requires a control attitude of +/- 1,0 degrees and knowledge attitude of +/- 0,1 degree. Several design aspects are considered in development of attitude control systems for a small satellite, such as: spacecraft dynamics, space environment, disturbance torques, orbit type, and spacecraft complexity. The ideal spacecrafts attitude sensor is a rate gyroscope, which provides rate information to the attitude control system In the case of NP SAT- 1, due to budget constraints alternative sensors will be utilized, such as: a three-axis magnetometer, earth sensors, and a Global Positioning System (GPS), A small satellite designed to have a three-axis stabilized, biased momentum system, must have a robust control system, and requires a momentum wheel to provide stiffness to maintain attitude, and magnetic torque rods on each axis. The current design of NPSAT- 1 uses all of these sensors to provide rate information for damping and stability to the control system that requires a complicated attitude control design, The purpose of this attitude control design simulation is to investigate and propose a control law utilizing a single pitch momentum wheel and three magnetic torque rods. A further proposal is to utilize a constant speed momentum wheel to avoid momentum damping and over speed, replace the pitch control with magnetic torquers, and develop a Kalman filter estimator to provide all the required angular rates,
DTIC
Control Simulation; Kalman Filters; Stability; Small Satellite Technology; Satellite Control; Satellite Design

20030112606 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Lithium Ion Batteries on 2003 Mars Exploration Rover
Bugga, Ratnakumar; Smart, Marshall; Whitcanack, Larry; Knight, Jennifer; Ewell, Richard; Surampudi, Rao; Puglia, Frank; Curran, Tim; The 2002 NASA Aerospace Battery Workshop; April 2003; 44 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 2003 Mars Exploration Rovers (MER) have Li-SO2 primary batteries on the Lander to support the EDL operations, Li-FeS2 thermal batteries on the back shell for firing pyros during cruise stage separation and Li ion rechargeable batteries on the Rover to assist in the launch, TCM and surface operations. The Rover is about ten times bigger in size, pay load and traversing capability than the previous Sojourner rover and will have a longer mission life with the rechargeable batteries. Lithium ion batteries fabricated by Yardney Technical Products for the MER mission show adequate performance in the operating range, in the MER environments, under steady state and pulse currents and, also in conjunction with a battery charger designed and built in-house.
Derived from text
Electric Batteries; Lithium; Metal Ions; Mars Exploration; Roving Vehicles

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20030111789 NASA Marshall Space Flight Center, Huntsville, AL, USA
Specification of the ISS Plasma Environment Variability
Minow, Joseph I.; Neergaard, Linda F.; Bui, Them H.; Mikatarian, Ronald R.; Barsamian, H.; Koontz, Steven L.; June 10, 2002; 1 pp.; In English; 8th Spacecraft Charging Technology Conference, 20-24 Oct. 2003, Huntsville, AL, USA
Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: Other Sources; Abstract Only

Quantifying the spacecraft charging risks and corresponding hazards for the International Space Station (ISS) requires a plasma environment specification describing the natural variability of ionospheric temperature (Te) and density (Ne). Empirical ionospheric specification and forecast models such as the International Reference Ionosphere (IRI) model typically only provide estimates of long term (seasonal) mean Te and Ne values for the low Earth orbit environment. Knowledge of the Te and Ne variability as well as the likelihood of extreme deviations from the mean values are required to estimate both the magnitude and frequency of occurrence of potentially hazardous spacecraft charging environments for a given ISS construction stage and flight configuration. This paper describes the statistical analysis of historical ionospheric low Earth orbit plasma measurements used to estimate Ne, Te variability in the ISS flight environment. The statistical variability analysis of Ne and Te enables calculation of the expected frequency of Occurrence of any particular values of Ne and Te, especially those that correspond to possibly hazardous spacecraft charging environments. The database used in the original analysis included measurements from the AE-C, AE-D, and DE-2 satellites. Recent work on the database has added additional satellites to the database and ground based incoherent scatter radar observations as well. Deviations of the data values from the IRI estimated Ne, Te parameters for each data point provide a statistical basis for modeling the deviations of the plasma environment from the IRI model output. This technique, while developed specifically for the Space Station analysis, can also be generalized to provide ionospheric plasma environment risk specification models for low Earth orbit over an altitude range of 200 km through approximately 1000 km.
Author
Risk; International Space Station; Hazards; Statistical Analysis; Atmospheric Models

20030111797 Lockheed Martin Space Mission Systems and Services, Littleton, CO, USA
Orbital Space Plane (OSP) Program
McKenzie, Patrick M.; September 19, 2003; 7 pp.; In English; 54th International Astronautical Congress, 29 Sep. - 3 Oct. 2003, Bremen, Germany
Contract(s)/Grant(s): NAS8-01098; No Copyright; Avail: CASI; A02, Hardcopy

Lockheed Martin has been an active participant in NASA's Space Launch Initiative (SLI) programs over the past several years. SLI, part of NASA's Integrated Space Transportation Plan (ISTP), was restructured in November of 2002 to focus the overall theme of safer, more afford-able space transportation along two paths - the Orbital Space Plane Program and the Next Generation Launch Technology programs. The Orbital Space Plane Program has the goal of providing rescue capability from the International Space Station by 2008 and transfer capability for crew (and limited cargo) by 2012. The Next Generation Launch Technology program is combining research and development efforts from the 2nd Generation Reusable Launch Vehicle (2GRLV) program with cutting-edge, advanced space transportation programs (previously designated 3rd Generation) into one program aimed at enabling safe, reliable, cost-effective reusable launch systems by the middle of the next decade. Lockheed Martin is one of three prime contractors working to bring Orbital Space Plane system concepts to a system definition level of maturity by December of 2003. This paper and presentation will update the international community on the progress of the' OSP program, from an industry perspective, and provide insights into Lockheed Martin's role in enabling the vision of a safer, more affordable means of taking people to and from space.
Author
Space Transportation; International Space Station; Systems Analysis; Aerospace Planes

20030112452 NASA Johnson Space Center, Houston, TX, USA
Expedition 8 Crew Interview: Pedro Duque
[2003]; In English; 29 min., 34 sec. playing time, in color, with sound
Report No.(s): JSC-1949C; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

European Space Agency (ESA) astronaut Pedro Duque is interviewed in preparation for his flight to and eight day stay on the International Space Station (ISS) as part of the Cervantes mission. Duque arrived on the ISS with the Expedition 8 crew onboard a Soyuz TMA-3, the seventh Soyuz flight to the station. He departed from the ISS on a Soyuz TMA-2 with the Expedition 7 crew of the ISS. In the video, Duque answers questions on: the goals of his flight; his life and career path; the Columbus Module, which ESA will contribute to the ISS, the ride onboard a Soyuz, and the importance of the ISS.
CASI
Astronauts; European Space Agency; International Space Station; Soyuz Spacecraft

20030112620 NASA Glenn Research Center, Cleveland, OH, USA
An Overview of the NASA Aerospace Flight Battery Systems Program
Manzo, Michelle; The 2002 NASA Aerospace Battery Workshop; April 2003; 29 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Develop an understanding of the safety issues relating to space use and qualification of new Li-Ion technology for manned applications. Enable use of new technology batteries into GFE equipment - laptop computers, camcorders. Establish a data base for an optimized set of cells (and batteries) exhibiting acceptable performance and abuse characteristics for utilization as building blocks for numerous applications.
Derived from text
Electric Batteries; Lithium; Metal Ions

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20030110965 Lunar and Planetary Inst., Houston, TX, USA
NASA Mobile Lunar and Planetary Science Module
Beck, R. A.; Vincent, R. K.; Watts, D. R.; Seibert, M.; Pleva, D.; Cauley, M.; Ramos, C.; Scott, T.; Harter, D.; Kosmo, J., et al.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NASA and university researchers have specified a fundamental suite of scientific instrumentation focused on surface composition determination for the calibration and validation of NASA orbiting sensors for mobile planetary exploration. The instruments have been integrated with navigation and clocks to create a scientific data base that is searchable by location, time of acquisition, and instrument. The time and location controlled data stream is then transmitted via a tiered hybrid wireless and network for lunar and planetary scientific analyses within remote sensing and lunar-spatial and planet-spatial information systems as well as a custom-designed navigation-system-aware Internet Browser. The system is designed specifically to provide surface composition information for lunar and planetary orbiting imagers. The base suite of scientific instrumentation for planetary surface analysis and orbiter calibration and validation consists of high-resolution video cameras, three spectroradiometers, an infra-red thermometer, Geiger counter, an astronaut operated microscope and associated sampling gear. These instruments have been integrated with two remotely controlled microcomputers within the test-bed that control the instruments and act as intermediate servers to store data as they are acquired.
Author
Instrument Packages; Data Bases; Wireless Communication; Communication Networks; Internet Resources; Information Systems

20030112227 BBN Systems and Technologies Corp., Cambridge, MA, USA
Comparison of TCeMA and TDMA for Inter-Satellite Communications using OPNET Simulation
Hain, Regina Rosales; Ramanathan, Ram; Bergamo, Marcos; Wallett, Thomas M.; [2003]; 8 pp.; In English; OPNETWORKS 2003 Conference, 25-29 Aug. 2003, Washington, DC, USA
Contract(s)/Grant(s): NAS3-01101; NRA-99-OSS-05-0977; Copyright; Avail: CASI; A02, Hardcopy

A robust data link protocol, enabling unique physical and MAC layer technologies and sub-network level protocols, is needed in order to take advantage of the full potential of using both TDMA and CDMA in a satellite communication network. A novel MAC layer protocol, TDMA with CDMA-encoding multiple access (TCeMA) integrated with null-steered digital beam-forming spatial multiplexing, is investigated to support flexible spacecraft communications. Abstract models of the

TCeMA and TDMA processes are developed in OPNFiT and a comparison of the performances of TCeMA and TDMA in a satellite network simulation are made. TCeMA provides the better connectivity and capacity with respect to TDMA for satellite communication traffic.
Author
Satellite Communication; Time Division Multiple Access; Computerized Simulation; Software Engineering; Satellite Networks; Code Division Multiple Access

20030112255 Analex Corp., Brook Park, OH, USA
Satellite Communications for ATM
Shamma, Mohammed A.; [2003]; 21 pp.; In English; I-CNS 2003, 19-22 May 2003, Annapolis, MD, USA
Contract(s)/Grant(s): NAS3-00145; WBS 22-727-01-03; No Copyright; Avail: CASI; A03, Hardcopy

This presentation is an overview on Satellite Communication for the Aeronautical Telecommunication Management (ATM) research. Satellite Communications are being considered by the FAA and NASA as a possible alternative to the present and future ground systems supporting Air Traffic Communications. The international Civil Aviation Organization (ICAO) have in place Standards and Recommended Practices (SARPS) for the Aeronautical Mobile Satellite Services (AMSS) which is mainly derived from the pre-existing Inmarsat service that has been in service since the 1980s. The Working Group A of the Aeronautical Mobile Communication Panel of ICAO has also been investigating SARPS for what is called the Next Generation Satellite Service (NGSS) which conforms less to the Inmarsat based architecture and explores wider options in terms of satellite architectures. Several designs are being proposed by Firms such as Boeing, ESA, NASA that are geared toward full or secondary usage of satellite communications for ATM. Satellite communications for ATM can serve several purposes ranging from primary usage where ground services would play a minimal backup role, to an integrated solution where it will be used to cover services, or areas that are less likely to be supported by the proposed and existing ground infrastructure. Such Integrated roles can include usage of satellite communications for oceanic and remote land areas for example. It also can include relieving the capacity of the ground network by providing broadcast based services of Traffic Information Services messages (TIS-B), or Flight Information Services (FIS-B) which can take a significant portion of the ground system capacity. Additionally, satellite communication can play a backup role to support any needs for ground replacement, or additional needed capacity even after the new digital systems are in place. The additional bandwidth that can be provided via satellite communications can also open the door for many new applications that generally will enhance the standard services provided. All of those possibilities were investigated and comments, as well as descriptions of those analyses are put forward, as well as suggestions for future areas of study.
Author
Aircraft Communication; Telecommunication; Satellite Communication; Aeronautical Satellites

20030112412 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Independent Confirmation of the Pioneer 10 Anomalous Acceleration
Markwardt, Craig B.; [2002]; 29 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

I perform an independent analysis of radio Doppler tracking data from the Pioneer 10 spacecraft for the time period 1987-1994. All of the tracking data were taken from public archive sources, and the analysis tools were developed independently by myself. I confirm that an apparent anomalous acceleration is acting on the Pioneer 10 spacecraft, which is not accounted for by present physical models of spacecraft navigation. My best fit value for the acceleration, including corrections for systematic biases and uncertainties, is (8.60 plus or minus 1.34) x 10(exp -8) centimeters per second, directed towards the Sun. This value compares favorably to previous results. I examine the robustness of my result to various perturbations of the analysis method, and find agreement to within plus or minus 5%. The anomalous acceleration is reasonably constant with time, with a characteristic variation time scale of greater than 70 yr. Such a variation timescale is still too short to rule out on-board thermal radiation effects, based on this particular Pioneer 10 data set.
Author
Doppler Radar; Pioneer 10 Space Probe; Anomalies; Radio Tracking; Acceleration (Physics); Mathematical Models

20030112676 Analex Corp., Cleveland, OH, USA
A TDMA Broadcast Satellite/Ground Architecture for the Aeronautical Telecommunications Network
Shamma, Mohammed A.; Raghavan, Rajesh S.; [2003]; 11 pp.; In English
Contract(s)/Grant(s): NAS3-00145; No Copyright; Avail: CASI; A03, Hardcopy

An initial evaluation of a TDMA satellite broadcast architecture with an integrated ground network is proposed in this

study as one option for the Aeronautical Telecommunications Network (ATN). The architecture proposed consists of a ground based network that is dedicated to the reception and transmissions of Automatic Dependent Surveillance Broadcast (ADS-B) messages from Mode-S or UAT type systems, along with tracks from primary and secondary surveillance radars. Additionally, the ground network could contain VHF Digital Link Mode 2, 3 or 4 transceivers for the reception and transmissions of Controller-Pilot Data Link Communications (CPDLC) messages and for voice. The second part of the ATN network consists of a broadcast satellite based system that is mainly dedicated for the transmission of surveillance data as well as En-route Flight Information Service Broadcast (FIS-B) to all aircraft. The system proposed integrates those two network to provide a nation wide comprehensive service utilizing near term or existing technologies and hence keeping the economic factor in prospective. The next few sections include a background introduction, the ground subnetwork, the satellite subnetwork, modeling and simulations, and conclusion and recommendations.
Author
Telecommunication; Aeronautics; Time Division Multiple Access; Communication Networks; Ground Stations; Satellite Networks; Satellite Design; Systems Engineering

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SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance; 39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20030109436 NASA Ames Research Center, Moffett Field, CA, USA
Computational Analysis of a Prototype Martian Rotorcraft Experiment
Corfeld, Kelly J.; Strawn, Roger C.; Long, Lyle N.; October 22, 2001; 1 pp.; In English; 20th AIAA Applied Aerodynamics Conference, 24-26 Jun. 2002, Saint Louis, MO, USA
Report No.(s): AIAA Paper 2002-2815; No Copyright; Avail: Other Sources; Abstract Only

This paper presents Reynolds-averaged Navier-Stokes calculations for a prototype Martian rotorcraft. The computations are intended for comparison with an ongoing Mars rotor hover test at NASA Ames Research Center. These computational simulations present a new and challenging problem, since rotors that operate on Mars will experience a unique low Reynolds number and high Mach number environment. Computed results for the 3-D rotor differ substantially from 2-D sectional computations in that the 3-D results exhibit a stall delay phenomenon caused by rotational forces along the blade span. Computational results have yet to be compared to experimental data, but computed performance predictions match the experimental design goals fairly well. In addition, the computed results provide a high level of detail in the rotor wake and blade surface aerodynamics. These details provide an important supplement to the expected experimental performance data.
Author
Rotary Wing Aircraft; Prototypes; Navier-Stokes Equation; Performance Prediction; Reynolds Averaging

20030111362 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Exploring with PAM: Prospecting ANTS Missions for Solar System Surveys
Clark, P. E.; Rilee, M. L.; Curtis, S. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

ANTS (Autonomous Nano-Technology Swarm), a large (1000 member) swarm of nano to picoclass (10 to 1 kg) totally autonomous spacecraft, are being developed as a NASA advanced mission concept. ANTS, based on a hierarchical insect social order, use an evolvable, self-similar, hierarchical neural system in which individual spacecraft represent the highest level nodes. ANTS uses swarm intelligence attained through collective, cooperative interactions of the nodes at all levels of the system. At the highest levels this can take the form of cooperative, collective behavior among the individual spacecraft in a very large constellation. The ANTS neural architecture is designed for totally autonomous operation of complex systems including spacecraft constellations. The ANTS (Autonomous Nano Technology Swarm) concept has a number of possible applications. A version of ANTS designed for surveying and determining the resource potential of the asteroid belt, called PAM (Prospecting ANTS Mission), is examined here.
Derived from text
Autonomy; Nanotechnology; NASA Space Programs; Space Missions; Solar System

20030111785 NASA Marshall Space Flight Center, Huntsville, AL, USA

Applying a Crew Accommodations Resource Model to Future Space Vehicle Research

Blume, Jennifer Linda; [2003]; 1 pp.; In English; Huntsville Simulation Conference 2003 (HSC '03), 29-31 Oct. 2003, Huntsville, AL, USA

Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: Other Sources; Abstract Only

The success of research and development for human space flight depends heavily on modeling. In addition, the use of such models is especially critical at the earliest phase of research and development of any manned vehicle or habitat. NASA is currently studying various innovative and futuristic propulsion technologies to enable further exploration of space by untended as well as tended vehicles. Details such as vehicle mass, volume, shape and configuration are required variables to evaluate the success of the propulsion concepts. For tended vehicles, the impact of the crew's requirements on those parameters must be included. This is especially important on long duration missions where the crew requirements become more complex. To address these issues, a crew accommodations resource model, developed as a mission planning tool for human spaceflight (Stillwell, Boutros, & Connolly), was applied to a reference mission in order to estimate the volume and mass required to sustain a crew for a variety of long duration missions. The model, which compiled information from numerous different sources and contains various attributes which can be modified to enable comparisons across different dimensions, was instrumental in deriving volume and mass required for a tended long duration space flight. With the inclusion of some additional variables, a set of volume and mass requirements were provided to the project. If due consideration to crew requirements for volume and mass had not been entertained, the assumptions behind validation of the propulsion technology could have been found to be incorrect, possibly far into development of the technology or even into the design and build of test vehicles. The availability and use of such a model contributes significantly by increasing the accuracy of human space flight research and development activities and acts as a cost saving measure by preventing inaccurate assumptions from driving design decisions.

Author

Spacecraft Cabins; Test Vehicles; Space Exploration; Research and Development; Mission Planning

20030111787 NASA Marshall Space Flight Center, Huntsville, AL, USA

Space Environments and Effects (SEE) Program: Spacecraft Charging Technology Development Activities

Kauffman, Billy; Hardage, Donna; Minor, Jody; October 07, 2003; 9 pp.; In English; 8th Spacecraft Charging Technology Development Conference, 20-24 Oct. 2003, Huntsville, AL, USA; No Copyright; Avail: CASI; A02, Hardcopy

Reducing size and weight of spacecraft, along with demanding increased performance capabilities, introduces many uncertainties in the engineering design community on how materials and spacecraft systems will perform in space. The engineering design community is forever behind on obtaining and developing new tools and guidelines to mitigate the harmful effects of the space environment. Adding to this complexity is the continued push to use Commercial-off-the-shelf (COTS) microelectronics, potential usage of unproven technologies such as large solar sail structures and nuclear electric propulsion. In order to drive down these uncertainties, various programs are working together to avoid duplication, save what resources are available in this technical area and possess a focused agenda to insert these new developments into future mission designs. This paper will introduce the SEE Program, briefly discuss past and currently sponsored spacecraft charging activities and possible future endeavors.

Author

Spacecraft Charging; Nuclear Electric Propulsion; Aerospace Environments; Microelectronics

20030111794 Jacobs Sverdrup, Huntsville, AL, USA

Low Earth Orbit Plasma Variability Model

Minow, Joseph I.; June 06, 2003; 1 pp.; In English; 2003 International Reference Ionosphere Workshop, 6-10 Oct. 2003, Grahmstown, South Africa

Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: Other Sources; Abstract Only

The empirical International Reference Ionosphere is a widely used model for estimating low Earth orbit plasma characteristics for use in spacecraft design and mission analysis. The climatological model provides mean values of plasma density, temperature, composition, and other ionospheric parameters that can be used to estimate the average magnitude of spacecraft charging, current collection for electrodynamic tethers, and other effects on spacecraft design. Mean IRI parameters are not adequate to answer questions such as what is the maximum or minimum value of the spacecraft potential, does the maximum spacecraft potential exceed a program requirement, will an electrodynamic tether provide adequate drag to deorbit a satellite at end of life, and will the tether provide sufficient thrust to reboost a spacecraft at any time in the solar cycle. These questions require estimates of the variability of the ionospheric environment about the mean values. This presentation

describes the status of work at MSFC to develop an empirical ionospheric variability model that can be used in conjunction with the climatological IRI model to provide both mean ionospheric parameters and variations of the environment about the mean. Our technique will use an extensive database of satellite and radar observations of the electron density and temperature to derive variances of the data about the model values. The variances will then be incorporated into Fortran wrapper software that calls the IRI-2001 model and provides statistical estimates of the deviation of the environment about the mean IRI values. We will provide an update on the state of the database development and provide examples of analysis and modeling efforts completed specifically for an International Space Station application.
Author
Low Earth Orbits; Plasma Density; Atmospheric Models; Climatology; Electron Density (Concentration)

20030111798 NASA Marshall Space Flight Center, Huntsville, AL, USA
Orbital Space Plane Program Status
Dumbacher, Daniel L.; [2003]; 1 pp.; In English; 54th International Astronautical Congress, 29 Sep. - 3 Oct. 2003, Bremen, Germany; No Copyright; Avail: Other Sources; Abstract Only

The Orbital Space Plane Program is an integral part of NASA's Integrated Space Transportation Program (ISTP). The ISTP consists of three major programs: Space Shuttle, Orbital Space Plane, and Next Generation Launch Technology. The Orbital Space Plane (OSP) Program will develop a new Crew Transfer Vehicle (CTV) with multipurpose utility for the Agency. The CTV will complement and back up the Space Shuttle by taking crews to and from the International Space Station (ISS), as well as enable a transition path to future reusable launch vehicle systems. In the CTV development cycle, around 2010 it will be used as a Crew Return Vehicle (CRV). The OSP will be launched on an Evolved Expendable Launch Vehicle (EELV). NASA is in the process of establishing Level 1 Requirements and initiating concept studies. Ongoing flight demonstrators will continue, while new flight demonstrator projects will begin. The OSP Program contains two elements: (1) Technology and Demonstrations, and (2) Design, Development, and Production. The OSP Design, Development, and Production element will enter the Formulation Phase in FY03. Per NASA Procedures and Guidelines 7120.5B, the Formulation Phase will be utilized to establish the Program schedule and budget plans. Current budget planning is based on Phase A concept studies being conducted in FY03 and FY04, preliminary design activities conducted in FY04 and FY05, and a Preliminary Design Review in FY05. An OSP full-scale development decision will be made in FY05. At that point, a conclusion to proceed will result in the OSP Program transitioning from the Formulation Phase to the Development Phase.
Author
Aerospace Planes; NASA Space Programs; Launch Vehicles; Space Shuttles; Space Shuttle Orbiters; Reusable Launch Vehicles

20030111910 NASA Marshall Space Flight Center, Huntsville, AL, USA
Operational Issues in the Development of a Cost-Effective Reusable LOX/LH2 Engine
Ballard, Richard O.; October 10, 2003; 8 pp.; In English; 5th International Symposium on Liquid Space Propulsion, 27-30 Oct. 2003, Chattanooga, TN, USA; No Copyright; Avail: CASI; A02, Hardcopy

The NASA Space Launch Initiative (SLI) was initiated in early 2001 to conduct technology development and to reduce the business and technical risk associated with developing the next-generation reusable launch system. In the field of main propulsion, two LOXLH2 rocket engine systems, the Pratt & Whitney / Aerojet Joint Venture (JV) COBRA and the Rocketdyne RS-83, were funded to develop a safe, economical, and reusable propulsion system. Given that a large-thrust reusable rocket engine program had not been started in the U.S. since 1971, with the Space Shuttle Main Engine (SSME), this provided an opportunity to build on the experience developed on the SSME system, while exploiting advances in technology that had occurred in the intervening 30 years. One facet of engine development that was identified as being especially vital in order to produce an optimal system was in the areas of operability and maintainability. In order to achieve the high levels of performance required by the Space Shuttle, the SSME system is highly complex with very tight tolerances and detailed requirements. Over the lifetime of the SSME program, the engine has required a high level of manpower to support the performance of inspections, maintenance (scheduled and unscheduled) and operations (prelaunch and post-flight). As a consequence, the labor- intensive needs of the SSME provide a significant impact to the overall cost efficiency of the Space Transportation System (STS). One of the strategic goals of the SLI is to reduce cost by requiring the engine(s) to be easier (Le. less expensive) to operate and maintain. The most effective means of accomplishing this goal is to infuse the operability and maintainability features into the engine design from the start. This paper discusses some of the operational issues relevant to a reusable LOx/LH2 main engine, and the means by which their impact is mitigated in the design phase.
Author
Technology Assessment; Reusable Rocket Engines; Spacecraft Launching; Cost Reduction

20030112133 NASA Langley Research Center, Hampton, VA, USA

Progress in the Phase 0 Model Development of a STAR Concept for Dynamics and Control Testing

Woods-Vedeler, Jessica A.; Armand, Sasan C.; September 2003; 21 pp.; In English

Contract(s)/Grant(s): 23-755-06

Report No.(s): NASA/TM-2003-212645; L-19002; NAS 1.15:212645; No Copyright; Avail: CASI; A03, Hardcopy

The paper describes progress in the development of a lightweight, deployable passive Synthetic Thinned Aperture Radiometer (STAR). The spacecraft concept presented will enable the realization of 10 km resolution global soil moisture and ocean salinity measurements at 1.41 GHz. The focus of this work was on definition of an approximately 1/3-scaled, 5-meter Phase 0 test article for concept demonstration and dynamics and control testing. Design requirements, parameters and a multi-parameter, hybrid scaling approach for the dynamically scaled test model were established. The El Scaling Approach that was established allows designers freedom to define the cross section of scaled, lightweight structural components that is most convenient for manufacturing when the mass of the component is small compared to the overall system mass. Static and dynamic response analysis was conducted on analytical models to evaluate system level performance and to optimize panel geometry for optimal tension load distribution.

Author

Design Analysis; Dynamic Control; Dynamic Response; Mathematical Models; Stellar Models; Soil Moisture

20030112192 NASA Marshall Space Flight Center, Huntsville, AL, USA

Nondestructive Inspection Techniques for Friction Stir Weld Verification on the Space Shuttle External Tank

Suits, Michael W.; Leak, Jeffery; Bryson, Craig; [2003]; 1 pp.; In English; ASM 2003 Fall Conference, 13-17 Oct. 2003, Pittsburg, PA, USA; No Copyright; Avail: Other Sources; Abstract Only

Friction Stir Welding (FSW) has gained wide acceptance as a reliable joining process for aerospace hardware as witnessed by its recent incorporation into the Delta Launch vehicle cryotanks. This paper describes the development of nondestructive evaluation methods and techniques used to verify the FSW process for NASA's Space Shuttle.

Author

Nondestructive Tests; Friction Stir Welding; External Tanks

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20030110778 Hawaii Univ., Honolulu, HI, USA

Mini-SMIFTS: A High Spatial Resolution Thermal Infrared Spectrometer for Mars Landers

Lucey, P. G.; Wilcox, B. B.; Gillis, J. J.; Hamilton, V. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are developing an imaging infrared spectrometer for Mars landed missions that will provide significantly higher spatial resolution than mini-TES, and collect these data at much higher rates. Our instrument will follow on the heels of highly successful thermal infrared instruments, with another pair of thermal IR spectrometers expected to land on Mars in the next two years (MER/Athena Mini-TES). MiniTES offers high spectral resolution but has relatively low spatial resolution (8 mrad at its highest angular resolution mode, compared to 0.25 mrad for Pancam). The advantage of the instrument proposed here is that it will incorporate some of the best characteristics of the existing orbital and lander instruments, plus some new advances, and put them together in one instrument package. The data that would be collected from a flight instrument based on our PIDDP instrument would then be well-suited for bridging the spectral and/or spatial resolution gaps in the current and future instruments.

Derived from text

Product Development; Imaging Spectrometers; Infrared Spectrometers; Spectral Resolution; Angular Resolution

20030111412 Remote Sensing Technology Center, Tokyo, Japan

Post-Launch Calibration of the Planet-B Extreme Ultraviolet Scanner

Shiomi, K.; Yamazaki, A.; Yoshikawa, I.; Takizawa, Y.; Nakamura, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Extreme Ultraviolet scanner (XUV) onboard Planet-B was a newly developed telescope for measuring an amount of helium gas and ions, which emit resonantly scattered light, on Martian atmosphere and ionosphere. XUV observed moonlight at a distance of 80 Earth radii (R(sub g)) when Planet-B was in parking orbit around Earth. We study the validity of pre-launch laboratory calibration, such as sensor efficiency, line of sight (LOS), and field of view (FOV) of XUV, with analyzing observation data of the Moon.

Derived from text

Calibrating; Scanners; Extreme Ultraviolet Radiation; Mars Atmosphere

20030111818 NASA Ames Research Center, Moffett Field, CA, USA

Airborne Sun Photometer Measurements of Aerosol Optical Depth during SOLVE II: Comparison with SAGE III and POAM III Measurements

Russell, P.; Livingston, J.; Schmid, B.; Eilers, J.; Kolyer, R.; Redemann, J.; Yee, J.-H.; Trepte, C.; Thomason, L.; Zawodny, J., et al.; [2003]; 1 pp.; In English; SOLVE II/Vintersol Joint Science Team Meeting, 21-24 Oct. 2003, Kissimmee, FL, USA Contract(s)/Grant(s): WBS 21-621-60-02-10; Copyright; Avail: Other Sources; Abstract Only

The 14-channel NASA Ames Airborne Tracking Sunphotometer (AATS-14) was operated aboard the NASA DC-8 during the Second SAGE III Ozone Loss and Validation Experiment (SOLVE II) and obtained successful measurements during the sunlit segments of eight science flights. These included six flights out of Kiruna, Sweden, one flight out of NASA Dryden Flight Research Center (DFRC), and the Kiruna-DFRC return transit flight. Values of spectral aerosol optical depth (AOD), columnar ozone and columnar water vapor have been derived from the AATS-14 measurements. In this paper, we focus on AATS-14 AOD data. In particular, we compare AATS-14 AOD spectra with temporally and spatially near-coincident measurements by the Stratospheric Aerosol and Gas Experiment III (SAGE III) and the Polar Ozone and Aerosol Measurement III (POAM III) satellite sensors. We examine the effect on retrieved AOD of uncertainties in relative optical airmass (the ratio of AOD along the instrument-to-sun slant path to that along the vertical path) at large solar zenith angles. Airmass uncertainties result fiom uncertainties in requisite assumed vertical profiles of aerosol extinction due to inhomogeneity along the viewing path or simply to lack of available data. We also compare AATS-14 slant path solar transmission measurements with coincident measurements acquired from the DC-8 by the NASA Langley Research Center Gas and Aerosol Measurement Sensor (GAMS).

Author

Aerosols; Photometers; Optical Thickness; Airborne Equipment; Gas Analysis

20030112100 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Tunable Solid-Etalon Filter for the ICESat/GLAS 532 nm Channel Lidar Receiver

Krainak, Michael A.; Stephen, Mark A.; Martino, Anthony J.; Lunt, David L.; [2003]; 3 pp.; In English; International Geoscience and Remote Sensing Symposium (IGARSS), 21-25 Jul. 2003, Toulouse, France; Copyright; Avail: CASI; A01, Hardcopy

The Geoscience Laser Altimeter System (GLAS) was launched into Earth orbit on board the Ice, Cloud and land Elevation Satellite (ICESat) on January 12, 2003. GLAS is a laser altimeter designed to measure ice-sheet topography and associated temporal changes, as well as cloud and atmospheric properties. Each (of the three identical) GLAS lasers is a diode pumped, Q-switched Nd:YAG laser with energy levels of 75 mJ (1064 nm) and 35 mJ (532 nm). The infrared pulse is used for both surface altimetry and atmospheric measurements while the green pulse is used primarily for atmospheric measurements. The receiver uses a 1 meter diameter telescope. We report on the tunable solid-etalon filter used in the ICESat/GLAS 532 nm channel lidar receiver.

Derived from text

Etalons; Tunable Filters; Ice, Cloud and Land Elevation Satellite; Laser Altimeters; Meteorological Parameters; Atmospheric Chemistry

20030112772 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
High Spatial Resolution Thermal Satellite Technologies
Ryan, Robert; April 03, 2003; 35 pp.; In English; Next Generation High Resolution Multispectral Thermal Infrared Remote Sensing Workshop, 22-23 Apr. 2003, Tucson, AZ, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2003-04-00018-SSC; No Copyright; Avail: CASI; A03, Hardcopy

This document in the form of viewslides, reviews various low-cost alternatives to high spatial resolution thermal satellite technologies. There exists no follow-on to Landsat 7 or ASTER high spatial resolution thermal systems. This document reviews the results of the investigation in to the use of new technologies to create a low-cost useful alternative. Three suggested technologies are examined. 1. Conventional microbolometer pushbroom modes offers potential for low cost Landsat Data Continuity Mission (LDCM) thermal or ASTER capability with at least 60-120 ground sampling distance (GSD). 2. Backscanning could produce MultiSpectral Thermal Imager performance without cooled detectors. 3. Cooled detector could produce hyperspectral thermal class system or extremely high spatial resolution class instrument.
CASI
Bolometers; High Resolution; Satellite Imagery; Infrared Detectors

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SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20030111762 NASA Marshall Space Flight Center, Huntsville, AL, USA
Nuclear Electric Propulsion for Outer Space Missions
Barret, Chris; [2003]; 1 pp.; In English; Society of Women Engineers Conference, 9-11 Oct. 2003, Birmingham, AL, USA; No Copyright; Avail: Other Sources; Abstract Only

Today we know of 66 moons in our very own Solar System, and many of these have atmospheres and oceans. In addition, the Hubble (optical) Space Telescope has helped us to discover a total of 100 extra-solar planets, i.e., planets going around other suns, including several solar systems. The Chandra (X-ray) Space Telescope has helped us to discover 33 Black Holes. There are some extremely fascinating things out there in our Universe to explore. In order to travel greater distances into our Universe, and to reach planetary bodies in our Solar System in much less time, new and innovative space propulsion systems must be developed. To this end NASA has created the Prometheus Program. When one considers space missions to the outer edges of our Solar System and far beyond, our Sun cannot be relied on to produce the required spacecraft (s/c) power. Solar energy diminishes as the square of the distance from the Sun. At Mars it is only 43% of that at Earth. At Jupiter, it falls off to only 3.6% of Earth's. By the time we get out to Pluto, solar energy is only .066% what it is on Earth. Therefore, beyond the orbit of Mars, it is not practical to depend on solar power for a s/c. However, the farther out we go the more power we need to heat the s/c and to transmit data back to Earth over the long distances. On Earth, knowledge is power. In the outer Solar System, power is knowledge. It is important that the public be made aware of the tremendous space benefits offered by Nuclear Electric Propulsion (NEP) and the minimal risk it poses to our environment. This paper presents an overview of the reasons for NEP systems, along with their basic components including the reactor, power conversion units (both static and dynamic), electric thrusters, and the launch safety of the NEP system.
Author
Nuclear Electric Propulsion; Space Missions; Interplanetary Flight; Interstellar Travel; NASA Programs

20030111795 NASA Marshall Space Flight Center, Huntsville, AL, USA
Propulsion Research at the Propulsion Research Center of the NASA Marshall Space Flight Center
Blevins, John; Rodgers, Stephen; [2003]; 1 pp.; In English; 54th International Astronautical Congress (IAC), 29 Sep. - 3 Oct. 2003, Bremen, Germany; No Copyright; Avail: Other Sources; Abstract Only

The Propulsion Research Center of the NASA Marshall Space Flight Center is engaged in research activities aimed at providing the bases for fundamental advancement of a range of space propulsion technologies. There are four broad research themes. Advanced chemical propulsion studies focus on the detailed chemistry and transport processes for high-pressure combustion, and on the understanding and control of combustion stability. New high-energy propellant research ranges from theoretical prediction of new propellant properties through experimental characterization propellant performance, material

interactions, aging properties, and ignition behavior. Another research area involves advanced nuclear electric propulsion with new robust and lightweight materials and with designs for advanced fuels. Nuclear electric propulsion systems are characterized using simulated nuclear systems, where the non-nuclear power source has the form and power input of a nuclear reactor. This permits detailed testing of nuclear propulsion systems in a non-nuclear environment. In-space propulsion research is focused primarily on high power plasma thruster work. New methods for achieving higher thrust in these devices are being studied theoretically and experimentally. Solar thermal propulsion research is also underway for in-space applications. The fourth of these research areas is advanced energetics. Specific research here includes the containment of ion clouds for extended periods. This is aimed at proving the concept of antimatter trapping and storage for use ultimately in propulsion applications. Another activity in this involves research into lightweight magnetic technology for space propulsion applications.
Author
Propulsion System Configurations; Propellant Properties; Propulsion System Performance; Aerospace Engineering; Combustion Stability; Nuclear Electric Propulsion

20030111822 NASA Glenn Research Center, Cleveland, OH, USA
Effects of Non-Uniform Fuel Distribution on Detonation Tube Performance
Perkins, H. Douglas; Sung, Chih-Jen; [2003]; 12 pp.; In English; 2003 International society of Airbreathing engines Conference, 31 Aug. - 5 Sep. 2003, Cleveland, OH, USA
Report No.(s): ISABE-2003-1237; No Copyright; Avail: CASI; A03, Hardcopy

A pulse detonation engine uses a series of high frequency intermittent detonation tubes to generate thrust. The process of filling the detonation tube with fuel and air for each cycle may yield non-uniform mixtures. Uniform mixing is commonly assumed when calculating detonation tube thrust performance. In this study, detonation cycles featuring idealized non-uniform H2/air mixtures were analyzed using a two-dimensional Navier-Stokes computational fluid dynamics code with detailed chemistry. Mixture non-uniformities examined included axial equivalence ratio gradients, transverse equivalence ratio gradients, and partially fueled tubes. Three different average test section equivalence ratios were studied; one stoichiometric, one fuel lean, and one fuel rich. All mixtures were detonable throughout the detonation tube. Various mixtures representing the same average test section equivalence ratio were shown to have specific impulses within 1% of each other, indicating that good fuel/air mixing is not a prerequisite for optimal detonation tube performance under the conditions investigated.
Author
Pulse Detonation Engines; Specific Impulse; Thrust; Computational Fluid Dynamics

20030112303 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Germany
Lightcraft Impulse Measurements under Vacuum
Schall, Wolfgang O.; Eckel, Hans-Albert; Walther, Sebastian; Aug. 2003; 72 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8655-02-M-4017; F61775-00-WE033; Proj-4847
Report No.(s): AD-A417732; SPC-02-4017; AFRL-PR-ED-TR-2002-0044; No Copyright; Avail: CASI; A04, Hardcopy

Under an EOARD contract, the DLR has conducted a series of comparative impulse measurements for two different lightcraft configurations with the same nozzle exit diameter of 10 cm: The German design (GL) is of the more conventional parabolical bell shape with a plasma breakdown region at the focal point of a parabola. The second lightcraft was supplied by the Air Force Research Laboratory (AFRL), and was designated as model 200-3/4. The experiments utilized the DLR multi-gas laser, running in CO(2) with a laser wavelength of 10.6 m. It was the goal of this investigation to extend previous atmospheric impulse measurements to a vacuum environment and to measure specific propellant consumption of the solid propellant Delrin in order to determine the exhaust velocity and the specific impulse for both lightcrafts as a function of the laser pulse energy at various pressures.
DTIC
Nozzles; Specific Impulse

20030112594 SAFT America, Inc., Cockeysville, MD, USA
GEO Li-Ion Battery for GEO Platform
Borthomieu, Y.; Sennet, A.; The 2002 NASA Aerospace Battery Workshop; April 2003; 20 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report describes the cells and life test up-date, and the module and battery design.
Author
Lithium Batteries; Electric Potential

20030112596 AEA Technology, Abingdon, UK
Lithium-Ion Batteries for the Mars Express Orbiter
Spurrett, Rob; Ng, Rod; Moulford, Bill; Lizius, David; The 2002 NASA Aerospace Battery Workshop; April 2003; 32 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Highlights of the Mars Express Orbiter battery are presented. There are three battery modules per S/C. Each module has a dedicated charge/discharge controller. The spacecraft can be powered by any two modules from three.A mission schedule is included.
Derived from text
Lithium Batteries; Spacecraft Power Supplies; Electric Potential

20030112598 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NiH2 LEO Cycle Life Study
Hollandsworth, Roger P.; Armantrout, Jon D.; Rao, Gopalakrishna M.; The 2002 NASA Aerospace Battery Workshop; April 2003; 30 pp.; In English; See also 20030112592; Original contains color illustrations
Contract(s)/Grant(s): NAS8-82697; NAS5-5000; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mantech cell cyle test history is presented.
Derived from text
Hydrides; Nickel Hydrogen Batteries

20030112605 National Space Development Agency, Tsukuba, Japan
Cycling Behavior of the Commercial Lithium-Ion Polymer Cells Simulating Satellite's Low-Earth-Orbit Application
Wang, Xianming; Sone, Yoshitsugu; Kusawake, Hiroaki; Kanno, Kouichi; Kuwajima, Saburo; The 2002 NASA Aerospace Battery Workshop; April 2003; 22 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The following topics are discussed: Cycling Life Test Simulating Low Earth-Orbit Application; Evaluation on Effect of Operating Conditions (Charge Rate and Taper Voltage) on Cell Performances; and Investigation on the Mechanism of Cell Volume Change with Cycling.
Derived from text
Electric Potential; Lithium Batteries

20030112616 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Mission Surface Operation Simulation Testing of Lithium-Ion Batteries
Smart, M. C.; Bugga, R.; Whitcanack, L. D.; Chin, K. B.; Davies, E. D.; Surampudi, S.; The 2002 NASA Aerospace Battery Workshop; April 2003; 44 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objectives of this program are to 1) Assess viability of using lithium-ion technology for future NASA applications, with emphasis upon Mars landers and rovers which will operate on the planetary surface; 2) Support the JPL 2003 Mars Exploration Rover program to assist in the delivery and testing of a 8 AHr Lithium-Ion battery (Lithion/Yardney) which will power the rover; 3) Demonstrate applicability of using lithium-ion technologyfor future Mars applications: Mars 09 Science Laboratory (Smart Lander) and Future Mars Surface Operations (General). Mission simulation testing was carried out for cells and batteries on the Mars Surveyor 2001 Lander and the 2003 Mars Exploration Rover.
Derived from text
Lithium Batteries; Spacecraft Power Supplies; Environment Simulation; Mars Exploration

20030112617 AEA Technology, Abingdon, UK
PROBA Lithium-Ion Battery
Spurrett, Rob; Holland, Adam; Schautz, Max; Lizius, David; The 2002 NASA Aerospace Battery Workshop; April 2003; 25 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The lithium-ion battery for the Project for On-Board Autonomy (PROBA) is well suited to autonomous operation, because of its wide operating temperature range, no need for reconditioning or cell balancing, and a simple charge control algorithm. This viewgraph presentation lists the characteristics of the battery, including battery resistance, capacity fade, and supporting life-test data. The battery has been demonstrated in low earth orbit for a year, and has been monitored with telemetry.
CASI
Lithium Batteries; Spacecraft Power Supplies; Environmental Tests; Low Earth Orbits; Earth Orbital Environments

20030112622 Mitsubishi Electric Corp., Kamakura, Japan
Development of the Lithium Ion Battery for Satellite
Kiyokawa, Takeshi; Yamazaki, Hiroyuki; Goto, Masayoshi; Gonai, Toshio; The 2002 NASA Aerospace Battery Workshop; April 2003; 41 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recently, Lithium Ion battery (LIB) is being developed for Electric vehicle because of: 1) High energy density; 2) High discharge voltage; 3) High efficiency of charge/discharge. We have been developing the Lithium Ion Battery for Space use to reduce the weight and to save cost. This LIB consists of Battery cell and Shunt circuit to protect the overvoltage and Bypass switch. This presentation lists the cell characteristics of the developed battery, as well as its electrical, thermal, and mechanical design. The results of performance and vibration tests are also given.
Derived from text
Spacecraft Power Supplies; Lithium Batteries; Design; Mechanical Engineering; Performance Tests; Vibration Tests

20030112774 NASA Stennis Space Center, Bay Saint Louis, MS, USA
High Test Peroxide Incident at Stennis Space Center
Ross, R.; Sewell, D.; Cockrell, M.; April 12, 2001; 5 pp.; In English
Report No.(s): SE-2001-04-00018-SSC; No Copyright; Avail: CASI; A01, Hardcopy

A renewed interest n hydrogen peroxide as a rocket engine propellant has created a void in the experience base since the last era of significant peroxide use. Advanced catalyst beds and high concentration formulations are currently being developed and tested in the propulsion community. Although peroxide has many positive attributes, there are situations where peroxide must be handled with extreme care. An incident occurred at NASA's Stennis Space Center (SSC) in December 2000 where a significant over pressurization event damaged facility and test hardware. A description of the event and findings of the investigation board are presented and discussed.
Author
Hydrogen Peroxide; Propellants; High Energy Oxidizers

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20030111369 NASA Johnson Space Center, Houston, TX, USA
Experimental Determination of Spinel/Melt, Olivine/Melt, and Pyroxene/Melt Partition Coefficients for Re, Ru, Pd, Au, and Pt
Righter, K.; Campbell, A. J.; Humayun, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-9435; NSF EAR-00-74036; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Experimental studies have identified spinels as important hosts phases for many of the highly siderophile elements (HSE). Yet experimental studies involving chromite or Cr-rich spinel have been lacking. Experimental studies of partitioning of HSEs

between silicate, oxides and silicate melt are plagued by low solubilities and the presence of small metallic nuggets at oxygen fugacities relevant to magmas, which interfere with analysis of the phases of interest. We have circumvented these problems in two ways: 1) performing experiments at oxidized conditions, which are still relevant to natural systems but in which nuggets are not observed, and 2) analysis of run products with laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), allowing a combination of high sensitivity and good spatial resolution.
Derived from text
Melts (Crystal Growth); Olivine; Pyroxenes; Spinel; Siderophile Elements; Chemical Analysis

20030111444 Arizona State Univ., Tempe, AZ, USA
The Carbon Isotopic Distribution of Murchison Amino Acids
Pizzarello, S.; Huang, Y.; Fuller, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The origin of amino acids in meteorites is not yet well understood, in spite of extensive molecular, isotopic, and chiral analyses of the last thirty years that have elucidated many of these compounds' features and distribution. The present general view of meteoritic amino acid formation is that of an interstellar/planetary sequence of Strecker-like reactions between aldehydes/ketones, HCN, water, and ammonia. This type of reaction, however, is non-stereospecific and cannot account for the enantiomeric excesses found in some Murchison and Murray amino acids, at least not directly. Since there are indications that the reaction was, indeed, involved in the formation of amino acids in meteorites, the questions arise whether we should consider a concomitant intervention of asymmetric catalyst(s), and that we may now detect enantiomeric excesses only in amino acids that did not racemize during parent body water alteration, or we should consider a different formation all together for amino acids displaying asymmetry. In fact, recent analyses of the Tagish Lake meteorite have suggested that the synthetic pathways for organics in meteorites, including amino acids, may have been multiple and distinct. Isotopic analyses of meteoritic amino acids, which could help identify their synthetic history(ies), so far have been limited to either very few individual compounds, as in the pioneer study by Engel et al., or groups of amino acids, and thus insufficient for detailed comparisons.
Derived from text
Amino Acids; Carbon; Hydrocyanic Acid; Meteorites; Isotopes

20030111477 Chicago Univ., Chicago, IL, USA
Time Scales for Elemental and Isotopic Fractionation by Evaporation and Condensation
Richter, F. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Earth, Moon, and achondrite meteorite parent bodies are systematically depleted to varying degrees in the more volatile elements, and this is almost certainly the result of their being made up of materials that were partially condensed or partially evaporated. On a much smaller scale, the Type B CAIs have elemental and isotopic compositions that suggest partial condensation followed by partial evaporation. Here we examine some of the key time scales that determine whether or not condensation and evaporation will produce isotopic and/or chemical fractionations.
Derived from text
Chemical Composition; Meteorites; Isotopes; Chemical Fractionation; Meteoritic Composition

20030111912 Miami Univ., Coral Gables, FL
Surface Chemistry of Enzymes for Detection and Decontamination of Organophosphorus Compounds
Leblanc, Roger M.; Aug. 20, 2003; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-00-1-0138
Report No.(s): AD-A417863; ARO-40411.22-CH; No Copyright; Avail: CASI; A03, Hardcopy

The principal objective of this project was to understand the molecular interactions between organophosphorus compounds and the enzymes that catalyze the hydrolysis of these compounds at air water-interface (Langmuir films) and in Langmuir-Blodgett films. The report contains the data on the characterization of the Langmuir films of organophosphorus acid anhydrolase (OPAA), organophosphorus acid hydrolase (OPH), and covalent bonding of the enzyme onto the substrate. Results are encouraging and the studied enzymes form stable monolayers at the interface and can be transferred on to the solid

substrate. Film thickness and topography were characterized. We are trying to covalently link the enzyme molecules on to the fiberoptic cable and investigate the fluorescence.
DTIC
Decontamination; Enzymes; Organic Phosphorus Compounds; Detection; Langmuir-Blodgett Films; Surface Reactions

20030112584 Army Research Lab., Aberdeen Proving Ground, MD
Mechanisms of Military Coatings Degradation: Accelerated and Outdoor Exposure Evaluations
Escarsega, John A.; Lum, William S.; Patterson, Philip H.; Sep. 2003; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418141; No Copyright; Avail: CASI; A03, Hardcopy

The Weapons and Materials Directorate of the U.S. Army Research Laboratory (ARL) has completed a 4-year research investigation on identifying and quantifying key degradation mechanisms of legacy and newly developed coatings systems used by the U.S. Army, Marine Corps, and Air Force. This study has incorporated numerous analytical tools and methods in an effort to better understand the fundamental principles of environmental degradation that lead to coating failures. These environmentally related failures are broadly characterized in two different ways: one as minor, such as appearance changes (color loss/fade), and the other as catastrophic, such as film protection changes (substrate corrosion). This report will summarize the coatings' appearance performances when exposed to enhanced ultraviolet radiation and to outdoor static weathering. Specifically discussed are the results obtained on the coatings' change in color and specular gloss. These evaluations will serve as a performance baseline providing the knowledge required to formulate more durable military coatings. Additionally, when correlated with results obtained from other techniques, a failure analysis model can be established predicting a coating's actual field service life.
DTIC
Ultraviolet Radiation; Coating; Protection; Corrosion

20030112627 Air Force Research Lab., Kirkland AFB, NM
Mechanics of a Near Net-Shape Stress-Coated Membrane. Volume II of II
Wilkes, James M.; Jun. 2003; 82 pp.; In English
Report No.(s): AD-A418142; AFRL-DE-TR-2002-1063-VOL-2; No Copyright; Avail: CASI; A05, Hardcopy

This report is the sequel to Volume I of the same title, in which asymptotic methods were used to derive theories that would aid in understanding the mechanical behavior of a stress-coated membrane. In Volume II we have applied those theories to a number of boundary value problems, obtaining generalizations of well-known solutions for a membrane, plate, or shell of a single material to solutions for the same structure, but now consisting of a multilayer- coated polymer material. Perhaps the most significant accomplishment of this work was the discovery of simple prescriptions for the coating stress that would maintain the shape of an initially parabolic coated membrane after removal from the mold upon which it was cast. These solutions involve linear combinations of Kelvin functions. Coating prescriptions are given for membrane laminates both with, and without, pressure and gravitational loads. The prescriptions are presently being used in the preliminary design of a near net- shaped stress-coated membrane, to be demonstrated hopefully in the near future.
DTIC
Mechanical Properties; Laminates; Coatings; Membrane Structures

20030112652 Max-Planck-Inst. fuer Biophysikalische Chemie, Goettingen
Master Equation Studies of Collision-Induced Processes of Large Hydrocarbon Ions and Clusters
Troe, Jurgen; Oct. 31, 2003; 5 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0012; Proj-2303
Report No.(s): AD-A418036; AFRL-SR-AR-TR-03-0451; No Copyright; Avail: CASI; A01, Hardcopy

Turbulent ion flow tube experiments on the charge transfer reaction O2+ C8H10 (ethylbenzene) >O2 + C8H10+ and the subsequent competition between collisional stabilization of excited C8H10 + and its fragmentation to CH3 + C7H7 + (benzylium or tropylium) has been analyzed quantitatively by statistical rate theory and a master equation analysis of energy transfer. Charge transfer is shown to proceed by a resonant process or through complex-formation, accompanied by differing distributions of vibrational energy generated in the excited ions. Calibrating collisional stabilization against measured fragmentation rates, collisional energy transfer of excited ions is shown to proceed at the ion-molecule collision rate with average energies removed by collision which are close to the corresponding values for excited neutral molecules. Benzylium vs tropylium yields were measured and analyzed quantitatively by statistical rate theory. The project provided ample

information required for the understanding of the behaviour of molecular ions under high temperature/high pressure combustion conditions.
DTIC
Collision Rates; Hydrocarbons; Chemical Reactions; Metal Clusters

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20030109378 Nevada Univ., Reno, NV
Multi-Functional Materials for Thermal Control of Sensors and Electronics
Wirtz, Richard; Fuchs, Alan; Jiang, Yanyao; Sep. 12, 2003; 104 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0305
Report No.(s): AD-A417602; 1330-117-30AT; AFRL-SR-AR-TR-03-0426; No Copyright; Avail: CASI; A06, Hardcopy

Research focuses on development of Thermal Energy Storage (TES) sandwich-structures that combine the heat storage function with structural functionality. Heat storage is via the latent heat of a component of the composite structure. The principal application is thermal control of variable-power avionics systems such as intermittently operated radar. The primary advantage of this approach is that such multi-functionality results in a smaller, less massive thermal control/structural system. In addition, the TES component of the system can be designed so that its thermal performance is g-load/orientation insensitive.
DTIC
Composite Materials; Temperature Control; Composite Structures; Temperature Effects

20030111916
Equilibrium and Non-Equilibrium Effects in Pitch Wetting
Wapner, P. G.; Hurt, R. H.; Krammer, Gernot; Hoffman, W. P.; Feb. 28, 2003; 6 pp.; In English
Contract(s)/Grant(s): Proj-2306
Report No.(s): AD-A417482; AFRL-PR-ED-AB-2003-050; No Copyright; Avail: CASI; A02, Hardcopy

The wetting behavior of pitch plays an important role in impregnation processes for densification, in deposition within processing equipment for heavy hydrocarbons, and in the synthesis of new pitch-based templated carbon forms. This paper reports on an experimental and theoretical study of the fundamental wetting behavior of mesophase pitch on well-characterized flat substrates. Contact angle measurements are reported as a function of temperature, time, and substrate chemists. There is strong evidence that pitch wetting is determined both by equilibrium effects (liquid surface tension, solid surface energy and their dispersive and polar components) and by non-equilibrium effects (spreading kinetics) In the high temperature regime the surface energies of the pitch and substrate are the most important factors determining wetting behavior, while pitch viscosity plays a dominant role in the lower temperature regime where spontaneous droplet spreading rates can be extremely slow.
DTIC
Viscoelasticity; Wetting; Pitch (Material); Equilibrium

20030111936 Materials Research Society, Warrendale, PA
Materials Research Society Symposium Proceedings, Volume 758 Held in Boston, Massachusetts on December 3-5, 2002. Rapid Prototyping Technologies
Pique, Alberto; Holmes, Andrew S.; Dimos, Duane B.; Apr. 2003; 214 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0820
Report No.(s): AD-A417756; No Copyright; Avail: CASI; A10, Hardcopy

Symposium LL, 'Rapid Prototyping Technologies,' was held December 3-5 at the 2002 MRS Fall Meeting in Boston, Massachusetts. The symposium highlighted a broad range of international research activities in the areas of direct-write (DW), solid freeform (SFF) and microstereolithography (MSL). Five sessions were held, covering layered manufacturing and laser sintering, solution and spray processing, direct-write of microelectronics, nanoscale rapid prototyping, and biological tissue engineering and biomedical applications. In total thirty-five papers were presented, with a good balance achieved ,between invited reviews and presentations of the latest research results. This was the third MRS symposium on rapid prototyping (RP)

and related technologies, following successful symposia at the Spring 2000 and Fall 2001 Meetings.
DTIC
Conferences; Rapid Prototyping; Technologies; Microelectronics

20030111992 Georgia Inst. of Tech., Atlanta, GA
Nanolaminates and Microlaminates: Modeling and Characterization
Jasiuk, Iwona; Lackey, W. J.; Aug. 6, 2003; 6 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0131
Report No.(s): AD-A417791; AFRL-SR-AR-TR-03-0362; No Copyright; Avail: CASI; A02, Hardcopy

The author fabricated C/SiC laminates with layer thicknesses spanning two length scales (micrometer and nanometer) and fabricated particle-reinforced composites consisting of particles (cobalt and SiC) and polymer matrix (polysterene and epoxy) with particle diameters spanning these two scales. The laminates were made using the laser vapor deposition technique, while the particle-reinforced composites were made using either polymer synthesis or a resin transfer molding technique. The author characterized the ultrastructures of these composites using SEM and TEM, and measured their local and global properties using nanoindentation apparatus, DMA, and MTS testing equipment. The focus was on matrix-inclusion interface. Finally, they conducted modeling of such composites. This included modeling using classical micromechanics approaches which account for ultrastructural features such as interphase thickness and reinforcement shape and voids, and generalized continuum modeling using couple stress theory. The author also conducted a study of concentrated force problem using micromechanics-based continuum theory. This should be useful in interpreting nanoindentation data.
DTIC
Microstructure; Laminates; Micromechanics; Silicon Carbides

20030112093 NASA Glenn Research Center, Cleveland, OH, USA
Modeling the Thermostructural Stability of Melt-Infiltrated SiC/SiC Composites
DiCarlo, James A.; Bhatt, Ramakrishna T.; McCue, Terry R.; [2003]; 6 pp.; In English; 27th Annual Cocoa Beach Conference and Exposition, 26-31 Jan. 2003, Florida, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy

SiC/SiC composites developed by NASA with Sylramic-iBN fibers and melt-infiltrated (MI) SiC-Si matrices have demonstrated 1000-hour rupture life in air at 100 MPa and 1315OC. Recently it has been determined that a major factor controlling the long-term rupture life of these composites is not environment or stress, but an intrinsic microstructural and strength instability caused by a thermally-induced silicon attack of the Sic fibers. The objective of this paper is to present a simple diffusion-based analytical model which predicts well the observed effects of stress-free thermal exposure on the residual tensile strength of Sylramic-iBN/SiC-Si composites. The practical implications of the model for SiC/SiC composites with MI matrices are discussed.
Author
Silicon Carbides; Tensile Strength; Composite Materials

20030112240 NASA Glenn Research Center, Cleveland, OH, USA
Micromechanics-Based Computational Simulation of Ceramic Matrix Composites
Murthy, Pappu L. N.; Mutal, Subodh K.; Duff, Dennis L., Technical Monitor; [2003]; 41 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Advanced high-temperature Ceramic Matrix Composites (CMC) hold an enormous potential for use in aerospace propulsion system components and certain land-based applications. However, being relatively new materials, a reliable design properties database of sufficient fidelity does not yet exist. To characterize these materials solely by testing is cost and time prohibitive. Computational simulation then becomes very useful to limit the experimental effort and reduce the design cycle time, Authors have been involved for over a decade in developing micromechanics- based computational simulation techniques (computer codes) to simulate all aspects of CMC behavior including quantification of scatter that these materials exhibit. A brief summary/capability of these computer codes with typical examples along with their use in design/analysis of certain structural components is the subject matter of this presentation.
Author
Ceramic Matrix Composites; Computer Programs

20030112404 Materials Research Society, Warrendale, PA

Materials Research Society Symposium Proceedings Volume 740 Held in Boston, Massachusetts on December 2-6, 2002. Nanomaterials for Structural Applications

Berndt, Christopher C.; Fischer, Traugott E.; Ovid'ko, Ilya; Skandan, Ganesh; Tsakalakos, Thomas; Feb. 2003; 462 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0054

Report No.(s): AD-A417952; No Copyright; Avail: CASI; A20, Hardcopy

This volume contains selected papers presented at the symposium whose thematic sessions covered nanostructured bulk materials, films, coatings and nanocomposites. These new materials are now being introduced in structural applications, such as wear resistance, plastic forming, and other load bearing applications, Nanophase or nanocrystalline materials are also being used in electronics, refractory, biological and catalytic applications, Progress in a wide range of structural applications for nanomaterials crucially depends on the development of new fabrication and processing technologies, along with a fundamental understanding of the relationship between the structure and properties,

DTIC

Composite Materials; Nanotechnology

20030112698 Rutgers - The State Univ., Piscataway, NJ

The International Conference on Nanostructured Materials (6th) - NANO 2002 Held in Orlando, Florida on June 16-21, 2002

Kear, Bernard H.; Aug. 20, 2003; 8 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0151

Report No.(s): AD-A418077; Rept-4-26896-F; AFRL-SR-AR-TR-03-0375; No Copyright; Avail: CASI; A02, Hardcopy

General topical areas and categories included: 1. Theoretical modeling and computer simulations of nanostructures and properties 2. Synthesis and processing thin films and layers 3. Synthesis and processing solidification technique 4. Synthesis and processing-mechanical methods 5. Synthesis and processing-nanocrystallization of amorphous alloys 6. Synthesis and processing-electrodeposition, other physical, chemical, and biological methods 7. Nanocomposite (metal-metal, metal-ceramic, biocomposites) 8. Structure and characterization 9. Crystallography of nanocrystalline and nanoquasicrystalline material 10. Clusters and cluster assembled material 11. Mechanical properties and deformation behavior 12. Magnetic properties 13. Electrical and optical properties 14. Designing properties by microstructural control 15. Thermal stability and phase transformations in nanomaterials 16. Performance and applications 17. MEMS, sensors, and other microengineered structures 18. Bulk nanostructured materials.

DTIC

Nanostructure (Characteristics); Nanocomposites; Nanocrystals

20030112702 Semiconductor Research Corp., Dayton, OH, USA

Deep Level Transient Spectroscopy Study of Defects and Impurities in GaN and Related III-N Materials

Look, David C.; Aug. 29, 2003; 5 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0214; Proj-3484

Report No.(s): AD-A418082; AFRL-SR-AR-TR-03-0370; No Copyright; Avail: CASI; A01, Hardcopy

The new system, for the first time, uses powerful Microsoft Windows Software for various options of DLTS measurements and data analyses. However, Phys Tech, which is a contractor of Accent and responsible for writing the software, did not provide us with a detailed manual of the DLTS Software until July of this year (we only received a draft of the Software manual in July). Therefore, we still have to learn how to operate the system in detail.

DTIC

Impurities; Gallium Nitrides; Defects; Spectroscopic Analysis

20030112712 Washington Univ., Seattle, WA

Realization of New and Enhanced Materials Properties through Nanostructural Control

Lee, Charles Y-C.; Dalton, Larry; Feb. 2003; 35 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0060

Report No.(s): AD-A418108; AFRL-SR-AR-TR-03-0353; No Copyright; Avail: CASI; A03, Hardcopy

This research focuses on:: (1) Organic electro- optic materials with the objective of realizing materials characterized by electro-optic coefficients greater than 100 pm/V at telecommunication wavelengths and which pass Telecordia standards. New

processing techniques were developed for fabrication 3-D devices and circuits and for achieving low insertion loss electro-optic devices including active wavelength division multiplexing (WDM) transmitter/receiver systems. During this period of time, the Dalton research group served as the national resource for state-of-the-art electro- optic materials providing materials to DoD laboratories, DoE labs, NIST researchers, industry, and academic researchers. (2) Metal core dendrimer materials were developed for applications as sensors, organic light emitting diodes, and light harvesting solar cell coatings. Materials were designed for improved emission properties and photochemical stability both by systematic design of the chelated metal and by design of the surrounding dendrimer structure. Materials were provided to DoD and NASA laboratories and to industry. (3) Single wall carbon nanotube actuators were developed and various mechanisms of actuation characterized. These materials were used to fabricate simple optical switches. Materials were provided to industry and to academic researchers.
DTIC
Control; Optical Materials; Nanostructures (Devices); Dendrimers; Carbon Nanotubes

20030112714 Stevens Inst. of Tech., Hoboken, NJ
Multi-Physics Modeling and Simulation of Process- Induced Stresses in Polymer-Matrix Composites
Pochiraju, Kishore V.; Jun. 2002; 128 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0431
Report No.(s): AD-A418111; AFRL-SR-AR-TR-03-0363; No Copyright; Avail: CASI; A07, Hardcopy
A three-dimensional thermo-chemical simulation of the curing phase of Resin Transfer Molding (RTM) Process and process-induced stress and deformation analysis methodologies are developed. The mechanics model considers orthotropic and thermo-chemically varying viscoelastic stiffness of the composite material and varying boundary conditions during the process cycle. The residual stress and deformation profiles resulting from several processing histories including the effect of thermal expansion, and chemical shrinkage are studied. Several numerical simulations are performed to compare and validate the developed method with the existing solutions.
DTIC
Composite Materials; Thermochemistry; Curing; Resin Transfer Molding

20030112736 Michigan Univ., Ann Arbor, MI
Instability and Failure in Ductile Solids with Regular Microstructures
Triantafyllidis, N.; Sep. 2003; 9 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0098
Report No.(s): AD-A418191; AFRL-SR-AR-TR-03-0461; No Copyright; Avail: CASI; A02, Hardcopy
The work accomplished in this project consists of the following contributions: (a) onset-of-failure surface calculations for finitely strained continua with periodic microstructures - which have either voids or rigid inclusions - and which are subjected to arbitrary loading in plane strain (2D), (b) failure surfaces for composites under combined axial and shear loading and comparison of the calculations with experimental results carried out at the University of Texas at Austin, (c) onset-of-failure surface calculations for finitely strained continua with prismatic microstructures-but arbitrary 2D cross section of the unit cell - which are subjected to arbitrary 3D loading and finally (d) development of a consistent criterion for the onset of failure in rate sensitive materials.
DTIC
Microstructure; Failure; Ductility; Solids; Stability; Reinforcing Materials

20030112801 Army Research Lab., Aberdeen Proving Ground, MD
A Continuum Framework for Finite Viscoplasticity and Classes of Flow Rules for Finite Viscoplasticity
Scheidler, Mike; Wright, T. W.; Sep. 2003; 105 pp.; In English
Report No.(s): AD-A418246; ARL-RP-68; No Copyright; Avail: CASI; A06, Hardcopy
A continuum framework for finite viscoplasticity is developed based on Lee's multiplicative decomposition with internal variables. Noteworthy features include a thermodynamically consistent treatment of the storage of cold work and plastic volume change and a careful examination of the restrictions imposed by the entropy inequality and the property of instantaneous thermoelastic response. Classes of flow rules for finite viscoplasticity are defined by assuming that certain measures for plastic strain rate and plastic spin depend on the state variables but not on the plastic deformation. It is shown that three of these classes are mutually exclusive for finite elastic strains. For small elastic shear strains, two of the three classes are approximately equivalent. A number of exact and approximate kinematic relations between the various measures for plastic

strain rate and plastic spin are derived. Some inconsistent flow rules encountered in the literature are also discussed. Throughout the paper, arbitrarily anisotropic materials are considered, and some of the simplifications resulting from the assumption of isotropy are noted.
DTIC
Viscoplasticity; Anisotropy; Thermoelasticity; Kinematics

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20030110573 NASA Ames Research Center, Moffett Field, CA, USA
Mid-Infrared Spectroscopy of Polycyclic Aromatic Nitrogen Heterocycles (PANHS) and their Ions
Mattioda, Andrew L.; Hudgin, Douglas; Bauschlicher, Charles W.; Alamandola, Louis J.; July 25, 2003; 1 pp.; In English; Exobiology PI Symposium, 25-29 Aug. 2003, Moffett Field, CA, USA
Contract(s)/Grant(s): RTOP 344-5821-02; No Copyright; Avail: Other Sources; Abstract Only

In recent years, polycyclic aromatic nitrogen heterocycles (PANHs) have attracted a good deal of attention because of their potent carcinogenic and mutagenic properties, and their prevalence in our environment. Such species also play a prominent role in the chemistry of life up to and including the very nucleobases from which our DNA is constructed. Surprisingly, these compounds may even be common outside of our terrestrial environment. To wit, it is now widely accepted that polycyclic aromatic materials are abundant in space and represent a major reservoir of organic carbon in the interstellar medium and developing planetary systems. Given that nitrogen is the fourth most abundant chemically reactive element in space (surpassed only by hydrogen, carbon, and oxygen), it is entirely reasonable to suspect that PANHs may represent an important component of that organic reservoir. Motivated by their intrinsic merit and with special attention toward evaluating their exobiological significance, we have initiated a program to study the spectroscopic and chemical properties of P A ' s under conditions relevant to extraterrestrial environments. Here we present the first results of that program-infrared spectroscopic measurements on a series of PANH's in neutral and cationic forms, isolated in inert matrices at cryogenic temperatures.temperatures. The species studied include: 1 -, and 2-azabenz[a]anthracene, 1-, 2-, and 4- azachrysene, dibenz[a,h]acridine, and dibenz[a,J)acridine. The experimental measurements are also compared with theoretical spectra calculated using density functional theory. General spectroscopic trends observed in this series of compounds are discussed and the implications of these results for Astrophysics and Exobiology are considered.
Author
Polycyclic Aromatic Hydrocarbons; Anthracene; Spectroscopy

20030110606 Washington Univ., Saint Louis, MO, USA
Vapor Pressure, Vapor Composition and Fractional Vaporization of High Temperature Lavas on Io
Fegley, B., Jr.; Schaefer, L.; Kargel, J. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-11958; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Observations show that Io's atmosphere is dominated by SO2 and other sulfur and sulfur oxide species, with minor amounts of Na, K, and Cl gases. Theoretical modeling and recent observations show that NaCl, which is produced volcanically, is a constituent of the atmosphere. Recent Galileo, HST and ground-based observations show that some volcanic hot spots on Io have extremely high temperatures, in the range 1400-1900 K. At similar temperatures in laboratory experiments, molten silicates and oxides have significant vapor pressures of Na, K, SiO, Fe, Mg, and other gases. Thus vaporization of these species from high temperature lavas on Io seems likely. We therefore modeled the vaporization of silicate and oxide lavas suggested for Io. Our results for vapor chemistry are reported here. The effects of fractional vaporization on lava chemistry are given in a companion abstract by Kargel et al.
Derived from text
Io; Lava; Vapor Pressure; Vaporizing; Composition (Property); High Temperature

20030110954 Universidad Nacional Autonoma de Mexico, Mexico City, Mexico

A Theoretical Study of Vinyl Alcohol Formation in the Interstellar Medium

Basiuk, V. A.; Kobayashi, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): JSPS-L01536; CONACYT-36317-E; DGAPA-IN102900; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Vinyl alcohol (VA) is one of the most recently detected interstellar species. It was identified in emission toward Sagittarius B2N. Although chemical pathways leading to its formation are not completely clear yet, the authors suggested that VA could possibly form through the chemical reaction presented. It requires high abundances of the reactants, whereas none of the two belongs to very abundant interstellar species. We suggest that the formation of VA can be alternatively explained based on the reactions of simple, commonly found and most abundant species. In particular, there is no need to look for a process capable of forming the C-C bond of VA, since it can be found in other interstellar species, such as acetylene and acetylene-related radicals. The missing atoms are available as ubiquitous H atoms and OH radicals. Radical reactions normally proceed without activation barriers, and are highly exothermic. In the present work, we estimated an energetic feasibility of some pathways to vinyl alcohol, starting from common and abundant interstellar species acetylene, and radicals.

Derived from text

Alcohols; Interstellar Matter; Chemical Reactions; Vinyl Radical

20030111050 Academy of Sciences (USSR), Moscow, USSR

The Behavior of Ni in Silicate Melts During Impact-simulated High-Temperature Heating

Dikov, Y. P.; Gerasimov, M. V.; Yakovlev, O. I.; Wlotzka, F.; Huth, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): RFBR-01-05-64564; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Investigation of siderophile elements (SE) composition in impactites from terrestrial and planetary impact craters is an important key for understanding of the presence of an impactor material. Any enrichment of SE in impactites compared to SE concentration in target rocks is usually considered as a result of contamination by chondritic projectile material. This approach is supported by the fact that many SE (particularly highly siderophile elements) are refractory elements and the resulting change in their concentration is expected only due to simple mixing of colliding materials. Nevertheless, there are mechanisms which provide sufficiently high mobility of highly refractory elements during an impact. Earlier we reported about an efficient reduction of iron in silicate melts at impact related high-temperature conditions with subsequent removal of metallic iron particles into the vapor outflow [1,2]. The formation and efficient loss of metallic iron particles is a possible mechanism which provides scavenging SE from silicate melts. Experiments with Pt-rich target have shown that Pt tended to form separated phases and be removed from silicate melts [2]. So, the behavior of SE during an impact needs further experimental investigation to give true evaluation of SE budget in different impactites. One of the aims of the present experiment was to investigate the behavior of Ni at impact-related high temperature conditions.

Author

Craters; Nickel; Silicates; Minerals; Impact Melts

20030111702 NASA Ames Research Center, Moffett Field, CA, USA

Theoretical Studies of Chemical Reactions following Electronic Excitation

Chaban, Galina M.; July 22, 2003; 1 pp.; In English; 226th ACS Meeting, Sep. 7, 2003, New York, NY, USA; No Copyright; Avail: Other Sources; Abstract Only

The use of multi-configurational wave functions is demonstrated for several processes: tautomerization reactions in the ground and excited states of the DNA base adenine, dissociation of glycine molecule after electronic excitation, and decomposition/deformation of novel rare gas molecules HRgF. These processes involve bond brealung/formation and require multi-configurational approaches that include dynamic correlation.

Author

Adenines; Glycine; Excitation; Rare Gases

20030111783

Laser Match Head for Pyrotechnic Ignition

Lee, Augustine; Stringer, Michael; Smit, Kenneth; May 2003; 22 pp.; In English

Report No.(s): AD-A417892; DSTO-TR-1448; DODA-AR-012-800; No Copyright; Avail: CASI; A03, Hardcopy

A reliable, cheap and simple pyrotechnic match head has been developed utilizing a pyrotechnic slurry at the end of an optical fibre. A 1 W pulsed diode laser has been used to ignite the match head at pulse energies of about 2 mJ. The laser matchhead is a convenient means for ignition of pyrotechnic devices less prone to unintentional ignition from electromagnetic fields, radio frequency absorption, electromagnetic pulses, electrical discharge or stray electrical energy than conventional bridgewire match heads connected to electrical cables. The laser match head can also be coated with layers of different pyrotechnic slurry in order to make the match head less friction and impact sensitive, and to give the match head different thermal ignition properties.
DTIC
Pyrotechnics; Electromagnetic Pulses; Ignition Systems; Semiconductor Lasers

20030111832 NASA Glenn Research Center, Cleveland, OH, USA
Alumina Volatility in Water Vapor at Elevated Temperatures: Application to Combustion Environments
Opila, Elizabeth J.; Myers, Dwight L.; [2003]; 10 pp.; In English; Symposium on High Temperature Corrosion and Materials Chemistry, IV, May 2003, Paris, France
Contract(s)/Grant(s): WBS 22-714-04-30; No Copyright; Avail: CASI; A02, Hardcopy

The volatility of alumina in high temperature water vapor was determined by measuring weight loss of sapphire coupons at temperatures between 1250 and 1500 C, water vapor partial pressures between 0.15 and 0.68 atm in oxygen, at one atmosphere total pressure, and a gas velocity of 4.4 centimeters per second. The variation of the volatility with water vapor partial pressure was consistent with Al(OH)3(g) formation. The enthalpy of reaction to form Al(OH)3(g) from alumina and water vapor was found to be 210 plus or minus 20 kJ/mol. Surface rearrangement of ground sapphire surfaces increased with water vapor partial pressure, temperature and volatility rate. Recession rates of alumina due to volatility were determined as a function of water vapor partial pressure and temperature to evaluate limits for use of alumina in long term applications in combustion environments.
Author
Aluminum Oxides; Combustion; Volatility; Water Vapor; High Temperature Environments

20030111945 Intermagnetics General Corp., Latham, NY
Development of Y-BA-CU-O Coated Conductor Using Metal Organic Chemical Vapor Deposition
Selvamanickam, V.; Sep. 2003; 12 pp.; In English
Contract(s)/Grant(s): F49620-00-C-0021
Report No.(s): AD-A417804; AFRL-SR-AR-TR-03-0438; No Copyright; Avail: CASI; A03, Hardcopy

The objective of the program is to develop a fundamental understanding of YBCO film deposition by Metal Organic Chemical Vapor Deposition (MOCVD) on biaxially-textured metal substrates. In comparison to other vapor deposition techniques, MOCVD offers the advantages of rapid deposition rates, film uniformity over large areas, and is not limited to line-of-sight deposition. The program includes a study of the a) influence of MOCVD processing conditions such as the flow rate of precursor vapors, precursor vaporization temperatures, oxygen partial pressure, reactor pressure, and the deposition temperature on the film features such as superconducting phase formation, composition, texture, deposition rates, uniformity in thickness, porosity and the presence of secondary phases, b) relationship between film microstructure and the critical current density (Jc), and c) influence of metal substrate and buffer layers on the growth and performance of YBCO.
DTIC
Coatings; Conductors; Metalorganic Chemical Vapor Deposition; Ybco Superconductors

20030111948 Chicago Univ., Chicago, IL
Participant Support for the Conference on the Dynamics of Molecular Collisions (XIXth)
Butler, Laurie J.; Jul. 2003; 25 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0286; Proj-2303
Report No.(s): AD-A417806; AFRL-SR-AR-TR-03-0434; No Copyright; Avail: CASI; A03, Hardcopy

The crucial AFOSR support of this prestigious international meeting, the XIXth Conference on the Dynamics of Molecular Collisions, included participant support for invited speakers and other presenting authors. The AFOSR support, under award number F49620-03-1-0286, was $10,000, with a duration of 5/1/2003 -12/31/2003. AFOSR has traditionally been generous in support of this meeting, as it draws a broad spectrum of the top researchers and young talent across several areas of direct interest to the AFOSR mission. The invited speakers included several with AFOSR funding, and the invited and

contributing participants are drawn from both educational institutions and national laboratories.
DTIC
Conferences; Molecular Collisions; Dynamics; Molecular Ions

20030112006 Air Force Research Lab., Edwards AFB, CA, USA
Understanding Injection Into High Pressure Supercritical Environments
Chehroudi, B.; Talley, D.; Mayer, W.; Branam, R.; Smith, J. J.; Oct. 9, 2003; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417985; No Copyright; Avail: CASI; A03, Hardcopy

This paper summarizes the results of systematic research programs at both the DLR and the AFRL which began nearly ten years ago. The research is aimed at improving the understanding of atomization, mixing, and combustion processes associated with coaxially injected liquid propellant rocket engines. Cold flow studies are imperative for investigations without the complexities introduced with combustion. Initial studies utilized liquid nitrogen (LN2) without a co-flow stream into a chamber with ambient pressures exceeding the thermodynamic critical pressure of the injectant. Secondly, cryogenic cold flow studies were extended with consideration of the effects of a co-flowing gas. Parallel to this work, combustion studies with cryogenic propellants were introduced to understand high-pressure coaxial injection phenomena with the influence of chemical reaction. In both cases, high- pressure injection and combustion facilities were specifically designed and implemented to gain maximum information from a single coaxial injector element. Results from visualization, jet initial growth rate, fractal analysis, Raman scattering, visible length scales, and phenomenological modeling are presented and discussed. It is found that the behavior of the injected jet into supercritical ambient is quite different from those at subcritical conditions. In particular, it is found that the nature of atomization is substantially different and departs significantly from the classical cascade of events attributed to low-pressure liquid jet atomization. At elevated pressure conditions, the injected cryogenic liquid jet behaves more like a high-density gas injected into a low- density gas environment. Implications of this behavior on mixing, growth rate, evolution and response of reacting and non-reacting flow-fields, combustion zone time and length scales, and combustor behavior are investigated and discussed.
DTIC
High Pressure; Supercritical Pressures; Liquid Nitrogen; Gas Injection; Rarefied Gases

20030112233 Naval Air Warfare Center, China Lake, CA, USA
Novel Ordered Crown Ether-Containing Polyimides for Ion Conduction
Irvin, Jennifer A.; Stasko, Daniel; Fallis, Stephen; Guenthner, Andrew J.; Webber, Cynthia; Blackwell, John; Chvalun, Sergei N.; July 25, 2003; 16 pp.; In English
Report No.(s): N60530-1137-AP4U; Copyright; Avail: CASI; A03, Hardcopy

We report the synthesis and characterization of thermally-stable polyimides for use as battery and fuel cell electrolyte membranes. Dianhydrides used were 1,4,5,8- naphthalenetetracarboxylic dianhydride and/or 4,4'-(hexafluoroisopropylidene)diphthalic anhydride. Diamines used were anti-4,4-diaminodibenzo-l8-crown-6, 4,4'-diaminodibenzo-24-crown-8, 2,2-bis(4-aminophenyl)hexafluoropropane, and/or 2,5- diaminobenzenesulfonic acid. The polymers were characterized using electrochemical impedance spectroscopy (EIS), thermal analysis and X-ray diffraction. Polymers containing the hexafluoroisopropylidene (HFIP) group were soluble in common organic solvents, while polymers without the HFIP group were very poorly soluble. Sulfonation yields polymers that are sparingly soluble in aqueous base and/or methanol. Degree of sulfonation, determined by titration, was between one and three sulfonate groups per repeat unit. Proton conductivity was determined as a function of water content, with a maximum conductivity of l x 10(exp -2) per centimeter when fully hydrated. Crown ether-containing polymers exhibit a high degree of order that may be indicative of crown ether channel formation, which may facilitate Li(+) transport for use in battery membranes.
Author
Ethers; Polyimides; Synthesis (Chemistry); Polymers; Thermal Stability

20030112395 NASA Marshall Space Flight Center, Huntsville, AL, USA
Characterization of Corning EPMA Standard Glasses 95IRV, 95IRW, and 95IRX
Carpenter, Paul K.; Counce, Dale; Kluk, Emily; Nabelek, Carol; [2002]; 1 pp.; In English
Contract(s)/Grant(s): NCC8-66; Copyright; Avail: Other Sources; Abstract Only

The preparation, synthesis, and characterization of Corning trace-element glasses 95IRV, 95IRW, and 95IRX by bulk chemical and electron microprobe techniques is discussed. Working values for the doped elements in the 95-series glasses are

established. Blank values have been determined by both bulk chemical and electron microprobe analysis, and important x-ray interferences are highlighted. Chemical homogeneity both within a rod cross-section, and along cane length has been documented. These glasses are standard reference materials intended for use as both primary and secondary electron microprobe standards.
Author
Chemical Analysis; Glass; Glass Fibers; Synthesis (Chemistry); Doped Crystals

20030112399 Army Engineer Research and Development Center, Vicksburg, MS, USA
Topical Lime Treatment for Containment of Source Zone Energetics Contamination
Brooks, Michael C.; Davis, Jeffrey L.; Larson, Steven L.; Felt, Deborah R.; Nestler, Catherine C.; Sep. 2003; 101 pp.; In English
Report No.(s): AD-A417946; ERDC/EL-TR-03-19; No Copyright; Avail: CASI; A06, Hardcopy

Energetic compounds, such as 2,4,6-trinitrotoluene (TNT) and hexahydro-1,3, 5-trinitro-1,3,5-triazine (RDX), and their degradation products can act as a source of contamination for soil on Department of Defense testing and training ranges. Base hydrolysis degrades nitroaromatics and nitramines, and the potential effectiveness of lime to induce this reaction has been demonstrated at the laboratory scale. The objective of this research was to further examine both basic and applied aspects of alkaline application as an inexpensive and effective means of reducing source-zone contamination on military ranges. Bench-scale microcosms were used to examine basic conditions that could affect the alkaline hydrolysis reaction, such as soil organic matter content, lime concentration, soil type, and contamination type. Results from experiments using soil from a variety of ammunition production facilities and training ranges, in general, support the use of explosive contaminant treatment by alkaline material in well-mixed systems. RDX in crystalline form was more resistant to treatment, possibly due to limitations associated with the dissolution of the RDX from the crystal to the aqueous phase. Larger-scale experiments, conducted in vessels packed with approximately 55 kg of soil, were used to investigate topical versus well-mixed applications of three alkaline materials (hydrated lime, quicklime, and Class C fly ash). TNT, RDX, and HMX in the mixed system were removed quickly from both the leachate and soil. However, results from experiments with topical applications of alkali material indicated that the aqueous transport of hydroxide ion was not sufficient to overcome the buffering capacity of the soil. Consequently, the soil pH was not raised to the extent necessary for alkaline treatment of explosive compounds. This result is fundamentally related to the CEC properties of the soil and is consequently considered a soil specific (and therefore site specific) result.
DTIC
Soils; Contamination; Calcium Oxides

20030112524 NASA Glenn Research Center, Cleveland, OH, USA
Universal Behavior of a Cyclic Oxidation Model
Smialek, James L.; [2003]; 22 pp.; In English
Contract(s)/Grant(s): WBS 22-244-00-03-07; No Copyright; Avail: CASI; A03, Hardcopy

A mathematical model has been generated to represent the iterative, discrete growth and spallation processes associated with cyclic oxidation. Parabolic growth kinetics (k(sub p)) over and a constant spall area (F(sub A)) were assumed, with spalling occurring interfacially at the thickest regions of the scale. Although most models require numerical techniques, the regularity and simplicity of this progression permitted an approximation by algebraic expressions. Normalization could now be performed to reflect all parametric effects, and a universal cyclic oxidation response was generated: W(sub u) = 1/2 {3J(sub u)(sup 1/2)+ J(sub u)(sup 3/2)} where W, is weight change normalized by the maximum and J(sub u) is the cycle number normalized by the number to reach maximum. Similarly, the total amount of metal consumed was represented by a single normalized curve. The factor [(S(sub c)-l)(raised dot)sqrt(F(sub A)k(sub p)DELTAt)] was identified as a general figure of merit, where S(sub c) is the mass ratio of oxide to oxygen and DELTAt is the cycle duration. A cyclic oxidation failure map was constructed, in normalized k(sub p)-F(sub A) space, as defined by the locus of points corresponding to a critical amount of metal consumption in a given time. All three constructions describe behavior for every value of growth rate, spall fraction, and cycle duration by means of single curves, but with two branches corresponding to the times before and after steady state is achieved.
Author
Mathematical Models; Oxidation; Spallation; Cycles; Reaction Kinetics; Approximation

20030112531 NASA Glenn Research Center, Cleveland, OH, USA

Diels-Alder Trapping of Photochemically Generated o-Xylenols: Application in the Synthesis of Novel Organic Molecules and Polymers

Meador, Michael A.; [2003]; 8 pp.; In English

Contract(s)/Grant(s): 22-708-90-34; No Copyright; Avail: CASI; A02, Hardcopy

Bis(o-xylenol) equivalents are useful synthetic intermediates in the construction of polymers and hydroxyl substituted organic molecules which can organize by hydrogen bonded self-assembly into unique supramolecular structures. These polymers and supramolecular materials have potential use as coatings and thin films in aerospace, electronic and biomedical applications.

Derived from text

Diels-Alder Reactions; Photochemical Reactions; Polymers; Synthesis (Chemistry); Xylene; Molecules

20030112535 Case Western Reserve Univ., Cleveland, OH, USA

In Situ Raman Microscopy of a Single Graphite Microflake Electrode in a Li(+)-containing Electrolyte

Shi, Qing-Fang; Dokko, Kaoru; Scherson, Daniel A.; [2003]; 21 pp.; In English

Contract(s)/Grant(s): NAG3-2644; WBS 22-755-12-04; No Copyright; Avail: CASI; A03, Hardcopy

Highly detailed Raman spectra from a single KS-44 graphite microflake electrode as a function of the applied potential have been collected in situ using a Raman microscope and a sealed spectroelectrochemical cell isolated from the laboratory environment. Correlations were found between the Raman spectral features and the various Li(+) intercalation stages while recording in real time Raman spectra during a linear potential scan from 0.7 down ca. 0.0V vs Li/Li(+) at a rate of 0.1 mV/s in a 1M LiClO4 solution in a 1:l (by volume) ethylene carbonate (EC):diethyl carbonate (DEC) mixture. In particular, clearly defined isosbestic points were observed for data collected in the potential range where the transition between dilute phase 1 and phase 4 of lithiated graphite is known to occur, i.e. $0.157 < E < 0.215$ vs Li/Li(+). Statistical analysis of the spectroscopic data within this region made it possible to determine independently the fraction of each of the two phases present as a function of potential without relying on coulometric information and then predict, based on the proposed stoichiometry for the transition, a spectrally-derived voltammetric feature.

Author

Electrodes; Electrolytes; Graphite; Raman Spectra; Lithium; Electrochemistry; In Situ Measurement

20030112578 Rensselaer Polytechnic Inst., Troy, NY

Chemical Design of Structural Ceramics

Rajan, Krishna; Dec. 2001; 7 pp.; In English

Contract(s)/Grant(s): F49620-O1-1-0409

Report No.(s): AD-A418023; AFRL-SR-AR-TR-03-0445; No Copyright; Avail: CASI; A02, Hardcopy

A major aim of this program was to establish computational techniques based on statistical methodologies for the compositional design of structural ceramics. For the purposes of this study we are focusing on silicon nitride based ceramics. The enhancement of properties in silicon nitride based ceramics has come through a combination of controlling chemistry and microstructure. Since no single ab-initio theory can address all relevant properties we had to first establish a workable database from which we could then begin to apply statistical techniques to aid in a design strategy for materials chemistry. The work to date has resulted in the establishment of a digital library and data warehousing for silicon nitride. Application of multivariate statistics tools on these data sets. Testing of these methods for their predictive capabilities. Developing a microanalytical database on grain boundary chemistry. Identification of the role of additive chemistry on the sintering and fracture toughness characteristics of silicon nitride.

DTIC

Ceramics; Structural Analysis; Microstructure; Methodology

20030112674 NASA Glenn Research Center, Cleveland, OH, USA

6F-Polyimides with Phenylethynyl Endcap for 600-7000F Applications

Chuang, Kathy C.; Bowamn, Cheryl L.; Tsotsis, Thomas K.; Arendt, Cory P.; [2003]; 14 pp.; In English

Contract(s)/Grant(s): NAS5-300145; RTOP 713-82-23; Copyright; Avail: CASI; A03, Hardcopy

6F-Polyimides with a phenylethynyl endcap (HFPE) were fabricated into carbon fiber composites using the standard polymerization of monomer reactant (PMR) approach via ester/acid route. Composites made from T650-35 carbon fabrics were evaluated at 600-700 F for their physical and mechanical properties as well as thermo-oxidative stability. In addition,

concentrated HFPE monomer solutions were infused into stitched AS4 and T650-35 preforms to improve the composite performance under thermal cycling and rapid heating conditions.
Author
Polyimides; High Temperature Tests; Mechanical Properties; Phenyls; Fabrication

20030112681 Material Integrity Solutions, Inc., Berkeley, CA, USA
Predicting and Mitigating Corrosion Related Damage in Geothermal Facilities, Phase-I
Shimohamadi, M.; Bratt, S.; Ridgely, J.; Aug. 2000; 120 pp.; In English
Report No.(s): DE2003-769198; No Copyright; Avail: Department of Energy Information Bridge

The overall goal of this project was to develop methods that can be used by geothermal plant operators to reduce O&M costs associated with CRD of plant components. For this purpose, the following specific objectives were established for this project: (1) Develop techniques and tools to measure the corrosion potential of condensing steam. (2) Investigate the existence of a relationship between early condensate chemistry and stress corrosion cracking (SCC) of specific materials. (3) Investigate the existence of a relationship between early condensate chemistry and bulk steam chemistry measurements. (4) Identify preventive and/or mitigative techniques for reducing SCC of rotor material operating in The Geysers plants and (5) Develop methods and tools to monitor conditions which lead to pitting of a specific material operating in early condensate regime.
NTIS
Damage; Geothermal Anomalies; Stress Corrosion Cracking

20030112725 Naval Postgraduate School, Monterey, CA
Visibility Over Land from Contrast Analysis of Multi-Spectral Satellite Observations
Vincent, Dominick A.; Sep. 2003; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418306; No Copyright; Avail: CASI; A04, Hardcopy

The objective of this thesis is to investigate the viability of using contrast reduction in multi-spectral satellite observations to characterize surface visibility reduction due to heavy aerosol loading. Two methods are explored. First, the spectral distribution of standard deviation of surface reflectance over a homogeneous background (urban, agriculture, or forested) is plotted for three aerosol conditions (dust, smoke, and low aerosol loading). Second, the same cases are analyzed using a pixel-to-pixel differencing of surface reflectance. The spectral distributions of the means for the resulting difference fields are constructed. Each aerosol type was found to exhibit a relatively unique spectral distribution for both methods. Each background was found to exhibit a characteristic amount of contrast in the absence of heavy aerosol loading. The unique spectral characteristics for each aerosol-background combination may be correlated to aerosol optical depths or surface visibilities with corrections for sensor view angle variations, Rayleigh scattering, and masking of clouds and surface water. The spectral distribution-aerosol optical depth correlation can be used to build an empirical model for aerosol optical depth and surface visibility retrievals from satellite observations. This method may be applied to multi-spectral or panchromatic imagery, unlike current aerosol optical depth retrievals over land.
DTIC
Aerosols; Visibility

20030112734 Harold Washington Coll., Chicago, IL, USA
New Strategies for Designing Receptors and Preparing Ultra-Sensitive Chemically Selective Electrode Surfaces
Higgins, Thomas B.; Mirkin, Chad A.; Aug. 31, 2003; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-00-1-0230; Proj-4113
Report No.(s): AD-A418189; AFRL-SR-AR-TR-03-0465; No Copyright; Avail: CASI; A03, Hardcopy

Our research efforts have been focused on the design and synthesis of macrocyclic complexes based on the 'Weak-Link Approach' and their applications for recognition and separation technologies. Several important research discoveries have been made over the course of the project. A more thorough understanding of the fundamental parameters that control the formation of macrocyclic receptors formed via the Weak-Link Approach has been developed. In addition, novel hemilabile ligands that have used to form a new class of macrocycles referred to as 'molecular tweezers' have been designed. These structures can recognize molecule based on size, shape and the ability to form tt-stacking interactions. Using the Weak-Link Approach we have also synthesized a stable Rh(II) species, a set of chiral macrocyclic receptors and a series of heterobimetallic macrocyclic structures. This provides us with a library of compounds to investigate in future sensing applications. In the area of signal transduction, we have developed several fluorescent systems that utilize a new class of highly

fluorescent ligands and Fluorescence Resonance Energy Transfer (FRET). Their receptor and molecular sensing properties has been investigated.
DTIC
Surface Properties; Electrodes; Macromolecules

20030112738 Case Western Reserve Univ., Cleveland, OH
First-Principles Theory of Chalcopyrites in Support of Their Development for Nonlinear Optical Applications
Lambrecht, Walter R.; Apr. 2003; 18 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0037
Report No.(s): AD-A418193; AFRL-SR-AR-TR-03-0462; No Copyright; Avail: CASI; A03, Hardcopy

Computational studies were carried out of the electronic structure and optical properties of chalcopyrite and defect chalcopyrite semiconductors. The second order nonlinear optical coefficients and frequency dependent response functions were calculated for the I-III-VI_2 chalcopyrites with I=Ag,Cu, III=Ga, In and VI=S, Se, Te. The superior properties of the tellurides were established. The band structure and effective masses of CdGeAs_2 were calculated including the effects of spin-orbit coupling. The band structures of the family of II-III_2-VI_4 defect chalcopyrites with II=Zn,Cd,Hg, III=Al,Ga,In and VI=S,Se,Te with the thiogallate structure were calculated including gap corrections beyond the local density approximation. The optical anisotropy of CdSe optical reflectivity was calculated and compared with that in wurtzite GaN. The native point defects in ZnGeP_2 were studied. The energies for formation and charge occupation levels were determined for the V_Zn, V_Ge, Zn_Ge and Ge_Zn point defects and their relevance for the electron paramagnetic resonance spectra were determined.
DTIC
Nonlinear Optics; Wurtzite; Gallium Nitrides; Density; Electronic Structure; Semiconductors (Materials)

20030112742 Harvard Univ., Cambridge, MA
Acquisition of Instrumentation to Characterize and Implement Nanowire-Based Sensors and Imaging Probes
Lieber, Charles M.; Oct. 2003; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-02-1-0304
Report No.(s): AD-A418195; AFRL-SR-AR-TR-03-0459; No Copyright; Avail: CASI; A01, Hardcopy

Instrumentation was acquired from the DURIP grant to set up a system for the growth and characterization of metal nitride materials. This instrument system was installed in extensively renovated laboratory space to meet the specialized needs of the equipment and is now fully functional. The instrumentation has been tested and shown to produce high- quality thin film materials with excellent photonic properties, and has also been used to prepare and characterize metal nitride nanowire materials for nanophotonic studies. The capabilities opened up by this new instrumentation enhance dramatically the scope of the P.I.'s AFOSR-funded research program.
DTIC
Image Processing; Acquisition; Gas Detectors

20030112746 NASA Glenn Research Center, Cleveland, OH, USA
Bisadducts from the Diels-Alder Trapping of Bis(o-Xylenols) Photochemically Generated from 2,5-Dibenzoyl-p-xylene
Meador, Michael A.; Kinder, James D.; Kirby, James P.; [2003]; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Photolysis of 2,5-dibenzoyl-p-xylene produces two discrete o-xylenols which undergo Diels-Alder cycloadditions with standard dienophiles, such as methyl acrylate, to produce 1,5-dihydroxy-1,5-diphenyl-l,2,3,4,5,6,7,8-octahydroanthracenes, 2a, in good yield (greater than 80%). The anti bisadduct crystallizes into hydrogen bonded stacks. Conversion of both syn- and anti-bisadducts to the corresponding anthracenes was achieved through the use of standard dehydration and aromatization chemistry.
Author
Diels-Alder Reactions; Photochemical Reactions; Trapping; Xylene; Synthesis (Chemistry)

20030112747 Corps of Engineers, Washington, DC, USA
Environmental Impact of New Chemical Agents for Fire Suppression
Huie, Robert E.; Aug. 28, 2003; 86 pp.; In English
Contract(s)/Grant(s): W74RDV73243630
Report No.(s): AD-A418320; No Copyright; Avail: CASI; A05, Hardcopy

The environmental impact of chemical agents is intimately tied to the environmental transformations these chemicals undergo. In this project, the most important transformations for various classes of proposed fire suppression agents were investigated and, for the important case of hydrogen abstraction by hydroxyl radicals, a computational screening tool was developed. Rate constants for hydroxyl radical reactions with hydrofluoroethers, perfluoronated alkenes, bromine-containing fluoroalkenes, and fluoroalkanes, were determined. By using the computational tool developed in the project, rate constants and atmospheric lifetimes for several bromine-containing halomethanes were calculated. In addition, the reactivity of several alkyl phosphates with free radicals in water were measured and the solubility of a series of fluoroalkylamines was calculated.
DTIC
Reaction Kinetics; Photochemical Reactions; Hydroxyl Radicals

20030112762 Massachusetts Inst. of Tech., Cambridge, MA
The Mechanisms of Creep Resistance of Advanced Directionally Solidified Eutectics: Experiments and Modeling
Aragon, Ali S.; Jan. 1999; 46 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0276
Report No.(s): AD-A418294; AFRL-SR-AR-TR-03-0460; No Copyright; Avail: CASI; A03, Hardcopy

The creep resistance of the directionally solidified ceramic eutectics of alumina/cubic zirconia was studied experimentally in the 1200-1520 C, and 100-275 Mpa stress range, with associated TEM and SEM microscopy, as a generic example of ceramic eutectics. Additional computer simulations were done both at the atomic level and by FEM methods to study: (a) the core structure of pyramidal edge dislocations in alumina that can only climb but not glide; and (b) the stress distribution in the alumina component during creep. A creep model based on diffusional climb of pyramidal system edge dislocations was in very good agreement with the measured creep rates. The model predicts that the creep resistance of the eutectics should be superior to that of pure sapphire fiber in the above temperature range, and must be considered as potential candidates for high temperature structural applications. Exploitation of their full potential in high temperature composites, however, requires extensive engineering materials development.
DTIC
Eutectics; Computerized Simulation; Mathematical Models; Creep Strength

20030112806 New Mexico Engineering Research Inst., Albuquerque, NM
Main Group Compounds as Extinguishants
Brabson, G. D.; Garcia, Maya M.; Heinonen, Everett W.; Juarez, Gabriel; Mather, J. D.; May 2001; 53 pp.; In English
Report No.(s): AD-A418254; NMERI-98/8/33380; No Copyright; Avail: CASI; A04, Hardcopy

Under the Montreal Protocol, an international treaty, the production of the fire and explosion protection agent Halon 1301 (bromotrifluoromethane, BFC-13B1, CBrF(3)) was phased out in the USA at the end of 1993. No environmentally acceptable halon substitute that is equivalent to the existing halons in toxicity effectiveness, and dimensionality has been identified. The objective of the overall effort is to assess compounds containing members of the main group elements as fire extinguishants and has potential halon replacements.
DTIC
Explosions; Toxicity; Fire Extinguishers; Neutralizers

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METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20030110647 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Initial Measurement of the Vapor Pressures of Simple Refractory Materials: Cu and Fe
Nuth, Joseph A., III; Ferguson, Frank T.; Johnson, Natasha; Martinez, Daniel; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has become increasingly clear over the past decade that high temperature processes played important roles in the Primitive Solar Nebula. Unfortunately, basic data, such as the vapor pressures of iron or SiO have not been measured over the appropriate temperature range (near T approximately equal to 2000K), but must be extrapolated from lower temperature measurements often made more than 50 years ago. The extrapolation of the available data to higher temperatures can be quite complex and can depend on other factors such as the oxygen fugacity or the presence of hydrogen gas. Moreover, modern

technology has made possible more accurate measurements of such quantities over a wider temperature range. We recently acquired a commercial Thermo-Cahn Thermogravimetric system capable of vacuum operation to 1700 C and measurement of mass change with microgram accuracy in a 100g sample or smaller. In this paper, we will report our progress in learning to make vapor pressure measurements using this system.
Derived from text
Iron; Vapor Pressure; Copper; Refractory Materials

20030110923 NASA Johnson Space Center, Houston, TX, USA
The Parameterization of Solid Metal-Liquid Metal Partitioning of Siderophile Elements
Chabot, N. L.; Jones, J. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-11122; RTOP 344-31-20-18; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The composition of a metallic liquid can significantly affect the partitioning behavior of elements. For example, some experimental solid metal-liquid metal partition coefficients have been shown to increase by three orders of magnitude with increasing S-content of the metallic liquid. Along with S, the presence of other light elements, such as P and C, has also been demonstrated to affect trace element partitioning behavior. Understanding the effects of metallic composition on partitioning behavior is important for modeling the crystallization of magmatic iron meteorites and the chemical effects of planetary differentiation. It is thus useful to have a mathematical expression that parameterizes the partition coefficient as a function of the composition of the metal. Here we present a revised parameterization method, which builds on the theory of the current parameterization of Jones and Malvin and which better handles partitioning in multi-light-element systems.
Derived from text
Liquid Metals; Chemical Effects; Light Elements

20030111824 NASA Glenn Research Center, Cleveland, OH, USA
Ultrasonic Spectroscopy of Stainless Steel Sandwich Panels
Cosgriff, Laura M.; Lerch, Bradley A.; Hebsur, Mohan G.; Baaklini, George Y.; Ghosn, Louis J.; [2003]; 15 pp.; In English; SAMPE 35th International Conference, 28 Sep. - 2 Oct. 2003, Dayton, OH, USA
Contract(s)/Grant(s): NAG3-2683; No Copyright; Avail: CASI; A03, Hardcopy

Enhanced, lightweight material systems, such as 17-4PH stainless steel sandwich panels are being developed for use as fan blades and fan containment material systems for next generation engines. In order to improve the production for these systems, nondestructive evaluation (NDE) techniques, such as ultrasonic spectroscopy, are being utilized to evaluate the brazing quality between the 17-4PH stainless steel face plates and the 17-4PH stainless steel foam core. Based on NDE data, shear tests are performed on sections representing various levels of brazing quality from an initial batch of these sandwich structures. Metallographic characterization of brazing is done to corroborate NDE findings and the observed shear failure mechanisms.
Author
Sandwich Structures; Stainless Steels; Ultrasonic Spectroscopy; Panels; Mechanical Properties; Metallography

20030111825 NASA Glenn Research Center, Cleveland, OH, USA
Temperature Dependent Electrical and Micromechanical Properties of Lanthanum Titanate with Additions of Yttria
Goldsby, Jon C.; [2003]; 15 pp.; In English; International Conference on Electroceramics (ICE-2003), 3-7 Aug. 2003, Cambridge, MA, USA; No Copyright; Avail: CASI; A03, Hardcopy

Lanthanum titanate (La2Ti2O7) a layered distorted perovskite (1) with space group Pna2(sub 1) has been shown to have potential as a high temperature piezoelectric (2). However this highly refractory oxide compound must be consolidated at relatively high temperatures approximately 1400 C. Commercial La2Ti207 powders were mechanically alloyed with additions of Y2O3 to lower the consolidation temperature by 300 C and to provide post processing mechanical stability. Temperature dependent electrical, elastic and anelastic behavior were selected as nondestructive means of evaluating the effects of yttria on the properties of this ferroceramic material.
Derived from text
Electrical Properties; Lanthanum; Micromechanics; Temperature Dependence; Titanates; Yttrium Oxides

20030111830 NASA Glenn Research Center, Cleveland, OH, USA
Microstructure and Mechanical Properties of Extruded Gamma Met PX
Draper, S. L.; Das, G.; Locci, I.; Whittenberger, J. D.; Lerch, B. A.; Kestler, H.; April 17, 2003; 10 pp.; In English; Gamma Titanium Aluminides 2003, 2003, USA; No Copyright; Avail: CASI; A02, Hardcopy

A gamma TiAl alloy with a high Nb content is being assessed as a compressor blade material. The microstructure and mechanical properties of extruded Ti-45Al-X(Nb,B,C) (at %) were evaluated in both an as-extruded condition and after a lamellar heat treatment. Tensile behavior of both as-extruded and lamellar heat treated specimens was studied in the temperature range of RT to 926 C. In general, the yield stress and ultimate tensile strength reached relatively high values at room temperature and decreased with increasing deformation temperature. The fatigue strength of both microstructures was characterized at 650 C and compared to a baseline TiAl alloy and to a Ni-base superalloy. Tensile and fatigue specimens were also exposed to 800 C for 200 h in air to evaluate the alloy's environmental resistance. A decrease in ductility was observed at room temperature due to the 800 C exposure but the 650 C fatigue properties were unaffected. Compressive and tensile creep testing between 727 and 1027 C revealed that the creep deformation was reproducible and predictable. Creep strengths reached superalloy-like levels at fast strain rates and lower temperatures but deformation at slower strain rates and/or higher temperature indicated significant weakening for the as-extruded condition. At high temperatures and low stresses, the lamellar microstructure had improved creep properties when compared to the as-extruded material. Microstructural evolution during heat treatment, identification of various phases, and the effect of microstructure on the tensile, fatigue, and creep behaviors is discussed.
Author
Microstructure; Titanium Alloys; Aluminum Alloys; Mechanical Properties; Extruding; Tensile Tests; Tensile Strength

20030111892 Swedish Inst. for Metals Research, Stockholm, Sweden
Investigation of the Role of Passivity in Stress Corrosion Cracking of Duplex Stainless Steels
Luukkonen, P.; Jargelius-Pettersson, R. F. A.; Haenstroem, S.; Feb. 2000; 62 pp.
Report No.(s): PB2004-100946; IM-2000-010; No Copyright; Avail: CASI; A04, Hardcopy
Electrochemical and surface analytical investigations have been carried out to elucidate the behavior of duplex stainless steels in chloride environments which can cause stress corrosion cracking. Comparisons have been made between S32304 (23Cr 4.6Ni 0.12N) S31803 (22Cr5.5Ni 3Mo 0.16N) and S32750 (25Cr7Ni 3.8Mo 0.26N) in 8Mo and 12M chlorides (LiCl, CaCl(sub 2) and MgCl(sub 2)) at 100 degrees C and 120 degrees C. Polarization curves have been obtained for the various alloy-environment combinations, scratch experiments have been conducted to investigate the depassivation-repassivation behavior and analysis of the surface films has been performed with glow discharge optical emission spectroscopy (GDOES).
NTIS
Stainless Steels; Stress Corrosion Cracking

20030111944 General Electric Co., Schenectady, NY, USA
Fundamental Studies of Microstructural Evolution During Friction STIR welding of Aluminum Alloys
Subramanian, P.R.; Ninnalan, Nirm V.; Young, Lisa M.; Sudkamp, Paul; Mika, David P.; Larsen, Michael; Othon, Michelle A.; Dupree, Paul L.; Sep. 17, 2003; 57 pp.; In English
Contract(s)/Grant(s): F49620-O1-1-O3OO
Report No.(s): AD-A417803; AFRL-SR-AR-TR-03-0423; No Copyright; Avail: CASI; A04, Hardcopy
This research program was aimed at developing a fundamental understanding of microstructural evolution in FSW Al alloys. The microstructural evolution in FSW-processed alloys is closely connected to the local thermomechanical cycles imposed through the combination of frictional heating and mechanical working by the tool material. The mechanical and corrosion properties of the resultant joints, in turn, are intimately linked to the evolved microstructures. In an effort to understand these relationships, FSW simulations were conducted on monolithic Al 6061 and Al 2195 plates. Thermal fields produced during FSW were determined using infrared (IR) imaging and embedded thermocouples. Efforts have been made to establish the link between the thermal fields and the resultant microstructural evolution in the various FSW zones. Texture evolution in the FSW zones has been evaluated using electron backscatter diffraction (EBSD). The influence of microstructural features on tensile, fatigue, and corrosion behavior is presented.
DTIC
Microstructure; Aluminum Alloys; Mechanical Properties; Friction Stir Welding; Thermodynamics

20030111960 Georgia Inst. of Tech., Atlanta, GA
Modeling Dislocations and Disclinations with Finite Micropolar Elastoplasticity
Clayton, J. D.; McDowell, D. L.; Bammann, D. J.; Jan. 2001; 4 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0221; DAAG55-98-1-0213
Report No.(s): AD-A417830; ARO-39511.18-EG; No Copyright; Avail: CASI; A01, Hardcopy

Presented are aspects of a constitutive model for crystalline metals containing dislocation and disclination defects. Kinematics and balance laws are developed simultaneously at two scales of observation. The macroscopic kinematic description is characterized by a multiplicative decomposition of the deformation gradient, while the meso- level description follows from an additive decomposition of a connection into objects reflecting dislocations and disclinations. At the macroscale, the standard linear and angular momentum balances are enforced, while at the mesoscale, we postulate additional momentum equations for driving forces conjugate to defect densities.
DTIC
Elastoplasticity; Mathematical Models; Metal Crystals; Dislocations (Materials)

20030112236 NASA Glenn Research Center, Cleveland, OH, USA
Atomistic Modeling of Nanostructures via the BFS Quantum Approximate Method
Bozzolo, Guillermo; Garces, Jorge E.; Noebe, Ronald D.; Farias, D.; June 2003; 20 pp.; In English
Contract(s)/Grant(s): WBS 22-708-31-02; Copyright; Avail: CASI; A03, Hardcopy
Ideally, computational modeling techniques for nanoscopic physics would be able to perform free of limitations on the type and number of elements, while providing comparable accuracy when dealing with bulk or surface problems. Computational efficiency is also desirable, if not mandatory, for properly dealing with the complexity of typical nano-strucured systems. A quantum approximate technique, the BFS method for alloys, which attempts to meet these demands, is introduced for the calculation of the energetics of nanostructures. The versatility of the technique is demonstrated through analysis of diverse systems, including multi-phase precipitation in a five element Ni-Al-Ti-Cr-Cu alloy and the formation of mixed composition Co-Cu islands on a metallic Cu(III) substrate.
Author
Nanostructures (Devices); Approximation; Quantum Mechanics; Mathematical Models; Heat Resistant Alloys

20030112241 NASA Glenn Research Center, Cleveland, OH, USA
Cost-Effective TiAl based Materials
Moxson, V. S.; Sun, Fusheng; Draper, Susan L.; Froes, F. H.; Duz, V.; May 2003; 8 pp.; In English; Gamma Titanium Aluminides 2003, 2003
Contract(s)/Grant(s): 22-713-82-22; Copyright; Avail: CASI; A02, Hardcopy
Because of their inherent low ductility, TiAl-based materials are difficult to fabricate, especially thin gage titanium gamma aluminide (TiAl) sheet and foil. In this paper, an innovative powder metallurgy approach for producing cost-effective thin gage TiAl sheets (with 356 mm long and 235 mm wide, and a thickness of 0.74, 1.09, 1.55, and 2.34 mm, respectively) is presented. The microstructures and tensile properties at room and elevated temperatures of the thin gage TiAl are studied. Results show that these TiAl sheets have a relatively homogenous chemistry, uniform microstructure, and acceptable mechanical properties. This work demonstrates a cost-effective method for producing both flat products (sheet/foil) and complex chunky parts of TiAl for various advanced applications including aerospace and automotive industries.
Author
Titanium Aluminides; Powder Metallurgy

20030112448 NASA Glenn Research Center, Cleveland, OH, USA
Durability Assessment of Various Gamma TiAl Alloys
Lerch, Brad; Draper, Sue; Pereira, Mike; Zhuang, Wyman; [2003]; 7 pp.; In English; 3rd International Symposium on Gamma Titanium Aluminides, 2-6 Mar. 2003, San Diego, CA, USA
Contract(s)/Grant(s): WBS 22-708-24-06; No Copyright; Avail: CASI; A02, Hardcopy
Seven cast and one wrought gamma-alloys were ballistically impacted and tested under high cycle fatigue. The fatigue strength of each alloy was characterized as a function of initial flaw size and modeled using a threshold-based fracture mechanics approach.
Author
Durability; Fracture Mechanics; Titanium Aluminides

20030112450 Northwestern Univ., Evanston, IL, USA
Temporal Evolution of Nanostructures in a Model Nickel-Base Superalloy: Experiments and Simulations
Sudbrack, Chantal K.; Yoon, Kevin E.; Mao, Zugang; Noebe, Ronald D.; Ishei, Dieter; Seidman, David N.; February 1, 2003; 8 pp.; In English
Contract(s)/Grant(s): NGT3-52378; 708-31-02; No Copyright; Avail: CASI; A02, Hardcopy

The temporal evolution of the nanostructure of a model Ni-base superalloy (Ni-5.2 at.% Al-14.2 at.% Cr) is studied experimentally employing three-dimensional atom-probe (3DAP) microscopy in conjunction with kinetic Monte Carlo (KMC) simulations at 600 C. It is demonstrated that not only can the mean compositions of individual gamma' (Ni3Al with the Li2 structure) precipitates be measured but the Ni, Al, and Cr concentration profiles within the precipitates can also be determined for precipitates with a mean radius (<r>) as small as 0.85 nm. The three asymptotic tinie dependencies of the Lifshitz-Slyzov-Wagner (LSW) theory of coarsening (Ostwald ripening) are measured and found to deviate from its theoretical predictions: possible explanations for these discrepancies are discussed. At 0.25 hr. there is 3DAP microscope evidence for the presence of precipitates of another nickel-rich phase. ='Ni3Cr' (Ni3Cr(1-x)Al(x)), which exhibits short-range order (SRO) and that is metastable with respect to Ni3Al. This metastable phase is also found by KMC simulations and has the composition Ni3Cr(1-x)Al(x), which is Ni-2.91 at.% Al-21.98 at.% Cr at 16 hours. Our results demonstrate that the decomposition of gamma the primary gamma (FCC) phase results in the concurrent formation of an ordered phase and a disordered phase by 0.25 hours.
Author
Nanostructures (Devices); Mathematical Models; Intermetallics; Heat Resistant Alloys; Simulation; Temporal Resolution; Nickel Alloys

20030112533 Virginia Univ., Charlottesville, VA, USA
Metals Technology for Aerospace Applications in 2020: Development of High Temperature Aluminum Alloys For Aerospace Applications
Dicus, Dennis, Technical Monitor; Starke, Edgar A., Jr.; October 15, 2003; 30 pp.; In English
Contract(s)/Grant(s): NAG1-02090; AFOSR-S49620-01-1-0090; No Copyright; Avail: CASI; A03, Hardcopy
The role of trace additions on the nucleation and stability of the primary strengthening phase, omega, is of paramount importance for the enhancement of mechanical properties for moderate temperature application of Al-Cu-Mg-(Ag) alloys. In order to better understand the competition for solute, which governs the microstructural evolution of these alloys, a series of Al-Cu-Mg-Si quaternary alloys were prepared to investigate the role of trace Si additions on the nucleation of the omega phase. Si additions were found to quell omega nucleation in conjunction with the enhanced matrix precipitation of competing phases. These initial results indicate that it is necessary to overcome a critical Mg/Si ratio for omega precipitation, rather than a particular Si content.
Author
Metals; Nucleation; Silicon; Heat Resistant Alloys; Microstructure

20030112545 Missouri Univ., Rolla, MO, USA
Fundamental Investigations of Plasticity in High Strength Nanostructured Aluminum Alloys
Mishra, Rajiv S.; Jan. 2000; 8 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0022
Report No.(s): AD-A418121; AFRL-SR-AR-TR-03-0378; No Copyright; Avail: CASI; A02, Hardcopy
Cryomilled aluminum alloys are being developed for aerospace applications. These high-strength aluminum alloys are currently targeted for low-temperature rocket applications. This research focused on the fundamental strengthening mechanisms in these alloys. The primary sources of strengthening in cryomilled aluminum alloys are dispersion of nanocrystalline particles and ultrafine grain size that form during the cryomilling stage. Optimized thermo-mechanical processing of cryomilled powder results in an ultrafine grain size material with nanocrystalline particles. This study investigated the temperature dependence of strength and ductility in these alloys. The theoretical models predict strengthening at low temperatures and decrease of flow stress with decreasing grain size because of diffusional flow and grain boundary sliding at elevated temperatures. The results from this study show discrepancies with theoretical models. Significant work hardening was observed at room temperature in both Al-Ti-Cu and Al-Mg alloys. The strain hardening exponents suggest contributions from both direct and indirect work hardening mechanisms. At elevated temperatures, the stress- strain rate data for Al-Mg alloys can be best described by a power law constitutive relationship with a stress exponent of 5 and threshold stress. However, the activation energy is very high even after compensating for threshold approach. This indicates that dissolution of Al3Mg2 precipitates influence the deformation kinetics. (6 figures, 8 refs.)
DTIC
Aluminum Alloys; High Strength Alloys; Plastic Properties

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20030111835 NASA Glenn Research Center, Cleveland, OH, USA
Foreign Object Damage of Two Gas-Turbine Grade Silicon Nitrides in a Thin Disk Configuration
Choi, Sung R.; Pereira, J. Michael; Janosik, Lesley A.; Bhatt, Ramakrishna T.; [2003]; 10 pp.; In English; ASME Turbo Expo 2003 Power of Land, Sea and Air, 16-19 Jun. 2003, Atlanta, GA, USA
Contract(s)/Grant(s): 708-31-09
Report No.(s): GT2003-38544; No Copyright; Avail: CASI; A02, Hardcopy

Foreign object damage (FOD) behavior of two commercial gas-turbine grade silicon nitrides, AS800 and SN282, was determined at ambient temperature through post-impact strength testing for thin disks impacted by steel-ball projectiles with a diameter of 1.59 mm in a velocity range from 115 to 440 m/s. AS800 silicon nitride exhibited a greater FOD resistance than SN282, primarily due to its greater value of fracture toughness (K(sub IC)). The critical impact velocity in which the corresponding post-impact strength yielded the lowest value was V(sub c) approx. 440 and 300 m/s for AS800 and SN282, respectively. A unique lower-strength regime was typified for both silicon nitrides depending on impact velocity, attributed to significant radial cracking. The damages generated by projectile impact were typically in the forms of ring, radial, and cone cracks with their severity and combination being dependent on impact velocity. Unlike thick (3 mm) flexure bar specimens used in the previous studies, thin (2 mm) disk target specimens exhibited a unique backside radial cracking occurring on the reverse side just beneath the impact sites at and above impact velocity of 160 and 220 m/s for SN282 and AS800, respectively.
Author
Silicon Nitrides; Impact Tests; Ambient Temperature; Impact Damage; Foreign Bodies

20030111885
Corrosion Protection Service Life of Epoxy-Coated Reinforcing Steel in Virginia Bridge Decks
Brown, M. C.; Weyers, R. E.; Via, C. E.; Sep. 2003; In English
Report No.(s): PB2004-101108; VTRC-04-CR7; No Copyright; Avail: National Technical Information Service (NTIS)

The corrosion protection service life extension provided by epoxy-coated reinforcement (ECR) was determined by comparing ECR and bare steel bars from 10 Virginia bridge decks built between 1981 and 1995. The objective was to determine the corrosion protection service life time extension provided by ECR field specimens with various degrees of coating adhesion: disbonded, partially disbonded, and wholly bonded coatings.
NTIS
Corrosion Prevention; Epoxy Resins; Steels; Protective Coatings

20030112046 Pennsylvania Univ., Philadelphia, PA
A Characterization System for Ceramic Powders
Chen, I-Wei; Aug. 31, 2003; 8 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0260
Report No.(s): AD-A417937; AFRL-SR-AR-TR-03-0443; No Copyright; Avail: CASI; A02, Hardcopy

The grant was initiated on April 1, 2001. We have purchased a laser particle size analyzer, a powder surface area analyzer, a mercury powder pore size analyzer, and an ultracentrifuge for powder separation. These instruments have all been installed and in operation. We have proceeded with powder and green body characterization of the bulk silicon nitride and SiAlONs. This includes the study of the effect of seeding with micrometer-sized crystals on a-SiAlON microstructure, the development of ceramic cellular composites by green body deformation, and infiltration of C-N precursors into reaction bonded silicon nitride, and the development of alpha-SiAlON ceramics with machinability and low glass content.
DTIC
Ceramic Matrix Composites; Crystals; Deformation

20030112280 NASA Glenn Research Center, Cleveland, OH, USA
Surface Characterization of 3C-SiC Mesa Heterofilms: Evidence for Growth by Edge/Corner Nucleation Mechanism
Trunek, Andrew J.; Neudeck, Philip G.; Spry, David J.; Powell, J. Anothny; [2003]; 19 pp.; In English; 2003 Electronic Materials Conference, 25-27 Jun. 2003, Salt Lake City, UT, USA; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents the first detailed observations of unique surface morphologies of 3C-Sic films grown on 4W6H-SIC mesas by the step-free surface heteroepitaxy technique. The top surfaces of 3C-Sic films were extensively studied by optical microscopy and atomic force microscopy (AFM) as both film thickness (i.e,, growth time) and growth temperature (i.e., terrace nucleation rate) were varied following complete coverage of each 4W6H mesa by an initial 3C-Sic film. Almost all surface steps observed by AFM were 0.25 nm, the height of a single Si-C bilayer. However, strikingly different step patterns were observed, suggesting that radically different processes dominate the nucleation of new 3C-Sic bilayers on top of existing 3C-Sic film surfaces.
Author
Silicon Carbides; Surface Properties; Epitaxy

20030112302 Air Force Research Lab., Edwards AFB, CA
Investigating the Strain Rate Effects on Cumulative Damage in a Highly Filled Polymeric Material
Liu, C. T.; Jan. 2003; 15 pp.; In English
Contract(s)/Grant(s): Proj-2302
Report No.(s): AD-A417692; AFRL-PR-ED-VG-2003-238; No Copyright; Avail: CASI; A03, Hardcopy
Investigate Cumulative Damage in a Highly Filled Polymeric Material under Constant and Dual-Displacement Rate Loading Conditions.
DTIC
Polymers; Strain Rate

20030112370 Georgia Inst. of Tech., Atlanta, GA
Compression Behavior of High Performance Polymeric Fibers
Kumar, Satish; Min, Byung G.; Veedu, Steekumar T.; Liu, Tao; Uchida, Tetsuya; Jun. 2003; 23 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0147
Report No.(s): AD-A418091; AFRL-SR-AR-TR-03-0366; No Copyright; Avail: CASI; A03, Hardcopy
Hydrogen bonding has proven to be effective in improving the compressive strength of rigid-rod polymeric fibers without resulting in a decrease in tensile strength while covalent crosslinking results in brittle fibers. Tensile strength of the PBO/SWNT fiber containing 10 wt% SWNT is over 50% higher than that of the control PBO fibers containing no SWNT. An optically homogeneous solution/dispersion of single wall carbon nanotubes (SWNTs) in oleum has been used to form isotropic films as well as SWNT coatings on polymers. Addition of SWNT increases the crystallization rate of polypropylene by as much as an order of magnitude or higher. SWNT orientation and exfoliation are important in achieving high modulus SWNT/polymer composite fibers. The specific capacitance of the SWNT/activated carbon film is significantly higher than that of the bucky paper.
DTIC
Compressive Strength; High Polymers; Rods; Carbon Fibers; Mechanical Properties

20030112374 Connecticut Univ., Storrs, CT
Liquid Crystalline Symposium
Mather, Patrick T.; Aug. 14, 2003; 3 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0418; Proj-2303
Report No.(s): AD-A418146; AFRL-SR-AR-TR-03-0351; No Copyright; Avail: CASI; A01, Hardcopy
Research in the physics, chemistry, and technology of liquid crystals (LCs) is alive and well, as demonstrated by the vitality of this recent LC symposium and the accompanying volume. While symposia focused on liquid crystal (LC) materials scienc have a strong tradition of excellence at MRS meetings, organizers and attendees of the Fall 2001 MRS Symposium CC agree that this was an especially excellent conference. Talks spanned a very diverse set of LC-related topics, ranging from reports on the latest hot research areas, including flexoelectrooptics, V-shaped switching, chiral discotics, and banana phases, to the most recent developments in LC-polymer composite systems and LC gels.
DTIC
Conferences; Liquid Crystals; Research and Development; Polymers

20030112391 Clark-Atlanta Univ., GA, USA
Tailor Pi-Conjugated Polymers for Enhanced Luminescence Efficiency
Pang, Yi; Karasz, Frank E.; May 2003; 53 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0090; Proj-2303
Report No.(s): AD-A417976; AFRL-SR-AR-TR-03-0447; No Copyright; Avail: CASI; A04, Hardcopy

During the reporting period, we have systematically examined the role of a meta-phenylene in the tt- conjugated polymers. Resulting form its effective tt- conjugation interruption, controllable insertion of m- phenylene along the polymer backbone is demonstrated to be a useful tool for precise color tuning. Introduction of a bent angle at the m-phenylene unit also improves the molecular packing in the solid state, thereby enhancing the PL quantum efficiency in the solid state. Although original investigation is focusing on the poly(phenylene ethynylene) system, the concept has been successfully extended to poly(phenylene vinylene) system. By synthesis of polymers with defined chemical structures, we have investigated the impact of trace iodine to the luminescent properties of polymers. The results show that the Wittig-Horner reaction is a preferred method to construct the vinylene bond of trans-configuration. It is noted that there are two types of phenyl rings, i.e., m- and p- phenyl rings, present along the PPV chain examined. Selective placement of substitute on the different type of phenyl rings is found to significantly affect the luminescent properties of the polymers. Through collaboration with Professor Karasz's group at UMass, many of the polymers are shown be electroluminescent with EL efficiency reaching as high as 1 % The EL efficiency of this class of materials will be further increased by improving the charge injection within the polymer layer.
DTIC
Luminescence; Chemical Composition; Polymers; Conjugates

20030112514 Massachusetts Inst. of Tech., Cambridge, MA
The Mechanisms of Creep Resistance of Advanced Ceramic Eutectics: Experiments and Modeling
Argon, Ali S.; Aug. 15, 2003; 46 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0276
Report No.(s): AD-A417986; No Copyright; Avail: CASI; A03, Hardcopy

The creep resistance of the directionally solidified ceramic eutectics of alumina/cubic- zirconia was studied experimentally in the 1200-1520 degrees C, and 100-275 Mpa stress range, with associated TEM and SEM microscopy, as a generic example of ceramic eutectics. Additional (computer simulations were done both at the atomic level and by FEM methods to study: a) the core structure of pyramidal edge dislocations in alumina-that can only climb but not glide; and b) the stress distribution in the alumina component during creep. A creep model based on diffusional climb of pyramidal system edge dislocations was in very good agreement with the measured creep rates. The model predicts that the creep resistance of the eutectics should be superior to that of pure sapphire fiber in the above temperature range, and must be considered as potential candidates for high temperature structural applications. Exploitation of their full potential in high temperature composites, however, requires extensive engineering materials development.
DTIC
Aluminum Oxides; Creep Strength; Zirconium Oxides

20030112580 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA
SEEDLING Proposal to Establish Pilot Data for a Consortium on Magnetic Nanoparticle Assemblies: A New Tool for Drug Delivery, Sensors and Electronic Devices
Riffle, Judy S.; May 2003; 15 pp.; In English
Contract(s)/Grant(s): F49620-02-1-O3O8
Report No.(s): AD-A418026; TR-30971; AFRL-SR-AR-TR-03-0449; No Copyright; Avail: CASI; A03, Hardcopy

Complexes of magnetic nanoparticles with polymer dispersion stabilizers can lead to well-defined magnetic dispersions and also to precursors for magnetic microspheres. Thus, complexes of block copolymers containing both hydrophilic and hydrophobic dispersion components with magnetite nanoparticles have been prepared and characterized. In-vitro cell survival assays of the hydrophilic complexes suggest a relationship between cell survival and proliferation and the molecular weight (and hydrophilicity) of the polymer dispersants (higher molecular weight results in better cell proliferation/survival). Magnetic transition metals such as cobalt, iron or nickel are susceptible to oxidation with concurrent loss in magnetic response unless the nanoparticle surfaces are protected with oxygen impermeable coatings. Copolymer precursors to graphitic-like and silica-like protective coatings have been prepared and utilized to coat cobalt nanoparticles in thermolysis reactions. High temperature pyrolyses of the complexes in both cases suggest that oxidatively stable cobalt nanoparticles approximately 10 nm in diameter can be formed. The pyrolysis procedure results in 10-nm cobalt but the particles are adhered together. Attention will be devoted during the forthcoming year on methods for separating the nanoparticles from each other and on 're-coating' the materials with appropriate biospecific functional groups.
DTIC
Drugs; Nanoparticles; Sensors; Magnetic Materials; Electronic Equipment

20030112581 Northwestern Univ., Evanston, IL
Assembling a Lasing Hybrid Material With Supramolecular Polymers and Nanocrystals
Li, Leiming; Beniash, Elia; Zubarev, Eugene R.; Xiang, Wanghua; Rabatic, Bryan M.; Sep. 21, 2003; 7 pp.; In English
Contract(s)/Grant(s): DAA655-97-1-0126
Report No.(s): AD-A418140; ARO-37254.107-CH-MUR; No Copyright; Avail: CASI; A02, Hardcopy

The combination of bottom-up and top-down processes to organize nanophases in hybrid materials is a key strategy to create functional materials. We found that oxide and sulphide nanocrystals become spontaneously dispersed in organic media during the self-assembly of nanoribbon supramolecular polymers. These nanoribbon polymers form by self-assembly of dendron rodcoil molecules, which contain three molecular blocks with dendritic, rod-like, and coil-like architectures. In an electric field these supramolecular assemblies carrying bound nanocrystals migrate to the positive electrode in an etched channel and align in the field. In the system containing ZnO nanocrystals as the inorganic component, both phases are oriented in the hybrid material forming an ultraviolet lasing medium with a lower threshold relative to pure ZnO nanocrystals.
DTIC
Polymers; Molecular Structure; Lasing; Nanocrystals

20030112591 Washington Univ., Seattle, WA, USA
Cryogenic Cycling Behavior of Polymeric Composite Materials
Seferis, James C.; Dec. 2002; 187 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0132
Report No.(s): AD-A418132; AFRL-SR-AR-TR-03-0359; No Copyright; Avail: CASI; A09, Hardcopy

The basis of this research was an exploration of the fundamental phenomena that determine the response of fiber-reinforced composite materials to thermal cycling between cryogenic and ambient temperatures. This analysis began with a phenomenological approach that investigated the role of the processing, structure, and properties of composite materials on their behavior at cryogenic temperatures. The components of a composite material, the fibers and the matrix, were investigated along with the interaction between the fibers and the matrix to determine the effects of composite structure and properties on performance. In addition, processing and thermal ramp rate effects on internal stresses were also investigated. This approach provided an understanding of which variables influence composite behavior at cryogenic temperatures. Once this knowledge base had been established it could be extended to predict and model the performance of composite materials and develop design procedures to produce composite materials with optimized performance. Overall, this work investigated the performance of composite materials at cryogenic temperatures through a phenomenological and theoretical approach that established a fundamental understanding of the science and engineering of composite materials.
DTIC
Polymers; Composite Materials; Cryogenics; Cryogenic Temperature

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

20030111700 Nebraska Univ., Lincoln, NE, USA
Validated Numerical Models for the Convective Extinction of Fuel Droplets (CEFD)
Gogos, George; Bowen, Brent; Nickerson, Jocelyn S.; The Aeronautics Education, Research, and Industry Alliance (AERIAL) 2002 Report; 2002, pp. 24-44; In English; See also 20030111697; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The NASA Nebraska Space Grant (NSGC) & EPSCoR programs have continued their effort to support outstanding research endeavors by funding the Numerical Simulation of the Combustion of Fuel Droplets study at the University of Nebraska at Lincoln (UNL). This team of researchers has developed a transient numerical model to study the combustion of suspended and moving droplets. The engines that propel missiles, jets, and many other devices are dependent upon combustion. Therefore, data concerning the combustion of fuel droplets is of immediate relevance to aviation and aeronautical personnel, especially those involved in flight operations. The experiments being conducted by Dr. Gogos and Dr. Nayagam s research teams, allow investigators to gather data for comparison with theoretical predictions of burning rates, flame structures, and extinction conditions. The consequent improved fundamental understanding of droplet combustion may

contribute to the clean and safe utilization of fossil fuels (Williams, Dryer, Haggard & Nayagam, 1997, f 2). The present state of knowledge on convective extinction of fuel droplets derives from experiments conducted under normal gravity conditions. However, any data obtained with suspended droplets under normal gravity are grossly affected by gravity. The need to obtain experimental data under microgravity conditions is therefore well justified and addresses one of the goals of NASA's Human Exploration and Development of Space (HEDS) microgravity combustion experiment.
Author
Drops (Liquids); Fuels; Combustion

20030112023 Nebraska Univ., Omaha, NE, USA
Numerical Simulation of the Combustion of Fuel Droplets: Finite Rate Kinetics and Flame Zone Grid Adaptation (CEFD)
Gogos, George; Bowen, Brent D.; Nickerson, Jocelyn S.; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; 17 pp.; In English; See also 20030112018; Copyright; Avail: CASI; A03, Hardcopy

The NASA Nebraska Space Grant (NSGC) & EPSCoR programs have continued their effort to support outstanding research endeavors by funding the Numerical Simulation of the Combustion of Fuel Droplets study at the University of Nebraska at Lincoln (UNL). This team of researchers has developed a transient numerical model to study the combustion of suspended and moving droplets. The engines that propel missiles, jets, and many other devices are dependent upon combustion. Therefore, data concerning the combustion of fuel droplets is of immediate relevance to aviation and aeronautical personnel, especially those involved in flight operations. The experiments being conducted by Dr. Gogos and Dr. Nayagam s research teams, allow investigators to gather data for comparison with theoretical predictions of burning rates, flame structures, and extinction conditions. The consequent improved hndamental understanding droplet combustion may contribute to the clean and safe utilization of fossil hels (Williams, Dryer, Haggard & Nayagam, 1997, 72). The present state of knowledge on convective extinction of he1 droplets derives fiom experiments conducted under normal gravity conditions. However, any data obtained with suspended droplets under normal gravity are grossly affected by gravity. The need to obtain experimental data under microgravity conditions is therefore well justified and addresses one of the goals of NASA s Human Exploration and Development of Space (HEDS) microgravity combustion experiment.
Author
Combustion; Drops (Liquids); Liquid Fuels

20030112243 NASA Glenn Research Center, Cleveland, OH, USA
Effects of Fuel Distribution on Detonation Tube Performance
Perkins, H. Douglas; Sung, Chih-Jen; January 2003; 24 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

A pulse detonation engine uses a series of high frequency intermittent detonation tubes to generate thrust. The process of filling the detonation tube with fuel and air for each cycle may yield non-uniform mixtures. Uniform mixing is commonly assumed when calculating detonation tube thrust performance. In this study, detonation cycles featuring idealized non-uniform Hz/air mixtures were analyzed using a two-dimensional Navier-Stokes computational fluid dynamics code with detailed chemistry. Mixture non-uniformities examined included axial equivalence ratio gradients, transverse equivalence ratio gradients, and partially fueled tubes. Three different average test section equivalence ratios were studied; one stoichiometric, one fuel lean, and one fuel rich. All mixtures were detonable throughout the detonation tube. Various mixtures representing the same average test section equivalence ratio were shown to have specific impulses within 1% of each other, indicating that good fuel/air mixing is not a prerequisite for optimal detonation tube performance under conditions investigated.
Author
Pulse Detonation Engines; Fuel Flow

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

20030111831 NASA Glenn Research Center, Cleveland, OH, USA
High-school Student Teams in a National NASA Microgravity Science Competition
DeLombard, Richard; Hodanbosi, Carol; Stocker, Dennis; September 15, 2003; 11 pp.; In English; AIAA Aerospace Sciences Conference and Exhibit, 5-8 Jan. 2003, Reno, NV, USA
Report No.(s): AIAA Paper 2004-1315; No Copyright; Avail: CASI; A03, Hardcopy

The Dropping In a Microgravity Environment or DIME competition for high-school-aged student teams has completed the first year for nationwide eligibility after two regional pilot years. With the expanded geographic participation and increased complexity of experiments, new lessons were learned by the DIME staff. A team participating in DIME will research the field of microgravity, develop a hypothesis, and prepare a proposal for an experiment to be conducted in a NASA microgravity drop tower. A team of NASA scientists and engineers will select the top proposals and then the selected teams will design and build their experiment apparatus. When completed, team representatives will visit NASA Glenn in Cleveland, Ohio to operate their experiment in the 2.2 Second Drop Tower and participate in workshops and center tours. NASA participates in a wide variety of educational activities including competitive events. There are competitive events sponsored by NASA (e.g. NASA Student Involvement Program) and student teams mentored by NASA centers (e.g. For Inspiration and Recognition of Science and Technology Robotics Competition). This participation by NASA in these public forums serves to bring the excitement of aerospace science to students and educators.Researchers from academic institutions, NASA, and industry utilize the 2.2 Second Drop Tower at NASA Glenn Research Center in Cleveland, Ohio for microgravity research. The researcher may be able to complete the suite of experiments in the drop tower but many experiments are precursor experiments for spaceflight experiments. The short turnaround time for an experiment's operations (45 minutes) and ready access to experiment carriers makes the facility amenable for use in a student program. The pilot year for DIME was conducted during the 2000-2001 school year with invitations sent out to Ohio- based schools and organizations. A second pilot year was conducted during the 2001-2002 school year for teams in the six-state region of Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. The third year for DIME was conducted during the 2002-2003 school year for teams from the fifty USA, the District of Columbia, and Puerto Rico. An annual national DIME program is planned for the foreseeable future. Presented in this paper will be a description of DIME, an overview of the planning and execution of such a program, results from the first three years, and lessons learned from the first national competition.
Author
Drop Towers; Microgravity; Scientists; NASA Programs; Students

20030111833 NASA Glenn Research Center, Cleveland, OH, USA
Sounding Rocket Microgravity Experiments Elucidating Diffusive and Radiative Transport Effects on Flame Spread over Thermally-Thick Solids
Olson, Sandra L.; Hegde, U.; Bhattacharjee, S.; Deering, J. L.; Tang, L.; Altenkirch, R. A.; June 27, 2003; 47 pp.; In English Contract(s)/Grant(s): NCC3-221; No Copyright; Avail: CASI; A03, Hardcopy

A series of 6-minute microgravity combustion experiments of opposed flow flame spread over thermally-thick PMMA has been conducted to extend data previously reported at high opposed flows to almost two decades lower in flow. The effect of flow velocity on flame spread shows a square root power law dependence rather than the linear dependence predicted by thermal theory. The experiments demonstrate that opposed flow flame spread is viable to very low velocities and more robust than expected from the numerical model, which predicts that at very low velocities (less than 5 centimeters per second), flame spread rates fall off more rapidly as flow is reduced. It is hypothesized that the enhanced flame spread observed in the experiments may be due to three- dimensional hydrodynamic effects, which are not included in the zero-gravity, two-dimensional hydrodynamic model. The effect of external irradiation was found to be more complex that the model predicted over the 0-2 Watts per square centimeter range. In the experiments, the flame compensated for the increased irradiation by stabilizing farther from the surface. A surface energy balance reveals that the imposed flux was at least partially offset by a reduced conductive flux from the increased standoff distance, so that the effect on flame spread was weaker than anticipated.
Author
Diffusivity; Flame Propagation; Mathematical Models; Microgravity; Solids; Sounding Rockets; Combustion; Spaceborne Experiments

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20030112286 Tokyo Denki Univ., Japan
Research Reports of The Faculty of Engineering, Tokyo Denki University, No. 49

December 2001; ISSN 0389-617X; 79 pp.; In English; In Japanese; Original contains black and white illustrations; Copyright; Avail: Other Sources

The reports generated by the engineering faculty include the following papers in their entirety: 1) Characteristics of Capillary Discharge Plasma Tool for Micro-Machine Fabrications; 2) Parallel-Division Method for Traveling Salesman Problem Using Chaos-Driven 2-opt Tabu Search; 3) Synthesis of Chelate Resin with Amidinourea as Adsorption Part; 4) Research on Ultra Dense Fine Pattern Replication Using Pattern Division and Double Wavelength Exposures. The titles of other faculty papers are listed in addition to these.

CASI

Universities; Engineering; Bibliographies

20030112604 Quallion, LLC, Sylmar, CA, USA

Quallion LLC: Powering Medical to Aerospace

Kishiyama, Clay; The 2002 NASA Aerospace Battery Workshop; April 2003; 19 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: Company background. Company organization Product application/technologies. Quality system. 15 battery design. Battery data. Summary.

CASI

Electric Batteries; Manufacturing; Design Analysis

20030112607 BAE Systems, Rockwell, MD, USA

Effects of LEO Cycling on Li-Ion Pouch Cell Electrodes

Massingill, James C.; The 2002 NASA Aerospace Battery Workshop; April 2003; 30 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objectives are: Identify the limiting electrode(s). Gain understanding of failure mechanism.

CASI

Cycles; Lithium; Electrolytic Cells; Electrodes

20030112761 Naval Postgraduate School, Monterey, CA

Physically Based Modeling and Simulation of a Ship in Open Water 3-D virtual Environment

Sicuro, David L.; Sep. 2003; 111 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418297; No Copyright; Avail: CASI; A06, Hardcopy

This thesis addresses the development of a physically based modeling simulator for a ship in a 3-D virtual environment to be used in naval tactical training systems. The objective is to develop a computer simulation program in which physical models are implemented in order to achieve a realistic representation of a ship in a virtual environment considering its physical features in the presence of environment conditions including waves, ocean current, wind, fog and day/night issues. The simulator was developed by integrating five marine models with a virtual ocean environment created with a visual simulation builder tool. The marine models include a maneuvering model, a wave model, a wind model and an ocean current model. The numerical results from another complex wave model were also combined using linear interpolation to increase the realism level of the simulator. The result of this thesis shows that the integration of multiple models from different sources is a feasible approach to meet the application requirements. The result also indicates that the use of the interpolation technique to take advantage of complex models yields a simulator with acceptable level of realism while imposing very low computational load in the application program.

DTIC

Computerized Simulation; Mathematical Models; Ocean Currents; Ships; Virtual Reality

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20030111886 General Accounting Office, Washington, DC
Electronic Government: Potential Exists for Enhancing Collaboration on Four Initiatives
Oct. 2003; 62 pp.
Report No.(s): PB2004-101390; GAO-04-6; No Copyright; Avail: CASI; A04, Hardcopy

In accordance with the President's management agenda, the Office of Management and Budget has sponsored initiatives to promote expansion of electronic government-the use of information technology, particularly Web-based Internet applications, to enhance government services. Each initiative demands a high degree of collaboration among organizations. For four of these initiatives, GAO was asked to determine, among other things, their implementation progress and the extent of collaboration among agencies and other parties involved. To enhance the effectiveness of their efforts at collaboration and help achieve the initiatives' goals, GAO is making recommendations to the managing partners of the four initiatives that address the specific collaboration issues revealed by the review.
NTIS
Information Systems; Computer Networks

20030111900 Naval Postgraduate School, Monterey, CA
Secure Wireless Handoff
Nafarrete, Romelo B.; Valverde, Lionel J.; Jun. 2003; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417516; No Copyright; Avail: CASI; A05, Hardcopy

With the rapidly growing demand for portable devices such as laptops handheld computers and Personal Digital Assistants (PDAs) with wireless networking capabilities the need for reliable wireless data network communication has also increased. Just like in mobile voice communication users demand uninterrupted secure wireless data communication as they move from place to place. Mobile IP satisfies some of these demands - it enables mobile devices with fixed IP addresses to be permanently reachable even as their point of attachment to the network changes. This allows for routing of data packets to and from the mobile device irrespective of its location on the network. While uninterrupted data flow can be achieved with Mobile IP it introduces additional security vulnerabilities including data privacy data integrity and authentication. The goal of this thesis is to investigate such vulnerabilities and explore implementations to overcome them.
DTIC
Computer Networks; Information Flow; Computer Information Security; Packets (Communication)

20030111926, Minority Business Development Agency, Washington, DC
Formal Classification and Verification of Simpson's 4-Slot Asynchronous Communication Mechanism
Henderson, N.; Paynter, S. E.; Jan. 29, 2002; 58 pp.; In English
Report No.(s): PB2004-101075; No Copyright; Avail: CASI; A04, Hardcopy

This paper critiques and extends Lamport's taxonomy of asynchronous registers, (Lam86a), (Lam86b). This extended taxonomy is used to characterise Simpson's 4-slot asynchronous communication mechanism (ACM), (Sim90), (Sim92), (Sim97a), (Sim97b), (Sim97c). A formalization of the Lamport atomic property and Simpson's original 4-slot implementation is given in the PVS logic (OSRSC99a). We prove that the 4-slot is atomic using Nipkow's retrieve relation proof rules, (Nip86), (Nip87), (Jon90). A description is given of the formal proofs, which have been discharged in the PVS theorem prover (OSRSC99b).
NTIS
Communication Networks; Proving; Asynchronous Transfer Mode

20030112065 Nippon Telegraph and Telephone Public Corp., Japan
NTT Technical Review, Volume 1, No. 1
April 2003; 100 pp.; In English; See also 20030112066 - 20030112088; Original contains color illustrations; Copyright; Avail: Other Sources

2003 is the year in which we will take a resolute step toward achieving the idea of the Resonant Communication Environment. Resonant communication, as brought about by information communication technology (ICT), is a concept

created by the NTT Group. It is explained in detail by the articles in this NTT Technical Review. One of the most important aspects of resonant communication is human empowerment. In this context, this means empowering human abilities in various ways through the benefits of broadband and ubiquitous technologies and services. First, consider human empowerment from the perspective of the individual. We used to be limited to information that we could perceive through our five senses, but various artificial sensors have already made it possible to detect gases, such as C02 and N02, and geomagnetism. The efficient use of artificial sensors along with the information provided by them enhances our perceptual abilities. Combine these sophisticated sensors with networks and we have a powerful means of exploiting a wide range of information remotely. Second, consider human empowerment in terms of people as a group, that is empowerment in knowledge. When faced with a problem that is too difficult to solve alone, we usually ask somebody nearby for help. However, we have already entered an entirely new environment where we can tap the accumulated wisdom of the whole world. When enormous numbers of individuals, computers, and objects are networked, these entities begin to work together as a whole on a global scale in the form of a superbrain. This brings us Knowledge Empowerment. Peer-to-peer and grid-computing are representative of some primary technologies moving us toward the superbrain. Knowledge empowerment does not simply mean more and more information. More important is to improve the quality of information by means of collaboration between people and ICT to eventually produce a synergetic effect. This empowerment will not be an additive effect of people plus technology, but a multiplicative effect. Given full play, these effects will stimulate our senses, bodies, and brains to bring out hidden abilities and thereby deepen our wisdom. We believe that human empowerment or, more generally speaking, digital empowerment in the resonant communication environment, offers many possibilities for the future. To help extend these possibilities in as many directions as possible, it is our desire to actively share to the maximum extent on a global scale our technical and business vision and up-to-date R&D activities. Thus, we decided to publish this new monthly NTT Technical Review, and I sincerely hope that it is enthusiastically accepted as a forum for the NTT Group to communicate resonantly with the world and enhance people s interests in our activities.
Author
Communication Networks; Optical Communication; Broadband; Wireless Communication; Wavelength Division Multiplexing; Semiconductor Devices

20030112066 Nippon Telegraph and Telephone Public Corp., Japan
Vision for a New Optical Generation: Broadband Leading to the World of Resonant Communication
Wada, Norio; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 6-17; In English; See also 20030112065; Copyright; Avail: Other Sources

NTT has announced its vision for the full-scale broadband and ubiquitous era that will be brought about by optics in the next five years. This paper introduces the 'Vision for a New Optical Generation and R&D Initiatives' presented by Norio Wada, President of NTT, at the 'NTT R&D Forum2002 in Musashino' held in November 2002.
Author
Optical Communication; Communication Networks; Broadband

20030112070 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Cross-phase Modulation Wavelength Converter using PLC Hybrid Integration Technologies
Sato, Rieko; Ito, Toshio; Ogawa, Ikuo; Okamoto, Hiroshi; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 32-38; In English; See also 20030112065; Copyright; Avail: Other Sources

We assembled a cross-phase modulation (XPM) wavelength converter by using semiconductor optical amplifier (SOA) and planar lightwave circuit (PLC) hybrid integration technologies. We clarified the optimal current conditions for low input power operation and successfully achieved -10 dBm input signal power operation at 10 Gbit/s without using a signal preamplifier. For stable control of XPM operation, we introduced a novel tuning technique to optimize the input power of the XPM wavelength converter. Using this technique, we could easily set the optimal input power for variable wavelength conversion among 30 wavelengths. We also fabricated an XPM wavelength converter unit containing a variable continuous wave source and confirmed simultaneous and automatic operation.
Author
Optical Communication; Optical Switching; Phase Modulation; Frequency Converters; Tuning

20030112071 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Signal Processing Using All-optical Wavelength Conversion-Application Using Hybrid-integrated XPM Device and SIPAS
Ito, Toshio; Sato, Rieko; Shibata, Yasuo; Kawaguchi, Yoshihiro; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 52-58; In English; See also 20030112065; Copyright; Avail: Other Sources

The explosive demand for data traffic requires high-speed all-optical signal processing by wavelength conversion using a device such as a planar lightwave circuit (PLC) hybrid-integrated cross-phase modulation (XPM) device or monolithically integrated SIPAS. An XPM device operates with a low input power of -10 dBm and can be used to adjust the wavelength or monitor the polarization mode dispersion (PMD) of a WDM channel, while SIPAS provides high-speed operation. This paper reports bit-rate and format conversion between conventional high-speed (10 Gbit/s) NRZ signals and extremely high-speed (40 Gbit/s) RZ signals by multi-wavelength conversion. It also discusses PMD compensation, which is an important issue, especially for extremely high-speed signals.
Author
Phase Modulation; Signal Processing; Wavelength Division Multiplexing; Optical Communication; Transmission Rate (Communications); Frequency Converters

20030112072 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Multi-location Collaboration Support System NetOfficeHIKARI
Honda, Sinkurou; Yasuno, Takayuki; NTT Technical Review, Vol. 1 No. 1 April 2003 - Broadband Leading to the World of Resonant Communication; April 2003, pp. 90-93; In English; See also 20030112065; Copyright; Avail: Other Sources

Meetings at which people gather and consult with each other are indispensable in organizations like companies and schools. In the past, people were forced to physically gather and face each other if they had something to talk over or collaborate about. Since the debut of the telephone, people at remote sites have been able to collaborate and the productivity of organizations has been dramatically improved. The latest multi-location telephone conference/TV conference systems not only make remote conferences practical, but also realize multi-location real-time collaboration. Here, we introduce our multi-location collaboration support system NetOfficeHIKARI and describe experiments conducted to assess it.
Author
Television Systems; Video Conferencing; Communication Networks

20030112074 Nippon Telegraph and Telephone Public Corp., Japan
Achieving 'Resonance of Knowledge': NTT's R&D Strategy to Provide the Basis for Its Envisaged Resonant Communications
Inoue, Yuji; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 18-25; In English; See also 20030112065; Copyright; Avail: Other Sources

This paper describes 'NTT's R&D Strategy for Realizing the Vision for a New Optical Generation' presented by Yuji Inoue, Senior Vice President, Director, Department III, NTT, at the 'NTT R&D Forum 2002 in Musashino' held in November 2002.
Author
Optical Communication; Technology Assessment; Wireless Communication; Communication Networks

20030112075 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Recent Research and Development of All-Optical Wavelength Conversion Devices
Suzuki, Yasuhiro; Toba, Hiromu; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 26-31; In English; See also 20030112065; Copyright; Avail: Other Sources

Wavelength conversion is a key technology for flexible wavelength control in photonic networks. At optical cross-connect nodes in photonic networks, wavelength conversion decreases the channel blocking probability and makes it possible to reuse wavelengths. The efficient use of wavelength resources will accelerate the establishment of flexible networks. All-optical wavelength conversion is especially attractive because it does not need OE or EO devices and is independent of signal formats and bit rates, making photonic networks transparent with respect to these properties. This special issue focuses on the all-optical wavelength conversion devices being studied and developed at NTT Photonics Laboratories. This paper summarizes recent R&D progress on them.
Author
Optical Switching; Communication Networks; Frequency Converters; Optoelectronic Devices

20030112076 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Semiconductor Monolithic Wavelength Converter (SIPAS)
Shibata, Yasuo; Tohmori, Yuichi; Oku, Satoshi; Ito, Toshio; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 39-45; In English; See also 20030112065; Copyright; Avail: Other Sources

This paper describes the operating principle, structure, fabrication technology, and basic characteristics of a newly developed wavelength converter called a SIPAS. In a SIPAS, a Mach-Zehnder interferometer with a semiconductor optical amplifier in each arm is monolithically integrated with a Sagnac interferometer. Filter-free wavelength conversion with output pulse width of 13 ps due to differential phase- modulation has been achieved using a fabricated SIPAS. The power penalty is as low as 0.9 dB at a bit rate of 10 Gbit/s.
Author
Frequency Converters; Wavelength Division Multiplexing; Phase Modulation; Pulse Duration; Semiconductor Devices

20030112077 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Multichannel Optical Coupling Technique and Its Application to a SIPAS Module
Ohki, Akira; Shibata, Yasuo; Ito, Toshio; Suzuki, Yasuhiro; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 46-51; In English; See also 20030112065; Copyright; Avail: Other Sources

We propose a novel multi-channel optical coupling technique called MOCA (multichannel optical coupling with an aspherical lens) to simplify the packaging of opto-electronic functional devices whose optical I/O ports are arrayed optical waveguides. MOCA uses only an aspherical lens to couple an optical waveguide array to an optical fibre array. In spite of its simplicity, MOCA provides efficient optical coupling for each optical I/O port and high performance for module reliability. To evaluate the performance of MOCA, we applied it to an all-optical wavelength converter chip known as a SIPAS (Sagnac interferometer integrated with parallel amplifier structure), which will be a key device in near-future WDM networks. The fabricated module, which has a coupling loss of less than 3.5 dB per I/O port, acts as an all-optical wavelength converter for 10-Gbit/s RZ optical signals.
Author
Optical Communication; Optical Coupling; Wavelength Division Multiplexing

20030112078 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Wavelength Conversion Devices Using Quasi-phase-matched LiNb03
Asobe, Masaki; Tadanaga, Osamu; Miyazawa, Hiroshi; Nishida, Yoshiki; Suzuki, Hiroyuki; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 59-67; In English; See also 20030112065; Copyright; Avail: Other Sources

This paper describes recent progress in research on wavelength converters that employ quasi-phasematched LiNbO3 (QPM-LN) waveguides. The basic structure and operating principle of these devices are also explained. The wavelength conversion characteristics, resistance to photorefractive damage, and optical parametric amplification characteristics of an annealed proton exchanged waveguide are presented. Polarization-independent wavelength conversion using a ridge waveguide fabricated on epitaxially grown LiNbO3 is also introduced. QPM-LN-based wavelength converters have several advantages: for example, they can convert high-speed signals of 1 THz or more, have no signal-to-noise ratio degradation and no modulation format dependence, and can simultaneously convert broadband wavelength division multiplexing channels. Therefore, they will be key devices in future photonic networks.
Author
Lithium Niobates; Wavelength Division Multiplexing; Semiconductor Devices; Optical Waveguides; Frequency Converters

20030112079 Nippon Telegraph and Telephone Public Corp., Tsukuba, Japan
A Study on the Formation of Communities Using Broadband Networks
Tamaki, Norio; Miwa, Ryuji; Watanabe, Hiroshi; Nishiyama, Nobuhide; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 78-83; In English; See also 20030112065; Copyright; Avail: Other Sources

The diffusion of optical-fiber networks in recent years has made it easy to provide broadband capability, thereby holding out the possibility of transforming the business sector and society at large. Because broadband networks support video and voice as means of communication, people are able to communicate even if their capabilities for information input and output are low. This article surveys customer networks and related technological trends in relation to the addition of functions supporting the formation of communities, so as to enable local communities to make effective use of broadband networks.
Author
Broadband; Communication Networks; On-Line Systems

20030112080 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Uncompressed HDTV Over IP Transmission System Using Ultra-high-speed IP Streaming Technology
Harada, Keiji; Kawano, Tetsuo; Zaima, Kazutaka; Hatta, Seiji; Meno, Shigeyuki; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 84-89; In English; See also 20030112065; Copyright; Avail: Other Sources

In October 2001, 'NTT Laboratories developed the world's first Uncompressed high-definition television signal (1.5 Gbit/s) over IP transmission technology.' We are also developing operating systems for practical use. This article describes examples of the usage of this system and newly developed applications.
Author
High Definition Television; Protocol (Computers); Packet Transmission; Video Signals

20030112081 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
NTT Develops High-quality MPEG-2 Codec LSI for Embedding in Consumer-oriented Interactive Video Communication Systems
NTT Technical Review, Vol. 1 No. 1 April 2003 - Broadband Leading to the World of Resonant Communication; April 2003, pp. 97-98; In English; See also 20030112065; Copyright; Avail: Other Sources

NTT has developed LSI technology for implementing consumer-oriented codec LSIs (development code: ISIL) that offer high picture quality exceeding that of standard TVs. Using this new technology, NTT is able to achieve simultaneous processing (full duplex) for encoding and decoding (compression and decompression) of high-quality progressively scanned pictures at 480/60P in conformance with MPEG-2 standards. In the past, this level of processing required the use of several specialized chips. NTT's single-chip design is unprecedented anywhere in the world. In the case of half-duplex processing -that is, processing of only encoding or decoding- the new chip can handle high-quality pictures up to 720/30P. The recently developed chip achieves both high performance and flexibility to accommodate video formats for a variety of applications, as well as video communication systems. The chip's design aims for low cost and low power consumption (less than 1.5 W), making it ideal for a wide range of consumer systems. It can be embedded in home digital video cameras, interactive video communication terminals, and mobile codec systems, contributing to the progress of a high-quality video environment that offers picture quality surpassing that of standard TVs. This will in turn promote the development of diverse and interactive consumer-oriented contents, and enable a rapid acceleration in the establishment of a high-quality visual communication society.
Derived from text
Coders; Decoders; Large Scale Integration; Video Communication; Chips (Electronics)

20030112083 Nippon Telegraph and Telephone Public Corp., Japan
QoS Evaluation of VoIP Communication Employing Self-organizing Neural Network
Masugi, M.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 101; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

This paper proposes a Quality-of-Service (QoS) evaluation method for Voice-over IP (VoIP) using a self-organizing neural network. For training of a self-organization model, two categories of variables were input into the self-organizing map: the QoS-related parameters and the system identifier that indicates the system performance level and properties. Based on measured PSQM+, end-to-end delay, and packet loss rate, evaluation results confirmed that our method can effectively evaluate the total QoS level composed of several QoS-related factors.
Author
Communication Networks; Neural Nets; Performance Prediction; Self Organizing Systems; Voice Communication

20030112267 Army Research Lab., Adelphi, MD
System Design Issues for Wireless Communication in a Multi-Processor Computer: Carrier Acquisition Phase Noise and Modulation Constellation
Kozick, Richard J.; Sadler, Brian M.; Sep. 2003; 27 pp.; In English
Report No.(s): AD-A418084; ARL-TR-2987; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study is to investigate system-level design issues for a wireless communication system that links the central processing units (CPUs) in an advanced multi- processor computer system. The three primary requirements for the wireless communication system are that it must (1) support dynamic reconfigurability of the CPUs, (2) achieve very high data rates (on the order of 100 Gbps system capacity), and (3) achieve extremely low latencies (on the order of 10 nanoseconds). These requirements differ significantly from commercial wireless communication networks for voice and data. The objective of this effort is to identify and quantify the critical communication system design issues and trade-offs that will enable the successful achievement of the stringent requirements on dynamic reconfigurability, data rate, and latency.
DTIC
Electromagnetic Noise; Phase Modulation; Systems Engineering; Wireless Communication; Multiprocessing (Computers)

20030112444 Alaska Univ., Fairbanks, AK, USA

Application of Satellite SAR Imagery in Mapping the Active Layer of Arctic Permafrost

Li, Shu-Sun; Romanovsky, V.; Lovick, Joe; Wang, Z.; Peterson, Rorik; [2003]; 21 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-8614; No Copyright; Avail: CASI; A03, Hardcopy

A method of mapping the active layer of Arctic permafrost using a combination of conventional synthetic aperture radar (SAR) backscatter and more sophisticated interferometric SAR (INSAR) techniques is proposed. The proposed research is based on the sensitivity of radar backscatter to the freeze and thaw status of the surface soil, and the sensitivity of INSAR techniques to centimeter- to sub-centimeter-level surface differential deformation. The former capability of SAR is investigated for deriving the timing and duration of the thaw period for surface soil of the active layer over permafrost. The latter is investigated for the feasibility of quantitative measurement of frost heaving and thaw settlement of the active layer during the freezing and thawing processes. The resulting knowledge contributes to remote sensing mapping of the active layer dynamics and Arctic land surface hydrology.

Author

Synthetic Aperture Radar; Permafrost; Radar Imagery; Satellite Imagery; Surface Layers

20030112653 Virginia Univ., Charlottesville, VA, USA

RF-MEMS Based Tunable Matching Network

Barker, Scott N.; Oct. 23, 2003; 7 pp.; In English

Contract(s)/Grant(s): N00014-02-1-0561

Report No.(s): AD-A418038; GG10424; No Copyright; Avail: CASI; A02, Hardcopy

This project investigates a tunable matching network using the double-slug turns based on a distributed RF-MEMS transmission line (DMTL). The proposed design has a maximum voltage standing wave ratio (VSWR) of 16:1 with the number of match points ranging from 529 at 5 GHz to 1597 at 20 GHz. Simulation results are performed to demonstrate the capabilities of this design. Real-time adaptable RF front-ends are becoming an attractive method for dealing with the numerous communication architectures and frequency bands in use today. An important component in realizing such adaptable system is a tunable matching network that is able to maintain low loss and high linearity. Such a device could be used for tuning microwave amplifiers to operate in various modes or in different frequency bands. RF-MEMS have the capability of implementing these tunable matching networks with minimal degradation to the overall amplifier performance.

DTIC

Microelectromechanical Systems; Radio Frequencies; Computer Networks; Tunable Filters

20030112703 Naval Postgraduate School, Monterey, CA

Analysis of Voice Quality Problems of Voice Over Internet Protocol (VoIP)

Tasyumruk, Lutfullah; Sep. 2003; 95 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418298; No Copyright; Avail: CASI; A05, Hardcopy

After its introduction in mid 199Os, Voice over Internet Protocol (VoIP) or IP telephony has drawn much attention. The prospect of cost savings on long distance and international toll calls, the global presence of Internet Protocol (IP), and the trend to converge data networks with voice networks have made VoIP one of the fastest growing telecom sectors. Additionally, the emergence of 3rd Generation (3G) cellular technology which offers high bandwidth will result in the convergence of the Internet and the cellular networks which will further stimulate the growth of VoIP. However, VoIP faces many problems mainly because of the nature of IP networks which were built to transport non- real-time data unlike voice. This thesis analyzes factors affecting the voice quality of VoIP. These factors are delay, jitter, packet loss, link errors, echo and Voice Activity Detection (VAD). Further, implementation suggestions to lessen the effects of these factors are presented and finally, these suggestions are analyzed.

DTIC

Protocol (Computers); Convergence; Telephony; Vibration

20030112716 Air Force Flight Test Center, Edwards AFB, CA

A Limited Evaluation of Off-Boresight Flight Reference Symbologies for Fixed Wing Aircraft Helmet-Mounted Displays

Sheesley, Donald G.; Holler, Thomas A.; McIlvaine, Stephen P.; Bivetto, Frederick C.; Owens, C. T.; Jun. 2003; 88 pp.; In English

Report No.(s): AD-A418161; AFFTC-TIM-03-01; No Copyright; Avail: CASI; A05, Hardcopy

This report presents the results of Project Have SYCLOPS, a limited evaluation of off-boresight flight reference symbologies for fixed wing helmet-mounted displays (HMDs). The overall objective was to compare three HMD flight reference displays containing own- ship status information as aids during operationally representative, off-boresight, air- to-air and air-to-ground piloting tasks. The three symbologies were the Baseline (BL), Baseline Plus (BL+) and Advanced Non-Distributed Flight Reference (ANDFR). The Air Force Research Laboratory, Human Effectiveness Directorate (AFRL/HECV) requested this testing. USAF Test Pilot School (TPS) Class O2B conducted two calibration flights and twelve VISTA flight test sorties at Edwards AFB, CA from 10 Apr 03 to 23 Apr 03, totaling 19.3 hours. Three T-38 support sorties were also flown totaling 3.5 hours. All test objectives were met.
DTIC
Helmet Mounted Displays; Fixed Wings; Aircraft Configurations

20030112758 Naval Postgraduate School, Monterey, CA
Wireless Content Repurposing Architecture for DC Command and Control
Suh, Robert J.; Sep. 2003; 148 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418291; No Copyright; Avail: CASI; A07, Hardcopy

Damage control communications should be improved onboard US Navy ships. Current standard operating procedures are antiquated and should be replaced. Wireless networks are an improvement over the status quo and mobile devices other new capabilities that greatly improve the situational awareness for team members. In this thesis, a system architecture is designed for a damage control wireless local area network with Commercial-Off-The-Shelf components. This makes the system affordable and prevents previous miscommunication from occurring. This architecture will meet the following requirements: operate in a shipboard environment, multi- purpose, multi-user, scalable, resilient, mobility, and secure.
DTIC
Architecture (Computers); Command and Control; Damage; Communication Networks

20030112796 Naval Postgraduate School, Monterey, CA
An Evaluation of the Network Efficiency Required in Order to Support Multicast and Synchronous Distributed Learning Network Traffic
Quick, Christopher V.; Sep. 2003; 173 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418235; No Copyright; Avail: CASI; A08, Hardcopy

The USA military has had and will continue to have a legacy of comparatively short tours and long deployments in locations where the availability of all forms of education and training may be limited. This not only limits the potential of military members but can have a detrimental effect on morale and retention. Distributed Learning is one way to combat this ever increasing dilemma. With the proliferation of computer technology and Internet access throughout the Department of Defense (DoD), Distributed Learning can put education and training at the finger tips of most military members. It can even bring education to the field limited only by the networks, data delivery methods, and bandwidth provided military units.
DTIC
Education; Networks; Computer Systems Design

20030112807 Space and Naval Warfare Systems Center, San Diego, CA
Recommendations for Knowledge Desk Configurations for U.S. Navy Fleet Command Centers
Feher, B.; Morrison, J. G.; Yturralde, R. F.; Sep. 2003; 28 pp.; In English
Report No.(s): AD-A418259; SSC/SD-TR-3168; No Copyright; Avail: CASI; A03, Hardcopy

This report defines the functional requirements for K-Desks, based on current human factors research and operational experience observed as part of the Command-21 and KWT efforts during Operation Enduring Freedom and Operation Iraqi Freedom aboard USS Carl Vinson (CVN 79) and USS Constellation (CV 64).
DTIC
Combat; Functional Design Specifications; Constellations

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20030111719 Glasgow Univ., UK

Using Software Development Standards to Analyze Accidents Involving Electrical, Electronic or Programmable, Electronic Systems: The Blade Mill PLC Case Study

Johnson, C. W.; Bowell, M.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 111-127; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents the results of a project commissioned by the Electrical and Control Systems Unit of the UK Health and Safety Executive. The results of the project will be used to give guidance to operators and suppliers of electrical, electronic or programmable electronic systems (E/E/PES) in satisfying particular requirements of the Management of Health and Safety at Work Regulations 1999. The associated approved code of practice explains an obligation to adequately investigating the immediate and underlying causes of incidents and accidents to ensure that remedial action is taken, lessons are learnt and longer term objectives are introduced . There are relatively few techniques that might be used to investigate the underlying causes of E/E/PES related incidents. The following sections, therefore, introduce two techniques to support the investigation of this class of mishaps. One is based around flowcharts. These provide a series of questions to prompt investigators about the causal factors leading to an adverse event. Such a lightweight approach is appropriate for low consequence events. In contrast, the second technique involves additional documentation and analysis. It is, therefore, more appropriate for incidents that have greater potential consequences or a higher likelihood of recurrence. Events and Causal Factors (ECF) modeling is used together with a form of causal reasoning developed by the US Department of Energy (1992). The intention is that both the lightweight flowcharts and the more complex modeling techniques should help investigators to map causal factors back to the lifecycle phases and common requirements described in the IEC 61508 standard. This provides an important bridge from the products of mishap analysis to the design and operation of future systems. It is likely, however, that we will encounter incidents that cannot easily be attributed to lifecycle phases or common requirements in IEC 61508. Our work, therefore, offers important insights into the limitations of existing development standards. An implicit motivation in our work is to provide the feedback mechanisms that are necessary to improve the application of IEC 61508 and related standards such as DO-178B. A fatal injury in a gravel wash plant is used to illustrate this paper.

Author

Accident Investigation; Software Engineering; Software Development Tools; Programmable Logic Devices; Electronics

20030111836 NASA Glenn Research Center, Cleveland, OH, USA

Detection of High-Impedance Arcing Faults in Radial Distribution DC Systems

Gonzalez, Marcelo C.; Button, Robert M.; [2003]; 8 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

High voltage, low current arcing faults in DC power systems have been researched at the NASA Glenn Research Center in order to develop a method for detecting these 'hidden faults', in-situ, before damage to cables and components from localized heating can occur. A simple arc generator was built and high-speed and low-speed monitoring of the voltage and current waveforms, respectively, has shown that these high impedance faults produce a significant increase in high frequency content in the DC bus voltage and low frequency content in the DC system current. Based on these observations, an algorithm was developed using a high-speed data acquisition system that was able to accurately detect high impedance arcing events induced in a single-line system based on the frequency content of the DC bus voltage or the system current. Next, a multi-line, radial distribution system was researched to see if the arc location could be determined through the voltage information when multiple 'detectors' are present in the system. It was shown that a small, passive LC filter was sufficient to reliably isolate the fault to a single line in a multi-line distribution system. Of course, no modification is necessary if only the current information is used to locate the arc. However, data shows that it might be necessary to monitor both the system current and bus voltage to improve the chances of detecting and locating high impedance arcing faults

Author

Impedance; Electrical Faults; Radial Distribution; Direct Current

20030111838 NASA Glenn Research Center, Cleveland, OH, USA

Measured Propagation Characteristics of Coplanar Waveguide on Semi-Insulating 4H-SiC Through 800 K

Ponchak, George E.; Altervitz, Samuel A.; Downey, Alan N.; Freeman, Jon C.; Schwartz, Zachary D.; [2003]; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Wireless sensors for high temperature industrial applications and jet engines require RF transmission lines and RF integrated circuits (RFICs) on wide bandgap semiconductors such as SiC. In this paper, the complex propagation constant of coplanar waveguide fabricated on semiinsulating 4H-SiC has been measured through 813 K. It is shown that the attenuation increases 3.4 dB/cm at 50 GHz as the SiC temperature is increased from 300 K to 813 K. Above 500 K, the major contribution to loss is the decrease in SiC resistivity. The effective permittivity of the same line increases by approximately 5 percent at microwave frequencies and 20 percent at 1 GHz.
Author
Silicon Carbides; Waveguides; Propagation; Planar Structures

20030111845 Naval Postgraduate School, Monterey, CA
Design, Construction, And Testing Of A Reduced- Scale Cascaded Multi-Level Converter
Crowe, Robert A.; Jun. 2003; 145 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417626; No Copyright; Avail: CASI; A07, Hardcopy

The main focus in the design of the next generation combatant, DD(X), is the US Navy's proposed Integrated Power System (IPS) which includes an all-electric propulsion drive system. The reduction of current waveform harmonics is critical in combatant propulsion systems such as the IPS. One method of reducing the current harmonics is to utilize a multi-level converter topology. The multi-level converter, as compared to a standard converter, features low dv/dt losses and low switching losses. This thesis examines the design, construction and testing of two multi-level converters operated in tandem, called a Cascaded Multi-Level Converter (CMLC). A digital logic switching circuit is designed and constructed to control the CMLC during the operational testing phase. The CMLC is demonstrated in a three- phase high-voltage configuration with 178.5 V zero-to-peak voltage, 2.10 A zero-to-peak current achieved using an R-L load.
DTIC
Frequency Converters; Switching Circuits; Topology; Construction; Performance Tests

20030111904
Solid-State Emitter Development
Cahay, Marc; Boolchand, Punit; Jul. 2002; 137 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-98-C-1204; Proj-2002
Report No.(s): AD-A417857; AFRL-SN-WP-TR-2002-1129; No Copyright; Avail: CASI; A07, Hardcopy

Theoretical and experimental studies were performed to investigate the feasibility of realizing a new, voltage-activated, nonthermionic cathode proposed by Mumford and Cahay (based on W. Friz's concept). It consists of a heavily n-doped indium phosphide (InP) substrate upon which a layer of thin-film cadmium sulfide (CdS) is grown followed by a layer of lanthanum sulfide (LaS) with a metal grid atop it. Theoretically, only a low voltage (<20 volt) would need to be applied between grid and substrate to produce electron emission from the surface. Under this contract, theoretical analysis of expected self-heating, space-charge, current self- quenching and current-crowding effects was performed. Also, an attempt was made to develop growth techniques for the CdS/LaS layers needed for the structure. CdS thin films were deposited by RF magnetron sputtering and were characterized. Also, a technique was developed to synthesize bulk LaS in the form of a 2-inch-diameter target. The lowest work function measured from this material was 2.6 eV in air. Finally, LaS was grown on Si, glass, and InP by sputtering this target. These films were characterized by X-ray diffraction and X-ray photoelectron and atomic force spectroscopy. Further work will be needed to develop processing techniques for fabricating a testable emitter.
DTIC
Emitters; Cathodes; Electron Emission; Solid State Devices

20030111933 Naval Postgraduate School, Monterey, CA
Plasma Antennas: Survey of Techniques and Current State of the Art
Jenn, David C.; Sep. 29, 2003; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417637; NPS-CRC-03-001; No Copyright; Avail: CASI; A03, Hardcopy

Plasma antennas refer to a wide variety of antenna concepts that incorporate some use of an ionized medium. This study summarizes the basic theory behind the operation of plasma antennas based on a survey of patents and technical publications. Methods of exciting and confining plasmas are discussed, and the current state of the art in plasma technology is examined.
DTIC
Plasmas (Physics); Plasma Antennas; Antenna Design

20030112069 Nippon Telegraph and Telephone Public Corp., Japan
Singlemode Lightwave Transmission in SOI-Type Photonic-Crystal Line-Defect Waveguides with Phase-Shifted Holes
Yamada, K.; Notomi, M.; Shinya, A.; Takahashi, C.; Takahashi, J.; Morita, H.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 102; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

Single-mode lightwave transmission was observed in novel line-defect photonic crystal (PC) waveguides. The waveguide structure is constructed by adding phase-shifted holes in an ordinary missing hole line defect. This device permits fine single-mode lightwave transmission even though the waveguide structure is fabricated on a silicon-on-insulator (SOI) substrate, which seriously promotes off-plane leakage of waveguiding modes.
Author
SOI (Semiconductors); Photonics; Optical Waveguides; Light Transmission; Semiconductor Devices

20030112087 Nippon Telegraph and Telephone Public Corp., Japan
SOI-based Photonic Crystal Line-Defect Waveguides
Yamada, K.; Notomi, M.; Shinya, A.; Yokohama, I.; Shoji, T.; Tsuchizawa, T.; Watanabe, T.; Takahashi, J.; Tamechika, E.; Morita, H.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 102; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

We have experimentally demonstrated single-mode lightwave transmission and tunable waveguiding characteristics in photonic crystal (PC) waveguides constructed on an SOI substrate as is most likely to be used for the large-scale integration of photonic circuits. We have also demonstrated a low-loss mode profile converter that will enable efficient connection between conventional silica-based waveguides and PC line-defect waveguides. These SOI-based devices represent an important step towards practical large-scale integrated photonic crystal circuits.
Author
Large Scale Integration; SOI (Semiconductors); Optical Waveguides; Photonics

20030112247 NASA Glenn Research Center, Cleveland, OH, USA
Electrospun Polyaniline/Polyethylene Oxide Nanofiber Field Effect Transistor
Pinto, N. J.; Johnson, A. T.; MacDiarmid, A. G.; Mueller, C. H.; Theofylaktos, N.; Robinson, D. C.; Miranda, F. A.; July 03, 2003; 12 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

We report on the observation of field effect transistor (FET) behavior in electrospun camphorsulfonic acid doped polyaniline(PANi)/polyethylene oxide(PE0) nanofibers. Saturation channel currents are observed at surprisingly low source/drain voltages. The hole mobility in the depletion regime is 1.4 x 10(exp -4) sq cm/V s while the 1-D charge density (at zero gate bias) is calculated to be approximately 1 hole per 50 two-ring repeat units of polyaniline, consistent with the rather high channel conductivity (approx. 10(exp -3) S/cm). Reducing or eliminating the PEO content in the fiber is expected to enhance device parameters. Electrospinning is thus proposed as a simple method of fabricating 1-D polymer FET's.
Author
Field Effect Transistors; Polyethylenes; Density (Number/Volume); Doped Crystals; Electric Potential

20030112248 NASA Glenn Research Center, Cleveland, OH, USA
Coupling Between Microstrip Lines With Finite Width Ground Plane Embedded in Thin Film Circuits
Ponchak, George E.; Dalton, Edan; Tentzeris, Manos M.; Papapolymerou, John; [2003]; 15 pp.; In English
Contract(s)/Grant(s): NAS3-2329; NSF 99-84761; NSF 01-96376; Copyright; Avail: CASI; A03, Hardcopy

Three-dimensional (3D) interconnects built upon multiple layers of polyimide are required for constructing 3D circuits on CMOS (low resistivity) Si wafers, GaAs, and ceramic substrates. Thin film microstrip lines (TFMS) with finite width ground planes embedded in the polyimide are often used. However, the closely spaced TFMS lines a r e susceptible to high levels of coupling, which degrades circuit performance. In this paper, Finite Difference Time Domain (FDTD) analysis and experimental measurements a r e used to show that the ground planes must be connected by via holes to reduce coupling in both the forward and backward directions. Furthermore, it is shown that coupled microstrip lines establish a slotline type mode between the two ground planes and a dielectric waveguide type mode, and that the via holes recommended here eliminate these two modes.
Author
Microstrip Transmission Lines; Thin Films; Embedding; Dielectric Waveguides; Finite Difference Time Domain Method; Circuits

20030112250 NASA Glenn Research Center, Cleveland, OH, USA

Preliminary Evaluations of Polymer-based Lithium Battery Electrolytes Under Development for the Polymer Electrolyte Rechargeable Systems Program

Manzo, Michelle A.; Bennett, William R.; [2003]; 10 pp.; In English; 1st International Energy Conversion Engineering Conference, 17-21 Aug. 2003, Portsmouth, VA, USA

Contract(s)/Grant(s): WBS 22-755-60-22; Copyright; Avail: CASI; A02, Hardcopy

A component screening facility has been established at The NASA Glenn Research Center (GRC) to evaluate candidate materials for next generation, lithium-based, polymer electrolyte batteries for aerospace applications. Procedures have been implemented to provide standardized measurements of critical electrolyte properties. These include ionic conductivity, electronic resistivity, electrochemical stability window, cation transference number, salt diffusion coefficient and lithium plating efficiency. Preliminary results for poly(ethy1ene oxide)-based polymer electrolyte and commercial liquid electrolyte are presented.

Author

Electrolytes; Lithium Batteries; Polymers; Recharging; Electrochemistry; NASA Programs

20030112281 Georgia Inst. of Tech., Atlanta, GA

Microscopic Modeling of Tribochemical Processes Vapor-Phase Lubrication and Nanotribology in MEMS

Landman, Uzi; May 2003; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-00-1-0149; Proj-2303

Report No.(s): AD-A418088; AFRL-SR-AR-TR-03-0367; No Copyright; Avail: CASI; A03, Hardcopy

Research activities supported by this grant focused on the following main topics: 1. Investigations of fluid flow through nanometer scale nozzles (nanojets), aiming at the development of miniaturized injectors in NEMS (Nano Electro Mechanical Systems). 2. Studies of the effects of surface roughness on the properties of confined fluids, pertaining to tribological and lubrication processes in nano- scale junctions. 3. Development of large-scale computer-based molecular dynamics simulation aimed at investigations of the effect of fluids (particularly water) on adhesive interactions in NEMS.

DTIC

Microelectromechanical Systems; Tribology; Vapor Phase Lubrication; Nanotechnology

20030112337 Situs Logic, Pasadena, CA, USA

Design Tools for Integrated Asynchronous Electronic Circuits

Martin, Alain J.; Nystroem, Mika; Wong, Catherine G.; Jun. 19, 2003; 17 pp.; In English

Contract(s)/Grant(s): DAAH01-03-C-R021; ARPA ORDER-K476

Report No.(s): AD-A417138; SITUS-TR-03-03; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this Phase-I study was to demonstrate the feasibility of a suite of industrial CAD tools for the design of high-performance, energy-efficient, asynchronous VLSI circuits based on the Caltech technology. Situs Logic's general strategy in the EDA-tools market is to develop and commercialize a complete suite of CAD tools for the design of asynchronous, QDI, VLSI systems including synthesis, analysis, simulation, verification, at the logical and physical levels. Situs has developed a business model for the commercialization of the CAD tools, and has designed the prototype of the tool suite based on this business model and the Caltech approach. The market for asynchronous tools will not be at first the mainstream market, but rather some 'early adopters' designing low-volume high-profit chips, for instance for defense or space applications. Inside the market segment of asynchronous VLSI tools, the competitive advantage pursued by Situs is differentiation rather than cost leadership, even though the Situs tools will be priced significantly below equivalent tools in the mainstream EDA market. The main technical activities and developments were directed towards the design of a prototype tool-site to test and demonstrate the feasibility of the approach. Although the design flow is not entirely automated yet-some steps still have to be preformed manually the results of the effort are very promising: The circuits synthesized with the prototype tool are easily competitive with the state of the art.

DTIC

Computer Aided Design; Very Large Scale Integration

20030112385 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Evaluation of an Ultra-Low Power Reed Solomon Encoder for NASA's Space Technology 5 Mission

Lei, K. E.; Xapsos, M. A.; Poivey, C.; LaBel, K. A.; Stone, R. F.; Yeh, P-S.; Gambles, J.; Hass, J.; Maki, G.; Murguia, J.; [2003]; 16 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Radiation test results and analyses are presented for ultra-low power Reed Solomon encoder circuits that are being considered for use on the Space Technology 5 (ST5) mission. The total ionizing dose tolerance is in excess of 100 krad(Si) and is due to the low supply voltage and the use of back-bias, which suppresses radiation-induced leakage currents in the n-channel devices. The circuits do not latch-up for ion LET values of at least 90 MeV-sq cm/mg. A hardened-by-design approach to SEU has achieved an upset threshold of about 20 MeV-sq cm/mg. The SEU rate expected for these circuits in the geosynchronous transfer orbit of ST5 is low.
Author
Coders; Circuits; Radiation Dosage; Radiation Tolerance; Space Technology Experiments

20030112465 NASA Glenn Research Center, Cleveland, OH, USA
Flight Weight Design Nickel-Hydrogen Cells Using Lightweight Nickel Fiber Electrodes
Britton, Doris L.; Willis, Bob; Pickett, David F.; [2003]; 18 pp.; In English; Space Power Workshop, 21-24 Apr. 2003, Redondo Beach, CA, USA
Contract(s)/Grant(s): WBS 22-755-60-10; Copyright; Avail: CASI; A03, Hardcopy

The goal of this program is to develop a lightweight nickel electrode for advanced aerospace nickel-hydrogen cells and batteries with improved specific energy and specific volume. The lightweight nickel electrode will improve the specific energy of a nickel-hydrogen cell by >50%. These near-term advanced batteries will reduce power system mass and volume, while decreasing the cost, thus increasing mission capabilities and enabling small spacecraft missions. This development also offers a cost savings over the traditional sinter development methods for fabrication. The technology has been transferred to Eagle-Picher, a major aerospace battery manufacturer, who has scaled up the process developed at NASA GRC and fabricated electrodes for incorporation into flight-weight nickel-hydrogen cells.
Author
Nickel Hydrogen Batteries; Electric Batteries; Electrodes

20030112546 Carnegie-Mellon Univ., Pittsburgh, PA
Acquisition of Single and Double Crystal X-Ray Topography System
Skowronski, M.; Jun. 2001; 4 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0249; Proj-3484
Report No.(s): AD-A418122; AFRL-SR-AR-TR-03-0371; No Copyright; Avail: CASI; A01, Hardcopy

The Durip Award was used to purchase two pieces of instrumentation in support of one overreaching goal of the AFOSR-funded program: correlation of growth conditions of silicon carbide boules and their structural characteristics. The x-ray topography unit was ordered in September of 2000 and manufactured and delivered to Carnegie Mellon University in January of 2001. The installation was completed in March 2001 and was followed by extensive alignment and testing. The system is producing valuable data for several federally funded projects, including 'Growth of Semi-insulating 6H-SiC Crystals for GaN-based Microwave Devices,' funded by the Air Force Research Laboratory (AFRL); 'Structural Defects in Semi-insulating SiC Wafers,' funded by the Air Force Office of Scientific Research; 'High Volume, High Quality Silicon Carbide Substrate Merchant Manufacturing,' a subcontract to Sterling Semiconductor, Inc. from the AFRL; and 'Identification of Screw Dislocation Sources in SiC PVT growth, ' funded by the Office of Naval Research. The system is intensively used for imaging extended defects in silicon carbide crystals grown by the Physical Vapor Transport method and in silicon carbide high-voltage diodes. Among the major findings accomplished with the help of x-ray topography are as follows: evidence of plastic deformation occurring during crystal growth of SiC boules, which causes the dislocation multiplication and resulting densities in the 10 (super 5) sq cm range; evidence of dislocation serving as nucleation sites for stacking faults under forward bias, which leads to the degradation of SiC bipolar devices through the increase of forward voltage drop (both the stacking faults and pre- existing dislocations have been imaged using x-ray topography); and evidence of stacking faults formation during the initial stages of SiC growth leading to nucleation of screw dislocations.
DTIC
Semiconductors (Materials); X Rays; Silicon Carbides

20030112589
High Brightness Emissive Miniature Display Development
Jones, Gary; Jan. 2003; 7 pp.; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A418126; AFRL-HE-WP-TR-2003-0014; No Copyright; Avail: CASI; A02, Hardcopy

The program thrust was material/device development, to improve the thermal characteristics of OLED materials so that they can withstand more heating without deterioration, and to improve the efficiency of the devices so that less heat is generated. Additionally, the program was to engineer a better thermal management strategy, to remove generated heat quickly and effectively, thus limiting the temperature rise in the OLED device.
DTIC
Brightness; Light Emitting Diodes; Flat Panel Displays; Heating

20030112595 Japan Storage Battery Co. Ltd., Kyoto, Japan
Verification Results of Life Estimation Method for JSB Aerospace Lithium-Ion Cell
Inoue, Takefumi; Imamura, Nobutaka; Yoshida, Hiroaki; Mizutani, Minoru; Goto, Masayoshi; The 2002 NASA Aerospace Battery Workshop; April 2003; 22 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The present results indicated that: 1. JSB's calculation method was verified by comparing with experimental data. It has been satisfy requirements for their use in LEO and GEO judging from the calculation. We have confirmed the accuracy of the calculation with the verification in this presentation.
CASI
Computation; Experimentation; Data Acquisition; Life (Durability)

20030112599 Eagle-Picher Technologies, LLC, Joplin, MO, USA
C/NOFS Battery and Magnetic Properties
Cook, William D.; Studyvin, William; The 2002 NASA Aerospace Battery Workshop; April 2003; 26 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Contents include the following: Satellite background. Cell design. Cell design sleeved. C/NOFS battery design. C/NOFS radiator plate. Battery qualification. Battery vibration test. Magnetic test setup. Magnetic test process. Magnetic test X, Y, Z axes. Magnetic test anomalies. Magnetic test probe. Magnetic pre-gauss results. Magnetic positioning test. Conclusion.
CASI
Electric Batteries; Magnetic Anomalies; Magnetic Properties; Vibration Tests

20030112601 Aerospace Corp., El Segundo, CA, USA
Understanding the Impact of Electrolyte and Cobalt Additive Concentrations on the Performance of Nickel-Hydrogen Cells
Thaller, L. H.; Zimmerman, A. H.; To, G. A.; The 2002 NASA Aerospace Battery Workshop; April 2003; 23 pp.; In English; See also 20030112592; No Copyright; Avail: CASI; A03, Hardcopy

This paper is a viewgraph presentation on the impact that electrolyte and cobalt additive concentrations have on the performance of Nickel-Hydrogen cells. The topics include: 1) Data Bases Relevant to Study; 2) Factors that were considered; 3) Findings Relative to 26% vs. 31% KOH; and 4) Findings Relative to 5% vs. 10% Cobalt.
CASI
Additives; Cobalt; Nickel Hydrogen Batteries; Electrolytes; Concentration (Composition)

20030112602 National Space Development Agency, Tsukuba, Japan
Simulated LEO and GEO Cycling Tests of Lithium-Ion Cells at Tsukuba Space Center, NASDA
Sone, Y.; Wang, X.; Kusawake, H.; Kuwajima, S.; The 2002 NASA Aerospace Battery Workshop; April 2003; 29 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents viewgraphs on simulated Low Earth Orbits (LEO) and Geosynchronous Equatorial Orbit (GEO) cycling tests of Lithium-ion cells.
CASI
Geosynchronous Orbits; Lithium; Low Earth Orbits; Metal Ions; Computerized Simulation

20030112612 Aerospace Corp., El Segundo, CA, USA

Life Test and Performance Comparisons of Lithium-Ion with Traditional Battery Types

Zimmerman, A. H.; Quinzio, M. V.; The 2002 NASA Aerospace Battery Workshop; April 2003; 23 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The expected transitioning of spacecraft power system batteries from the older nickel cadmium and the widely used nickel hydrogen batteries to the new lithium-ion technology introduces a number of uncertainties in the traditional performance data used to design space power systems. Some of the foremost areas of uncertainty include cycle life, degradation rates and effects, calendar life, and self-discharge. Numerous ground tests project that for LEO cycling conditions and accelerated GEO conditions, lithium-ion batteries are capable of simply providing the number of cycles required for many space missions. However, the parametric data are not yet available that allow trades between cycle life reliability and depth-of-discharge (DOD), charge voltage levels, charge control methods, and operating temperatures to be made by system designers. These types of databases have been developed over years of testing and use for NiCd and for NiH2 batteries. The coming years are certain to see the development of similar databases for Li-ion batteries, databases that include information on how cell degradation modes influence reliability. The calendar life of batteries is critical in their use in space power systems, which often demand extremely long life. For example, 15 years of calendar life are commonly sought from NiH2 batteries in GEO missions. We are not really sure of the calendar life capability of NiH2 cells, except that it is significantly longer than the 15-20 years that has been demonstrated for properly managed NiCd batteries. At present, 20 years is typically the maximum planned for NiH2 (5 years ground storage plus 15 years operational life). For Li-ion batteries years of real-time testing are needed to fully eliminate uncertainties regarding unexpected degradation or failure modes that may show up late in life. The self-discharge behavior of lithium ion cells is radically different from that of NiCd or NiH2 cells. Lithium ion cells have very low self-discharge rates, on the order of C/25,000 or less. Thus, it is possible to leave batteries open-circuited for lengthy periods of time without loss of much capacity. This is a different management approach than for NiCd or NiH2 batteries, for which regular overcharge, trickle-charge or reconditioning was needed to maintain all cells at well-matched and high states of charge. While this is a real advantage for lithium ion, it also raises the question of how to assure that cells in lithium ion batteries are kept well matched during periods of ground or orbital inactivity, since lithium ion cells are not tolerant of overcharge. In this report we provide some comparisons between lithium-ion battery performance and the behavior of NiCd, NiMH, and NiH2 battery cells. These comparisons include ongoing life tests for both small and large cells, as well as accelerated and real-time tests. We also provide data on the self-discharge rates of these different types of cells as part of an effort to evaluate how to best assure that lithium ion cells remain well matched in batteries.

Derived from text

Electric Batteries; Lithium; Metal Ions; Accelerated Life Tests; Performance Tests

20030112613 Eagle-Picher Technologies, LLC, Joplin, MO, USA

60% LEO Life Cycle Data for Large Capacity Ni-H2 Cells

Dermott, Jeff; Brill, Jack; The 2002 NASA Aerospace Battery Workshop; April 2003; 15 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents the life cycle data for large capacity Ni-H2 Cells at 60% low earth orbits. The topics include: 1) Cell Design Features; 2) Cell BOL Performance Summary; 3) BOL Dell Performance; 4) Life Test Cycle Regime; 5) Life Test Set-up; and 6) Life Test Data. A short summary is also presented on the performance of all the cells. This paper is presented in viewgraph form.

CASI

Life (Durability); Nickel Hydrogen Batteries; Performance Tests; Low Earth Orbits

20030112614 Eagle-Picher Technologies, LLC, Joplin, MO, USA

Nickel-Hydrogen Positive Plaque Comparison: Water Based Versus Alcohol Based Slurry

Dermott, Jeff; The 2002 NASA Aerospace Battery Workshop; April 2003; 15 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper is a viewgraph presentation on a comparison of water based slurry versus alcohol based slurry plaque for Nickel-Hydrogen cells. The topics include: 1) Water Based Slurry History; 2) Electrode/Plaque Data; 3) Cell Data; 4) Life Test Data; and 5) Flight Data.

CASI

Alcohols; Slurries; Water; Nickel Hydrogen Batteries

20030112615 Aerospace Corp., USA
Nickel-Hydrogen IPV LEO Life Tests at NSWC/Crane
Baer, Jean Marie; Hwang, Warren; The 2002 NASA Aerospace Battery Workshop; April 2003; 27 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

NiH2 Air Force qualification battery cells are: Assembled into seven IPV packs and LEO life tested at the Naval Surface Warfare Center, Crane Division. A typical life cycle simulates a 90-min orbit, using a 2-step constant current charge control. Testing duration ranges from approximately 51,000 to 80,000 cycles. Life tests provide valuable information in understanding the long-term distribution of failures of various cell designs.
CASI
Nickel Hydrogen Batteries; Life (Durability); Failure

20030112618 SAFT America, Inc., Cockeysville, MD, USA
Lithium Ion DD Cells Space Application Cycling Update
Croft, Haiyan; Staniewicz, Bob; The 2002 NASA Aerospace Battery Workshop; April 2003; 23 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The overview of the DD cells are: Chemistry. How accelerated testing is performed. Low Earth Orbit (LEO) testing. Geosynchronous Earth Orbit (GEO) testing. 100% Depth of Discharge (DOD) at Room Temperature (RT). 100% DOD at -20C. Conclusion.
Derived from text
Accelerated Life Tests; Lithium; Cycles; Electric Batteries

20030112631 Conductus, Inc., Sunnyvale, CA
Front-End Prototype for JTRS System
Berkowitz, Stuart; Oct. 2003; 8 pp.; In English
Contract(s)/Grant(s): N00014-02-C-0006
Report No.(s): AD-A418044; 1053; No Copyright; Avail: CASI; A02, Hardcopy

Two superconducting filters were designed, developed, and delivered for integration into a high performance wide-band receiver. A high temperature superconducting (HTS) pre-selector bandpass was completed, and an HTS notch filter was completed. These filters provide both high out-of-band rejection (better than 100 dB) and low noise figure (better than 0.5 dB center band).
DTIC
Prototypes; Superconductivity

20030112642 Aerospace Corp., El Segundo, CA
Reliability Concerns for GaAs-Based HBTs in DoD Space Systems
Mayer, D. C.; Robertson, S. R.; Jul. 31, 2003; 7 pp.; In English
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A418223; TR-2003(8506)-4; SMC-TR-04-02; No Copyright; Avail: CASI; A02, Hardcopy

Gallium-arsenide-based heterojunction bipolar transistor (HBT) circuits are known to be sensitive to current gain degradation associated with aspects of the semiconductor manufacturing process. This letter discusses the susceptibility of GaAs-based HBT circuits to a life-limiting failure mechanism and the impact of this failure mode on the use of these circuits in space system applications.
DTIC
Bipolar Transistors; Gallium Arsenides; Heterojunction Devices; Circuits

20030112678 Texas Technological Univ., Lubbock, TX, USA
Compact Pulsed Power and High Power Microwave Devices
Kristiansen, M .; Dickens, J. C.; Shkuratov, S. I.; Sep. 2003; 32 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0221
Report No.(s): AD-A418099; AFRL-SR-AR-TR-03-0463; No Copyright; Avail: CASI; A03, Hardcopy

This research final report covers activities conducted by Texas Tech University from June 1, 2000 to May 31, 2003 on Grant No. F46620-00-1-0221. We investigated the fundamental basic materials limitations to the design of compact,

expendable (i.e. one-time use), pulsed power and microwave sources which can be munitions launched, air dropped, towed, etc. These devices are driven by explosives. The main devices of interest include ferromagnetic generators (FMGs), piezoelectric generators (PEGs), and two-stage systems consists of FMG and PEG as primary sources and flux compression generators (FCG) as a pulsed power amplifier. Additional research was focused on the investigations of limitations of electronic components (resistors, capacitors and batteries) to determine which are the best for designing short-time use portable pulsed power systems. The overall goal of the research was to obtain a basic physical understanding of compact generating systems and to establish the fundamental materials limits to their function, taking advantage of thermal and kinetic inertia, one- time dielectric stresses, etc. The longer term, practical goal is to obtain engineering guidelines for developing order of magnitude smaller devices than are possible with present-day, long life, high reliability generators.
DTIC
Microwave Equipment; Generators; Ferromagnetic Materials

20030112787 Naval Research Lab., Washington, DC
Dynamics of a Gravity Gradient Anchored Tethered Space Antenna
Gates, Stephen S.; Oct. 30, 2003; 24 pp.; In English
Report No.(s): AD-A418210; NRL/MR/8230--03-8721; No Copyright; Avail: CASI; A03, Hardcopy

An analysis of the attitude dynamics of a tether- stabilized orbiting space antenna is presented. For many missions it is desirable to fly an antenna in space with its collecting surface nadir directed. Oriented with its large spatial dimensions perpendicular to the gravitational radius vector, an antenna body alone could well be unstable. Adding tethered masses to the antenna could stabilize the attitude by altering the system's inertial properties. The motion equations are derived for a system comprised of a rigid body and two tethered point masses in orbit about an inertially spherical gravitational primary. An arbitrary number of tethers connect the point masses to the rigid body attaching at distinct locations. A single tether is allowed to connect the respective masses. The tethers are assumed to be massless tensile members of fixed unstrained length possessing viscoelastic constitutive character. The nonlinear motion equations for the system are derived from Newton-Euler momentum principles. A steady state solution to the motion equations is proposed for the system centroid in a circular orbit. Considering small motions about the steady state configuration, the linearized motion equations are derived. The linearized equations are brought to a standard canonical form suitable for application of the stability theorems for linear stationary second order systems.
DTIC
Antennas; Dynamic Characteristics; Gravitation

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20030110918 Proxemy Research, Inc., Laytonsville, MD, USA
Scaling of Pahoehoe Flow Field Features
Baloga, S. M.; Glaze, L. S.; Crown, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pahoehoe flow fields are one of the most significant landforms in planetary and terrestrial volcanism. Such flow fields often contain many different types of features, including toes, monofilaments of toes, channels at multiple scales, tubes, sheets, tumuli and lava rises, small and large lobes that may be a a or pahoehoe. These features are generally intermingled or superimposed and often the appearance of overriding a a lobes dominates the visual appearance of the flow field. The issue we are beginning to address is how to simulate large pahoehoe flow fields in a planetary setting based on modes of emplacement from terrestrial experience. The complexity of pahoehoe flows seems to make modeling of flow field growth a formidable task. Clearly a host of random influences are present. Moreover, the features found in a pahoehoe flow field occur at different scales. This suggests that the physical processes occur at different scales as do the type and significance of the random effects that are present. For example, the budding of toes is governed by relatively microscopic physics related to

formation of a thin skin and its fracture while the emplacement of a large solitary lobe is governed by classical viscous fluid dynamics and an entirely different regime of heat transport.
Derived from text
Volcanology; Flow Distribution; Landforms; Lava; Heat Transfer

20030111729 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: A Consideration on SUMMAC Method
Takasawa, K.; 2002; 30 pp.; In Japanese
Report No.(s): PB2004-100460; NAL/TR-1439; Copyright; Avail: National Technical Information Service (NTIS)

In this paper the authors investigated the SUMMAC Method for solving time-dependent viscous incompressible flow of fluid with free surface. The authors designed a computer program known as 'type-A' to reproduce exactly the features of the SUMMAC Method. A technique for extrapolation of flow velocity components out into vacant space and a method for determining the free surface area also described here in detail. Four items were proposed to improve the numerical stability of the original method. The authors designed an improved version of the computer program - 'type-B', to integrate these four items. Both computer programs were tested on the 'Impinging Jet' example.
NTIS
Incompressible Flow; Fluid Flow

20030111829
Sound Radiated by a Wave-Like Structure in a Compressible Jet
Golubev, V. V.; Prieto, A. F.; Mankbadi, R. R.; Dahl, M. D.; Hixon, R.; [2003]; 7 pp.; In English; 41st AIAA Aerospace Sciences Meeting, 6-9 Jan. 2003, Reno, NV, USA
Report No.(s): AIAA Paper 2003-1063; No Copyright; Avail: CASI; A02, Hardcopy

This paper extends the analysis of acoustic radiation from the source model representing spatially-growing instability waves in a round jet at high speeds. Compared to previous work, a modified approach to the sound source modeling is examined that employs a set of solutions to linearized Euler equations. The sound radiation is then calculated using an integral surface method.
Author
Sound Waves; Acoustic Instability; Aeroacoustics; Radiation Sources

20030111878 National Aerospace Lab., Amsterdam
Invariant Families in the Hele-Shaw Problem
Kuznetsova, O.; Mar. 2003; 44 pp.
Report No.(s): PB2004-100920; TRITA-MAT-03-MA-07; No Copyright; Avail: CASI; A03, Hardcopy

This paper contains the recent results on invariant families previously announced in the author's PhD thesis. Some of the results were published in Russian and the part concerning the polynomial solutions. The results concerning the invariant families with bounded distortion of the logarithmic derivative were never published before by the author. The discussion of isoperimetric defect estimates and related questions were firstly announced jointly with V. Tkachev. We give here only a brief outline of preliminaries concerning the Hele-Shaw model and its basic properties.
NTIS
Computational Fluid Dynamics; Polynomials

20030111984 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory. Pressure Measurements of 750kW Arc-Heated Wind Tunnel Flow
Matsuzaki, T.; Kurotaki, T.; Watanabe, Y.; Isida, K.; Ito, T.; 2002; In English
Report No.(s): PB2004-100478; NAL/TR-1448; Copyright; Avail: National Technical Information Service (NTIS)

NAL has been promoting a diagnostic study of the 750kW arc-heated wind tunnel flow to characterize various important flow parameters, such as heat flux and pressure which are, necessary for determining materials test conditions. Results of pressure distribution measurements in high enthalpy air flows are presented. The pressure transducers used for pitot and static pressure measurements were calibrated against NIST (National Institute of Standards and Technology) traceable standard transducer in real measurement configuration. Accurate pitot and static pressure distributions were obtained.
NTIS
Arc Heating; Wind Tunnel Tests; Air Flow

20030111990 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory. Diagnostic Experiments in an Arc-Heated Channel Nozzle Flow
Ishida, K.; Watanabe, Y.; Matsuzaki, T.; Ito, T.; Kukui, T.; 2002; In Japanese
Report No.(s): PB2004-100482; NAL/TR-1446; Copyright; Avail: National Technical Information Service (NTIS)

The 750kW arc-heated (or arc-jet) wind tunnel is equipped with a channel nozzle to evaluate flat plate TPS materials. TPS material tests for HOPE-X design data have been made with this channel nozzle, but the flow characteristics of the high enthalpy flow generated in the nozzle have not been well investigated. Therefore, flow diagnostic experiments have been planned. Experimental items included in the plan are emission spectroscopy, mass spectrometry, heat flux measurements, and thermometry and direct surface observations of the test materials. A new calibration model was designed to install the instrumentation necessary for the measurement of these items in the channel nozzle test section. The conception of the experiments, design details of the module and main experimental results are presented.
NTIS
Arc Heating; Nozzle Flow

20030111997 Army Engineer Research and Development Center, Vicksburg, MS, USA
Development of Two-Dimensional Numerical Model of Hydrodynamics and Salinity for Biscayne Bay, Florida
Brown, Gary L.; McAdory, Robert; Nail, Gregory H.; Sarruff, Maria S.; Berger, R. C.; Sep. 2003; 174 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417838; ERDC/CHL-TR-03-10; No Copyright; Avail: CASI; A08, Hardcopy

This report documents the development of a verified 2-D numerical model of the hydrodynamics and salinity of Biscayne Bay, FL. The computer code employed for this study was TABS-MDS (multidimensional sediment) (formerly called RMA10-WES). The model was calibrated and verified against an extensive set of hydrodynamic and salinity field data collected in a previous effort performed by the U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory, in conjunction with the Biscayne National Park. This report discusses general characteristics of the Biscayne Bay system, model development, model boundary condition, and calibration and verification results.
DTIC
Hydrodynamics; Mathematical Models; National Parks; Salinity; Florida; Two Dimensional Models

20030112230 NASA Glenn Research Center, Cleveland, OH, USA
Implementation of a Water Flow Control System into the ISS'S Planned Fluids & Combustion Facility
Edwards, Daryl A.; August 2003; 18 pp.; In English; 14TH Annual Thermal and Fluids Analysis Workshop, 18-22 Aug. 2003, Hampton, VA, USA
Contract(s)/Grant(s): RTOP 400-35-1A; No Copyright; Avail: CASI; A03, Hardcopy

The Fluids and Combustion Facility (FCF) will become an ISS facility capable of performing basic combustion and fluids research. The facility consists of two independent payload racks specifically configured to support multiple experiments over the life of the ISS. Both racks will depend upon the ISS's Moderate Temperature Loop (MTL) for removing waste heat generated by the avionics and experiments operating within the racks. By using the MTL, constraints are imposed by the ISS vehicle on how the coolant resource is used. On the other hand, the FCF depends upon effective thermal control for maximizing life of the hardware and for supplying proper boundary conditions for the experiments. In the implementation of a design solution, significant factors in the selection of the hardware included ability to measure and control relatively low flow rates, ability to throttle flow within the time constraints of the ISS MTL, conserve energy usage, observe low mass and small volume requirements. An additional factor in the final design solution selection was considering how the system would respond to a loss of power event. This paper describes the method selected to satisfy the FCF design requirements while maintaining the constraints applied by the ISS vehicle.
Author
Combustion Chambers; Water Flow; International Space Station; Fluids; Control Systems Design

20030112451 NASA Glenn Research Center, Cleveland, OH, USA
Depth-Selective Diagnostics of Thermal Barrier Coatings Incorporating Thermographic Phosphors
Eldridge, Jeffrey I.; Bencic, Timothy J.; Allison, Stephen W.; Beshears, David L.; [2003]; 11 pp.; In English
Contract(s)/Grant(s): 713-82-52; No Copyright; Avail: CASI; A03, Hardcopy

Thermographic phosphors have been previously demonstrated to provide effective non-contact, emissivity-independent surface temperature measurements. Because of the translucent nature of thermal barrier coatings (TBCs), thermographic-

phosphor-based temperature measurements can be extended beyond the surface to provide depth-selective temperature measurements by incorporating the thermographic phosphor layer at the depth where the temperature measurement is desired. In this paper, thermographic phosphor (Y2O3:Eu) fluorescence decay time measurements are demonstrated for the first time to provide through-the-coating-thickness temperature readings up to 1000 C with the phosphor layer residing beneath a 100-Fm-thick TBC (plasma-sprayed 8wt% yttria-stabilized zirconia). With an appropriately chosen excitation wavelength and detection configuration, it is shown that sufficient phosphor emission is generated to provide effective temperature measurements, despite the attenuation of both the excitation and emission intensities by the overlying TBC. This depth-selective temperature measurement capability should prove particularly useful for TBC diagnostics, where a large thermal gradient is typically present across the TBC thickness.
Author
Thermography; Depth Measurement; Coating; Surface Temperature; Temperature Measurement; Phosphors; Yttria-Stabilized Zirconia

20030112479 University of South Alabama, Mobile, AL
Quantification of the Spatial Variability of the Ocean Surface Roughness and Momentum Flux
Chen, Quin J.; Oct. 2003; 19 pp.; In English
Contract(s)/Grant(s): N00173-02-010G905
Report No.(s): AD-A417971; No Copyright; Avail: CASI; A03, Hardcopy

It is well known that physical processes occurring at the air-sea interface, such as air-sea mass, momentum, and energy exchanges, are controlled by the ocean surface roughness that has often been characterized in the literature as being homogeneous in space and time from a large-scale point of view. However, the ocean surface roughness is heterogeneous within a wavelength. The surface areas on wave crests are usually rougher than those on wave troughs. The mechanisms range from capillary ripples on wave crests to larger scale wave breaking. Ambient swell and non-uniform currents can also cause significant spatial variations of the surface roughness as short waves become steeper on the swell crest than those on the swell trough. This study parameterizes the spatial variability of the sea surface roughness and quantifies the resultant variations of momentum and energy exchanges between the atmosphere and the coastal ocean using a phase-resolving numerical wave model. These results have been presented at conferences and submitted to a journal for possible publication. This report is organized as follows. First, the author presents the new parameterization of the momentum flux transferred from the wind to surface gravity waves in the coastal zone. Next, he analyzes the effect of wave nonlinearity on the drag coefficient using Stokes' second- order wave theory. Then he shows how to implement the parameterized wind stress into the phase resolving Boussinesq wave model with enhanced dispersion properties. After that, tests of the extended Boussinesq model with the wind forcing against wave measurements in a shallow lake were carried out followed by an application of the model to the study of sea- swell interactions. The report ends with a summary of the findings.
DTIC
Surface Waves; Ocean Surface; Wind (Meteorology); Surface Roughness; Variations

20030112530 Saint Louis Univ., MO, USA
Transition-Sensitized Turbulence Models for Compressible and Incompressible Flows
Thacker, William D.; February 13, 2003; 5 pp.; In English
Contract(s)/Grant(s): NAG1-02027; No Copyright; Avail: CASI; A01, Hardcopy

During the grant period from January 1,2002 to December 31,2002 work was carried out on three projects to extend the range of applicability of advanced turbulence models. First, a new transition-sensitized turbulence model was tested and refined. Second, the influence of compressibility on the pressure-strain rate correlation was studied. Third, the relationship between time-filtered large eddy simulation (TLES) and Reynolds-averaged Navier Stokes (RANS) modeling was investigated leading to submission of the article. The transition-sensitized turbulence model encompasses the early-stage transition and turbulent flow regimes describing the evolution of the ensemble mean disturbance energy and dissipation rate. It is founded on a consistent mathematical description of the laminar regime with its linear disturbances and the fully turbulent regime with its stochastic fluctuations. The unified description is provided by the ensemble viewpoint.
Derived from text
Transition Flow; Turbulence Models; Compressible Flow; Mathematical Models

20030112547 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA
Development and Validation of Computational Ship Hydrodynamics
Cross-Whiter, John; Simonsen, Claus; Aug. 29, 2003; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0589
Report No.(s): AD-A418124; DMI 2000890-04; No Copyright; Avail: CASI; A04, Hardcopy

As outlined in the grant proposal for the current project, Reference /1/, the overall technical objective for the current project was to investigate the maneuvering characteristics of a displacement vessel using the RANS code CFDSHIP-IOWA, with emphasis on the hull-rudder-propeller interaction. The numerical model was to be used to evaluate maneuvering characteristics by numerically performing the tests otherwise included in a physical Planar Motion Mechanism (PMM) test. At Force Technology - Division for Maritime Industry (formerly Danish Maritime Institute) experimental procedures and methods for analyzing model scale test results and extrapolation to full scale have been established over a 35-year period. Good general and detailed knowledge of maneuvering characteristics have consequently been gained during this period. It is recognized, however, that experimental work is both time-consuming and expensive when small alterations to an existing design are made during optimization of the maneuverability of a ship. In addition, PMM testing does not provide detailed knowledge of the flow regimes inducing the measured integral level forces. Since numerical procedures address both of these concerns Computational Fluid Dynamics (CFD) has been considered as an alternative to experimental work. CFD, has not, however, readily provided a tool for assessing maneuvering characteristics. To improve on this situation DMI initiated an R&D effort to develop methods in CFD to assess some of the basic hydrodynamic derivatives for a maneuvering ship.
DTIC
Maneuverability; Computational Fluid Dynamics; Hydrodynamics

20030112641 Washington Univ., Seattle, WA
Flow Over Difficult Bathymetry: Processes and Parameterizations
Gregg, Michael C.; Miller, Jack; Oct. 14, 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-97-1-1053
Report No.(s): AD-A418045; No Copyright; Avail: CASI; A03, Hardcopy

The goals of this grant were to understand the physics of flows generated by currents passing over small topographic features and to quantify and parameterize, if possible, the mixing these flows produce.
DTIC
Water Flow; Parameterization; Topography; Bathymeters

20030112650 Naval Postgraduate School, Monterey, CA
Drag Optimization Of Light Trucks Using Computational Fluid Dynamics
Williams, Nathan A.; Sep. 2003; 185 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418232; No Copyright; Avail: CASI; A09, Hardcopy

There are 80 million light trucks on the road today with suboptimal aerodynamic forms. Previous research has found that several miles per gallon can be saved by specifically tailoring truck bodies for reduced aerodynamic drag. Even greater savings can be obtained if the shape of the trucks is numerically optimized. This could reduce fuel consumption in the USA by billions of gallons per year. The purpose of this research is to develop and quantify optimal light truck canopy designs using computational fluid dynamics (CFD). Both two-dimensional and three-dimensional models are used to do this. Initially, this research focuses on quantifying and generalizing the effects of traditional automotive aerodynamic accessories, such as canopies and air dams. Once the effects of various form factors are quantified an optimization of the canopy is performed. This thesis demonstrates a method for drag reduction using CFD and traditional numerical optimization techniques. Lastly, the optimized forms are physically constructed and their effects on fuel economy are compared to the CFD prediction. The results indicate that the CFD formulation provides an accurate predictor for improving fuel economy and drag characteristics. The prototype air dam and optimally shaped canopy generated a 21.23% savings in terms of fuel economy.
DTIC
Aerodynamic Drag; Computational Fluid Dynamics; Drag Reduction; Trucks

20030112784 NASA Glenn Research Center, Cleveland, OH, USA

Computations of Internal and External Axisymmetric Nozzle Aerodynamics at Transonic Speeds

Dalbello, Teryn; Georgiadis, Nicholas; Yoder, Dennis; Keith, Theo; November 2003; 27 pp.; In English; 39th Combustion/27th Airbreathing Propulsion/21st Propulsion Systems Hazards/Third Modeling and Simulation Joint Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-708-73-22

Report No.(s): NASA/TM-2003-212731; E-14256; NAS 1.15:212731; Copyright; Avail: CASI; A03, Hardcopy

Computational Fluid Dynamics (CFD) analyses of axisymmetric circular-arc boattail nozzles have been completed in support of NASA's Next Generation Launch Technology Program to investigate the effects of high-speed nozzle geometries on the nozzle internal flow and the surrounding boattail regions. These computations span the very difficult transonic flight regime, with shock-induced separations and strong adverse pressure gradients. External afterbody and internal nozzle pressure distributions computed with the Wind code are compared with experimental data. A range of turbulence models were examined in Wind, including an Explicit Algebraic Stress model (EASM). Computations on two nozzle geometries have been completed at freestream Mach numbers ranging from 0.6 to 0.9, driven by nozzle pressure ratios (NPR) ranging from 2.9 to 5. Results obtained on converging-only geometry indicate reasonable agreement to experimental data, with the EASM and Shear Stress Transport (SST) turbulence models providing the best agreement. Calculations completed on a converging-diverging geometry involving large-scale internal flow separation did not converge to a true steady-state solution when run with variable timestepping (steady-state). Calculations obtained using constant timestepping (time-accurate) indicate less variations in flow properties compared with steady-state solutions. This failure to converge to a steady-state solution was found to be the result of difficulties in using variable time-stepping with large-scale separations present in the flow. Nevertheless, time-averaged boattail surface pressure coefficient and internal nozzle pressures show fairly good agreement with experimental data. The SST turbulence model demonstrates the best over-all agreement with experimental data.

Author

Convergent-Divergent Nozzles; Nozzle Flow; Nozzle Geometry; Boattails

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20030110619 National Space Development Agency, Tsukuba, Japan

Expected Performance of Lunar Imager/SpectroMeter on SELENE

Haruyama, J.; Ohtake, M.; Hirata, N.; Nakamura, R.; Matsunaga, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Lunar Imager / SpectroMeter (LISM) is a mission instrument package that will be installed on the Selenological and Engineering Explorer (SELENE) [1]. SELENE seeks to acquire data for scientific knowledge and possible utilization of the Moon [2]. LISM acquires various image and spectral data of the Moon's surface that will be crucial information for investigating the morphology, geology, and mineralogy of the Moon, and that contribute to the SELENE project purpose.

Author

Lunar Surface; Spectrometers

20030110630 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Locating Stardust-like Particles in Aerogel Using X-Ray Techniques

Jurewicz, A. J. G.; Jones, S. M.; Tsapin, A.; Mih, D. T.; Connolly, H. C., Jr.; Graham, G. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

Contract(s)/Grant(s): RTOP 624-13-55-01; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Silica aerogel is the material that the spacecraft STARDUST is using to collect interstellar and cometary silicates. Anticipating the return of the samples to earth in January of 2006, MANY individual investigators and, especially, the investigators in NASA's SRLIDAP program are studying means of both in situ analysis of particles, as well as particle extraction. To help individual PI's with extraction of particles from aerogel in their own laboratories, we are exploring the use

of standard laboratory x-ray equipment and commercial techniques for precisely locating specific particles in aerogel. We approached the evaluation of commercial x-ray techniques as follows. First, we determined the most appropriate detector for use with aerogel and particulates. Then, we compared and contrasted techniques useful for university laboratories.
Derived from text
Aerogels; Laboratory Equipment; Imaging Techniques; Cosmic Dust; X Ray Imagery

20030110897 NASA Johnson Space Center, Houston, TX, USA
Monte Carlo Simulations of the Response of the MARIE Instrument
Andersen, V.; Lee, K.; Pinsky, L.; Atwell, W.; Cleghorn, T.; Cucinotta, F.; Saganti, P.; Turner, R.; Zeitlin, C.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

The MARIE instrument aboard Mars Odyssey functions as a telescope for the detection of charged, energetic, nuclei. The directionality that leads to the telescope description is achieved by requiring coincident signals in two designated detectors in MARIE s silicon detector stack for the instrument to trigger. Because of this, MARIE is actually a bi directional telescope. Triggering particles can enter the detector stack by passing through the lightly shielded front of the instrument, but can also enter the back of the instrument by passing through the bulk of Odyssey. Because of this, understanding how to relate the signals recorded by MARIE to astrophysically important quantities such as particle fluxes or spectra exterior to the spacecraft clearly requires detailed modeling of the physical interactions that occur as the particles pass through the spacecraft and the instrument itself. In order to facilitate in the calibration of the MARIE data, we have begun a program to simulate the response of MARIE using the FLUKA [1] [2] Monte Carlo radiation transport code.
Author
Radiation Transport; Monte Carlo Method; Radiation Detectors

20030110976 Cornell Univ., Ithaca, NY, USA
Color Imaging of Mars with the Visible Imaging Subsytem (VIS) on the Mars Odyssey THEMIS Instrument
Bell, J. F., III; McConnochie, T.; Wolff, M. J.; Christensen, P. R.; Mehall, G.; Malin, M.; Caplinger, M.; Ravine, M.; Cherednik, L. L.; Bender, K. C., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA Mars Odyssey spacecraft began its primary orbital mapping mission in February 2001. Odyssey carries an imaging instrument called THEMIS, which has both infrared and visible wavelength imaging capabilities. The THEMIS Visible Imaging Subsystem (VIS) is a 5-color, 1024x1024 interline transfer CCD camera that acquires high spatial resolution 425 to 860 nm multispectral images from Mars orbit. This abstract describes the data reduction and calibration methods used to process VIS data, and presents some initial results on surface color properties at high spatial resolution.
Derived from text
Spaceborne Photography; CCD Cameras; Data Reduction; Data Processing

20030110977 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Panoramic Camera (Pancam) Investigation on the NASA 2003 Mars Exploration Rover Mission
Bell, J. F., III; Squyres, S. W.; Herkenhoff, K. E.; Maki, J.; Schwochert, M.; Dingizian, A.; Brown, D.; Morris, R. V.; Arneson, H. M.; Johnson, M. J., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Panoramic Camera System (Pancam) is part of the Athena science payload to be launched to Mars in 2003 on NASA's twin Mars Exploration Rover (MER) missions. The Pancam imaging system on each rover consists of two major components: a pair of digital CCD cameras, and the Pancam Mast Assembly (PMA), which provides the azimuth and elevation actuation for the cameras as well as a 1.5 meter high vantage point from which to image. Pancam is a multispectral, stereoscopic, panoramic imaging system, with a field of regard provided by the PMA that extends across 360 of azimuth and from zenith to nadir, providing a complete view of the scene around the rover.
Derived from text
CCD Cameras; Digital Cameras; Panoramic Cameras; Mars Missions

20030111002 Los Alamos National Lab., NM, USA

Characteristics of Stand-Off Detection of Geological Samples at Mars Atmosphere Pressure Using Laser-induced Breakdown Spectroscopy (LIBS)

Cremers, D. A.; Arp, Z.; Knight, A. K.; Scherbarth, N. L.; Wiens, R. C.; Maurice, S.; Salle, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

LIBS is a method of elemental analysis that uses a powerful laser pulse focused on the target sample to generate a hot plasma. Material in the plasma is vaporized/atomized and the resulting atoms are excited to emit light. The plasma light is collected, spectrally resolved and detected to determine elements in the target. At standoff distances of interest, 2-20 meters, the laser pulse can be used to interrogate solid materials.LIBS has been proposed as a new method for stand-off detection of geological samples for use on landers and rovers to Mars [1] and studies are on-going to determine capabilities [2-4]. Because of the severe size, weight, ruggedness and power requirements for space instrumentation and the need to maximize scientific return, it is important to benchmark capabilities with parameters representative of compact instrumentation likely to be used in a flight instrument. Some of these issues are addressed here.

Derived from text

Laser-Induced Breakdown Spectroscopy; Accuracy; Precision; Basalt

20030111003 Los Alamos National Lab., NM, USA

Analysis of Water Ice and Ice/Dust Mixtures Using Laser-induced Breakdown Spectroscopy (LIBS)

Cremers, D. A.; Brown, K.; Gibson, L.; Ferris, M. J.; Wiens, R. C.; Maurice, S.; Salle, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 1992, LIBS was proposed as a new method for stand-off detection of geological samples for use on landers and rovers to Mars [1]. Recently, there has been increased interest in the technique for this and other space applications and studies have determined some of the characteristics and capabilities of the method under the conditions that these measurements will have to be made [2-4]. In addition to rocks and soils, there is interest in using LIBS to analyze ices and dusts entrained in ice. This is especially true for missions to the Mars polar regions. Of particular interest is determining the nature of polar layered deposits, the geochemistry of polar surface materials, detection of water ice and the distribution of ice, and the presence of possible organics in these materials (via C/N ratios).

Author

Laser-Induced Breakdown Spectroscopy; Ice; Dust; Accuracy

20030111058 Lunar and Planetary Inst., Houston, TX, USA

First Airborne Thermal Infrared Hyperspectral Imaging of a Dry Lake: Real-World Data and TES/THEMIS Mars Interpretations

Kirkland, L. E.; Keim, E. R.; Herr, K. C.; Adams, P. M.; Burt, D.; McAfee, J. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Researchers seek to identify dry lake bed deposits on Mars, if present. The Global Surveyor TES and Mars Odyssey THEMIS are primary tools in this search. However, there are no published thermal infrared spectrometer (hyperspectral) airborne studies of a dry lake bed. Here we present the first such study and the impacts on TES/THEMIS interpretations. This research addresses a looming gap in the field spectroscopy experience required for complete and rigorous interpretations of TES/THEMIS data. A companion abstract focuses on the relevant Bristol Lake geology [1]. A hallmark of this work is the alliance of field geologists and field spectroscopists.

Author

Beds (Geology); Infrared Spectrometers

20030111168 University Coll., London, UK

The Scientific Objectives of the Beagle 2 Stereo Camera System

Griffiths, A. D.; Coates, A. J.; Jossett, J.L.; Paar, G.; Sims, M. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The stereo camera system (SCS) provides the primary imaging capability of the Beagle 2 lander for the Mars Express

Mission. Sensitive to visible and near IR wavebands (440-1000 nm) it is composed of twin camera/filter wheel units. The 1024 by 1024 pixel frame transfer CCDs, wide-angle (48 degree field of view) stereo optics and a choice of 24 filters allow a wide range of scientific objectives to be addressed. The total system mass is 360 g, the required volume envelope is 747 cm3 and the average power consumption is 1.8 W. A 10Mbit/s RS422 bus connects each camera to the lander common electronics. Stereo image pairs acquired shortly after landing will be combined to form a mosaic of the Beagle 2 robot arm (RA) workspace. The images will be processed to produce a Digital Elevation Model (DEM) of the rocks and soil present [2]. Due to the light time delay between Earth and Mars, an accurate DEM is vital to allow safe and accurate positioning of PAW instruments against scientifically interesting rock and soil surfaces. The DEM will also be used to study the geomorphology and size distributions/area cover of small rocks and boulders.
Author
Unmanned Ground Vehicles; Cameras; Image Resolution; Mars Surface

20030111169 Minnesota Univ., Minneapolis, MN, USA
Mars Analogue Field Spectroscopy: Building Real-World Experience for the Mars 2003 Rover Mini-TES
Greenhagen, B. T.; Kirkland, L. E.; Herr, K. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 2003 Mars Exploration Rover science strategy is to identify promising targets using the visible/near-infrared imaging Pancam and the thermal infrared spectrometer Mini-TES. The rover would then traverse to those targets for more detailed examination. Team members will select sites using target morphology and color from Pancam, and interpretations of the mineralogy using Mini-TES. This strategy requires low ambiguity, near real-time interpretations of Mini-TES data. Field spectrometer measurements from a rover perspective differ significantly from both laboratory and airborne measurements. Here we detail complications found in unique field measurements that used instrumentation very similar to the Mini-TES, and implications for identification of minerals using Mini-TES.
Author
Mars Exploration; Infrared Spectrometers; Field Tests

20030111561 Bern Univ., Bern, Switzerland
A Laser-Ablation Mass Spectrometer for the Surface of Mercury
Whitby, J. A.; Rohner, U.; Benz, W.; Wurz, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The European Space Agency's BepiColombo mission to Mercury is planned to include a lander which will investigate the composition and properties of the surface. The instruments on the lander will both provide ground-truth for the orbiting instrument package, and allow a higher resolution and more detailed analysis of the Hermean regolith. A knowledge of the elemental composition of the mantle of Mercury (which can be inferred from the crust) will rule out some models of how the planet formed as very different predictions are made for the relative proportions of volatile, moderately volatile and refractory elements. We have developed a laboratory prototype of a mass spectrometer appropriate for this mission which will allow the measurement of both elemental and isotopic compositions with a spatial resolution (lateral and vertical) better than the expected regolith grain size, thus allowing an accurate picture of the modal mineralogy to be built up. The high spatial resolution and the ability to acquire isotopic information will allow the estimated 10% of regolith grains arising from bombardment by chondritic meteorites to be discarded from the data set. Furthermore, depth profiling of individual regolith grains will enable a distinction to be made between the true composition of a mineral grain, and the expected coating of agglutinate materials acquired from micro-impacts.
Author
Mass Spectrometers; Spatial Resolution; Isotope Ratios; Chondrites

20030111698 Nebraska Univ., Lincoln, NE, USA
Airborne Remote Sensing (ARS) for Agricultural Research and Commercialization Applications
Narayanan, Ram; Bowen, Brent D.; Nickerson, Jocelyn S.; The Aeronautics Education, Research, and Industry Alliance (AERIAL) 2002 Report; 2002, pp. 12-23; In English; See also 20030111697; Copyright; Avail: CASI; A03, Hardcopy

Tremendous advances in remote sensing technology and computing power over the last few decades are now providing scientists with the opportunity to investigate, measure, and model environmental patterns and processes with increasing

confidence. Such advances are being pursued by the Nebraska Remote Sensing Facility, which consists of approximately 30 faculty members and is very competitive with other institutions in the depth of the work that is accomplished. The development of this facility targeted at applications, commercialization, and education programs in the area of precision agriculture provides a unique opportunity. This critical area is within the scope of NASA goals and objectives of NASA s Applications, Technology Transfer, Commercialization, and Education Division and the Earth Science Enterprise. This innovative integration of Aerospace (Aeronautics) Technology Enterprise applications with other NASA enterprises serves as a model of cross-enterprise transfer of science with specific commercial applications.
Author
Remote Sensing; Technology Transfer; Agriculture

20030111758 NASA Marshall Space Flight Center, Huntsville, AL, USA
The VISAR Process
Hathaway, David; Meyer, Paul; Templeton, Gary F.; [2003]; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

The Video Image Stabilization And Registration (VISAR) process is an award winning video image processing software developed at NASA's Marshall Space Flight Center. VISAR has a wide variety of application areas where the refinement of digital video is needed. It is used to correct jitter, rotation, and zoom effects by registering and processing on individual image captures that are a part of normal video capturing. Its most prominent uses were the 1996 Olympic Bombing case and in identifying Saddam Hussein during the Iraq war. Based on first-hand knowledge, this paper describes the VISAR process, which consists of several steps designed to refine digital video using VISAR software. The process determines the differences between two video images so that one, or both, of the images can be changed in ways that make them match as well as possible. Corrections include changes in position (horizontal and vertical image shifts), changes in orientation (image rotation), and changes in magnification (image zoom). While much of the VISAR process is automated, in its current embodiment it requires the user to initially identify the area of interest and to reset a threshold parameter if the default gives unacceptable results. The basic process that is used is an old tried and true method that determines how well the two images match. This process is called cross-correlation. It gives a single number, the correlation coefficient, that is equal to 1.0 if the images are perfectly matched, is equal to 0.0 if the images have nothing in common, and is equal to -1.0 if one image is the negative of the other. This basic process is used by many image stabilization methods. With VISAR we use it in a manner that provides statistical information needed to best determine orientation and magnification.
Derived from text
Image Processing; Pattern Registration; Digital Television

20030111918
L-Band VV Clutter Analysis for Natural Land in Northern Territory Areas
Dong, Yunhan; May 2003; 52 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417897; DSTO-RR-0254; DODA-AR-012-773; No Copyright; Avail: CASI; A04, Hardcopy

Land clutter is statistical by nature, and its values vary in many different dimensions. This report analyses land clutter characteristics using AirSAR data for airborne L band VV polarised radars. In particular, the report concentrates on the distribution of clutter values with respect to grazing angles for various vegetation communities typically seen in the Northern Territory region in Australia. Future reports will address wider aspects, including spatial distributions and Doppler spectra of clutter sufficient to enable the generation of radar clutter models.
DTIC
Ultrahigh Frequencies; Clutter; Vegetation; Land

20030112019 Iowa State Univ. of Science and Technology, Ames, IA, USA
Geo-Referenced Altitude Hold for Latex Balloons
Byrd, William J.; Cook, Michael J.; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; 10 pp.; In English; See also 20030112018; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

The capability to fly a balloon payload at a constant pressure altitude using a fixed-volume envelope has existed for decades. (NASA Scientific Balloon Facility Mission, History, and Accomplishments, http://master.nsbf.nasa.gov/mission 1 .html). However, the fixed-volume envelopes are expensive relative to latex balloons for small payloads (I 100 lbs). A capability to fly small packages at a constant GPS-referenced altitude using latex balloons has been developed at Iowa State University. The concept uses multiple balloons of differing sizes, GPS position data, and a ballast system. The hold altitude does not need to be determined pre-launch, alllowing for holding at an altitude based upon in-situ sensor data in red time. The

system has been flight tested and used for a research mission by the NASA Jet Propulsion Laboratory through a contract with the University of Iowa. Although not an automated system, it has the potential to be automated at a future date.
Author
Balloons; Launching

20030112021 Iowa State Univ. of Science and Technology, Ames, IA, USA
Expertise in: System Dynamics and Control, Control Theory and Applications, Aircraft/Spacecraft Flight Control, Guidance, Navigation
Chavez, Frank R.; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; 7 pp.; In English; See also 20030112018; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

Information is presented on control systems for autonomous vehicle operations including: blended wing body design;design and flight testing of micro-aerial vehicle systems;aeroelastic/aeroservoelastic efforts; flight simulation; and wind tunnel applications.
CASI
Blended-Wing-Body Configurations; Spacecraft Control; Aircraft Control; Automatic Control

20030112085 Nippon Telegraph and Telephone Public Corp., Japan
Nonlinear Robust Velocity Estimation of Vehicles from a Snowfall Traffic Scene
Sakaino, H.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 101; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

This paper discusses a novel robust velocity estimation method for moving vehicles in road traffic image sequences under severely falling snow. In such environments, it is difficult to detect the velocity of vehicles because of discontinuities, occlusions, noise, and brightness variations and separate two motions of vehicles and snow fall patterns. In order to estimate and recognize moving vehicles in images, a two-stage method has been proposed. The method includes a nonlinear smoothing, nonlinear robust static function, and brightness variation model. LBG clustering and merging algorithm is applied to count the velocity of moving vehicles. Recognition experiments to estimate the number of moving vehicles result in over 80% with a high separability in 300 images.
Author
Cluster Analysis; Merging Routines; Velocity Measurement; Nonlinear Systems; Image Processing

20030112095 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Measuring Aerosol Optical Properties with the Ozone Monitoring Instrument (OMI)
Veefkind, J. P.; Torres, O.; Syniuk, A.; Decae, R.; deLeeuw, G.; [2003]; 1 pp.; In English; EGS-AGU-EUG Joint Assembly 2003, 7-11 Apr. 2003, Nice, France; No Copyright; Avail: Other Sources; Abstract Only

The Ozone Monitoring Instrument (OMI) is the Dutch-Finnish contribution to the NASA EOS-Aura mission scheduled for launch in January 2004. OM1 is an imaging spectrometer that will measure the back-scattered Solar radiance between 270 an 500 nm. With its relatively high spatial resolution (13x24 sq km at nadir) and daily global coverage. OM1 will make a major contribution to our understanding of atmospheric chemistry and to climate research. OM1 will provide data continuity with the TOMS instruments. One of the pleasant surprises of the TOMS data record was its information on aerosol properties. First, only the absorbing aerosol index, which is sensitive to elevated lay- ers of aerosols such as desert dust and smoke aerosols, was derived. Recently these methods were further improved to yield aerosol optical thickness and single scattering albedo over land and ocean for 19 years of TOMS data (1979-1992,1997-2002), making it one of the longest and most valuable time series for aerosols presently available. Such long time series are essential to quantify the effect of aerosols on the Earth& climate. The OM1 instrument is better suited to measure aerosols than the TOMS instruments because of the smaller footprint, and better spectral coverage. The better capabilities of OMI will enable us to provide an improved aerosol product, but the knowledge will also be used for further analysis of the aerosol record from TOMS. The OM1 aerosol product that is currently being developed for OM1 combines the TOMS experience and the multi-spectral techniques that are used in the visible and near infrared. The challenge for this new product is to provide aerosol optical thickness and single scattering albedo from the near ultraviolet to the visible (330-500 nm) over land and ocean. In this presentation the methods for deriving the OM1 aerosol product will be presented. Part of these methods developed for OM1 can already be applied to TOMS data and results of such analysis will be shown.
Author
Aerosols; Imaging Spectrometers; Total Ozone Mapping Spectrometer; Solar Radiation; Backscattering

20030112102 NASA Langley Research Center, Hampton, VA, USA

Initial SVS Integrated Technology Evaluation Flight Test Requirements and Hardware Architecture

Harrison, Stella V.; Kramer, Lynda J.; Bailey, Randall E.; Jones, Denise R.; Young, Steven D.; Harrah, Steven D.; Arthur, Jarvis J.; Parrish, Russell V.; September 2003; 121 pp.; In English

Contract(s)/Grant(s): 23-728-60-85

Report No.(s): NASA/TM-2003-212644; L-18325; NAS 1.15:212644; No Copyright; Avail: CASI; A06, Hardcopy

This document presents the flight test requirements for the Initial Synthetic Vision Systems Integrated Technology Evaluation flight Test to be flown aboard NASA Langley's ARIES aircraft and the final hardware architecture implemented to meet these requirements. Part I of this document contains the hardware, software, simulator, and flight operations requirements for this light test as they were defined in August 2002. The contents of this section are the actual requirements document that was signed for this flight test. Part II of this document contains information pertaining to the hardware architecture that was realized to meet these requirements as presented to and approved by a Critical Design Review Panel prior to installation on the B-757 Airborne Research Integrated Experiments Systems (ARIES) airplane. This information includes a description of the equipment, block diagrams of the architecture, layouts of the workstations, and pictures of the actual installations.

Author

Enhanced Vision; Flight Operations; Navigation

20030112153 NASA Langley Research Center, Hampton, VA, USA

Single Vector Calibration System for Multi-Axis Load Cells and Method for Calibrating a Multi-Axis Load Cell

Parker, Peter A., Inventor; October 07, 2003; 19 pp.; In English

Patent Info.: Filed 8 Jan. 2001; US-Patent-6,629,446; US-Patent-Appl-SN-758115; NASA-Case-LAR-16020-1; No Copyright; Avail: CASI; A03, Hardcopy

A single vector calibration system is provided which facilitates the calibration of multi-axis load cells, including wind tunnel force balances. The single vector system provides the capability to calibrate a multi-axis load cell using a single directional load, for example loading solely in the gravitational direction. The system manipulates the load cell in three-dimensional space, while keeping the uni-directional calibration load aligned. The use of a single vector calibration load reduces the set-up time for the multi-axis load combinations needed to generate a complete calibration mathematical model. The system also reduces load application inaccuracies caused by the conventional requirement to generate multiple force vectors. The simplicity of the system reduces calibration time and cost, while simultaneously increasing calibration accuracy.

Official Gazette of the U.S. Patent and Trademark Office

Calibrating; Weight Indicators; Measuring Instruments; Loads (Forces)

20030112199 NASA Pasadena Office, CA, USA

High Precision Laser Range Sensor

Dubovitsky, Serge, Inventor; Lay, Oliver P., Inventor; November 11, 2003; 8 pp.; In English

Patent Info.: Filed 7 May 2002; US-Patent-6,646,723; US-Patent-Appl-SN-143169; NASA-Case-NPO-30804; No Copyright; Avail: CASI; A02, Hardcopy

The present invention is an improved distance measuring interferometer that includes high speed phase modulators and additional phase meters to generate and analyze multiple heterodyne signal pairs with distinct frequencies. Modulation sidebands with large frequency separation are generated by the high speed electro-optic phase modulators, requiring only a single frequency stable laser source and eliminating the need for a fist laser to be tuned or stabilized relative to a second laser. The combination of signals produced by the modulated sidebands is separated and processed to give the target distance. The resulting metrology apparatus enables a sensor with submicron accuracy or better over a multi- kilometer ambiguity range.

Official Gazette of the U.S. Patent and Trademark Office

Distance Measuring Equipment; Electro-Optics; Lasers; Modulators

20030112383 Rhode Island Univ., Kingston, RI, USA

Ceramic Strain Gages for Use at Temperatures up to 1500 Celsius

Gregory, Otto; Fralick, Gustave, Technical Monitor; April 2003; 28 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG3-2655; WU-708-87-23

Report No.(s): NASA/CR-2003-212189; NAS 1.26:212189; E-13792; No Copyright; Avail: CASI; A03, Hardcopy

Indium-tin-oxide (ITO) thin film strain gages were successfully demonstrated at temperatures beyond 1500 C. High temperature static strain tests revealed that the piezoresistive response and electrical stability of the ceramic sensors depended on the thickness of the ITO films comprising the active strain elements. When 2.5 microns-thick ITO films were employed as the active strain elements, the piezoresistive response became unstable at temperatures above 1225 C. In contrast to this, ceramic sensors prepared with 5 microns-thick ITO were stable beyond 1430 C and sensors prepared with 8 microns-thick ITO survived more than 20 hr of operation at 1481 C. Very thick (10 microns) ITo strain gages were extremely stable and responsive at 1528 C. ESCA depth profiles confirmed that an interfacial reaction between the ITO strain gage and alumina substrate was responsible for the high temperature electrical stability observed. Similar improvements in high temperature stability were achieved by doping the active ITO strain elements with aluminum. Several Sic-Sic CMC constant strain beams were instrumented with ITO strain gages and delivered to NASA for testing. Due to the extreme surface roughness of the CMC substrates, new lithography techniques and surface preparation methods were developed. These techniques relied heavily on a combination of Sic and A12O3 cement layers to provide the necessary surface finish for efficient pattern transfer. Micro-contact printing using soft lithography and PDMS stamps was also used to successfully transfer the thin film strain gage patterns to the resist coated CMC substrates. This latter approach has considerable potential for transferring the thin film strain gage patterns to the extremely rough surfaces associated with the CMC's.
Author
High Temperature; Strain Gages; Thin Films; ITO (Semiconductors)

20030112389 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Calibration of Passive Microwave Polarimeters that Use Hybrid Coupler-Based Correlators
Piepmeier, J. R.; [2003]; 10 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

Four calibration algorithms are studied for microwave polarimeters that use hybrid coupler-based correlators: 1) conventional two-look of hot and cold sources, 2) three looks of hot and cold source combinations, 3) two-look with correlated source, and 4) four-look combining methods 2 and 3. The systematic errors are found to depend on the polarimeter component parameters and accuracy of calibration noise temperatures. A case study radiometer in four different remote sensing scenarios was considered in light of these results. Applications for Ocean surface salinity, Ocean surface winds, and soil moisture were found to be sensitive to different systematic errors. Finally, a standard uncertainty analysis was performed on the four-look calibration algorithm, which was found to be most sensitive to the correlated calibration source.
Author
Algorithms; Calibrating; Correlators; Remote Sensing; Polarimeters; Microwaves; Couplers; Mathematical Models

20030112454 NASA Ames Research Center, Moffett Field, CA, USA
Method and Apparatus for Virtual Interactive Medical Imaging by Multiple Remotely-Located Users
Ross, Muriel D., Inventor; Twombly, Ian Alexander, Inventor; Senger, Steven O., Inventor; August 19, 2003; 38 pp.; In English; Avail: CASI; A03, Hardcopy

A virtual interactive imaging system allows the displaying of high-resolution, three-dimensional images of medical data to a user and allows the user to manipulate the images, including rotation of images in any of various axes. The system includes a mesh component that generates a mesh to represent a surface of an anatomical object, based on a set of data of the object, such as from a CT or MRI scan or the like. The mesh is generated so as to avoid tears, or holes, in the mesh, providing very high-quality representations of topographical features of the object, particularly at high- resolution. The system further includes a virtual surgical cutting tool that enables the user to simulate the removal of a piece or layer of a displayed object, such as a piece of skin or bone, view the interior of the object, manipulate the removed piece, and reattach the removed piece if desired. The system further includes a virtual collaborative clinic component, which allows the users of multiple, remotely-located computer systems to collaboratively and simultaneously view and manipulate the high-resolution, three-dimensional images of the object in real-time.
Author
Imaging Techniques; Rotation; High Resolution

20030112455 George Washington Univ., Hampton, VA, USA
Infrared Thermography Flight Experimentation
Blanchard, Robert C.; Carter, Matthew L.; Kirsch, Michael; [2003]; 31 pp.; In English
Contract(s)/Grant(s): NCC4-156; No Copyright; Avail: CASI; A03, Hardcopy

Analysis was done on IR data collected by DFRC on May 8, 2002. This includes the generation of a movie to initially

examine the IR flight data. The production of the movie was challenged by the volume of data that needed to be processed, namely 40,500 images with each image (256 x 252) containing over 264 million points (pixel depth 4096). It was also observed during the initial analysis that the RTD surface coating has a different emissivity than the surroundings. This fact added unexpected complexity in obtaining a correlation between RTD data and IR data. A scheme was devised to generate IR data near the RTD location which is not affected by the surface coating This scheme is valid as long as the surface temperature as measured does not change too much over a few pixel distances from the RTD location. After obtaining IR data near the RTD location, it is possible to make a direct comparison with the temperature as measured during the flight after adjusting for the camera s auto scaling. The IR data seems to correlate well to the flight temperature data at three of the four RID locations. The maximum count intensity occurs closely to the maximum temperature as measured during flight. At one location (RTD #3), there is poor correlation and this must be investigated before any further progress is possible. However, with successful comparisons at three locations, it seems there is great potential to be able to find a calibration curve for the data. Moreover, as such it will be possible to measure temperature directly from the IR data in the near future.
Author
Thermography; Infrared Photography; Infrared Radiation; Surface Temperature

20030112512 Woods Hole Oceanographic Inst., MA, USA
Geoclutter Target Moorings
Peters, Donald B.; Oct. 22, 2003; 5 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0711
Report No.(s): AD-A417969; No Copyright; Avail: CASI; A01, Hardcopy

The Geoclutter target was designed to meet the following specifications: 6 meters in length, 4 air-filled aluminum 6-inch schedule, 10 pipes in a square bundle, sufficient weight to result in approximately 500 pounds wet weight, the ability to orient directionally by dragging, an attachment point for the deployment/recovery mooring penant, and tagline bales at the ends for handling. Attached are an overall dimensioned drawing and two photos of dock testing the target. The target was used successfully in the Geoclutter field experiment for Nick Makris of MIT.
DTIC
Clutter; Targets; Mooring

20030112563 Army Research Lab., Adelphi, MD
Fort A.P. Hill Soil Permittivity and Conductivity Measurements for the Wide Area Airborne Minefield Detection Program
Smith, Gregory D.; Stanton, Brian J.; Sep. 2003; 60 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417988; ARL-TR-3049; No Copyright; Avail: CASI; A04, Hardcopy

This report discusses the soil permittivity and conductivity measurements at various test environment locations at Ft A.P. Hill for use in modeling predictions in support of the Wide Area Airborne Mine Detection (WAAMD) program. The WAAMD sensor suite consists of four optical sensors and three radar systems. The radars are stand-alone systems operating in different bands: Mirage (300-2800 MHz), Stanford Research Institute (200-450 MHz), and Veridian (8.16- 10 GHz) . Soil sample sites were located in the drop zone, Lightweight Airborne Mine Detection (LAMD) area, and Area 71A. The drop zone was divided into six test environments. The environments consisted of mines in (1) bare dirt, (2) short grass, and (3) tall grass, and backgrounds of the (4) bare dirt, (5) short grass, and (6) tall grass. The backgrounds were sections of the test sites used to provide ambient data (no mines) of the test environments. Two soil sample sites were selected for characterizing the mines in bare dirt, three sites were selected for characterizing the mines in tall grass, and two sites were selected for characterizing the mines in short grass. A single site was selected for each of the background areas. The LAMD site had four soil sample sites and Area 71A, lane 19 had two soil sample sites. There were 16 soil sample sites selected from these areas. Samples were taken on 21 October 02, 29 October 02, and 25 November 02. Permittivity and conductivity values were measured from 100 to 3000 MHz. The water mass per unit volume of the soil was calculated after completing permittivity and conductivity measurements.
DTIC
Conductivity; Mine Detectors; Grasses

20030112600 NASA Johnson Space Center, Houston, TX, USA

Commercial NiMH Cells in LEO Cycling: Thermal Vacuum Life Test Performed for the Floating Potential Probe (FPP)

Darcy, Eric; Strangways, Brad; The 2002 NASA Aerospace Battery Workshop; April 2003; 17 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Contents include the following: 1. Introduction: What is the (Floating Potential Probe) FPP? Why was NiMH battery selected? Haw well would crimped seal cell performed in long term vacuum exposure? 2. Verification tests: Battery description. Test methods. Results. Main findings. FPP status.

CASI

Thermal Vacuum Tests; Life (Durability); Electrolytic Cells

20030112717 Naval Postgraduate School, Monterey, CA

Radar Absorbing Material Design

Yuzcelik, Cihangir K.; Sep. 2003; 83 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418302; No Copyright; Avail: CASI; A05, Hardcopy

Low observable platforms have extremely low radar cross section specifications that cannot be achieved by shaping alone. The application of radar absorbing material is necessary, in which case the appropriate constitutive parameters and thickness must be selected. The universal design chart gives combinations of mu, epsilon and tau that provide zero specular reflection at normal incidence. Three different backing materials were used to generate the charts: (1) perfect electric conductor, (2) free space, and (3) graphite. One can pick the required values from the charts for an ideal zero reflection dielectric/magnetic layer. The extension to other materials is straightforward. Numerical simulations of coated plates were performed to estimate the effectiveness of the absorbing layers in reducing radar cross section. The reduction in monostatic radar cross section value is shown by plotting the radar cross section of the plate with and without radar absorbing material.

DTIC

Radar Cross Sections; Antiradar Coatings; Electric Conductors; Specular Reflection

20030112744 Defence Research and Development Canada, Ottawa, Ontario, Canada

Distortion in ISAR Imaging and Restoration of Distorted ISAR Images

Wong, S.; Duff, G.; Riseborough, E.; Sep. 2003; 35 pp.; In English

Report No.(s): AD-A418199; DRDC-TM-2003-143; No Copyright; Avail: CASI; A03, Hardcopy

A physics based numerical model has been developed to describe the gross distortion on ISAR images due to small perturbed target motion. Quantitative results obtained under controlled experimental conditions on the target's motion have confirmed that large distortion in the ISAR image of the target can occur. The experimental data give excellent agreement with the model results. The distortion is a consequence of the phase modulation effect in the radar return signal, as a result of small fluctuating perturbed motion of the target. This gives rise to distortion of the image in the cross-range direction. The distortion can be corrected by applying time-frequency analysis. The Short-Time Fourier transform is used in this paper to examine some of the issues in refocusing distorted ISAR images.

DTIC

Target Recognition; Synthetic Aperture Radar; Mathematical Models; Radar Photography

20030112763 Tanner Research, Inc., Pasadena, CA

Insect Small-Target Motion Detection for Seeker Applications

Shoemaker, Patrick; O'Carroll, David; Jan. 2003; 23 pp.; In English

Contract(s)/Grant(s): N00014-03-M-0171

Report No.(s): AD-A418203; No Copyright; Avail: CASI; A03, Hardcopy

Although insects are relatively simple organisms compared to vertebrates, with nervous systems of limited size and complexity, they nonetheless possess capabilities that could greatly enhance the performance of autonomous flying vehicles and weapons if they could be duplicated in an artificial system. Insects do a remarkable job of controlling flight and other behaviors based on their low-resolution visual sense. Computation of optical flow for estimation of egomotion, and detection and tracking of moving targets, are two examples of such processing. For man- made systems that emulate these capabilities,

we would, expect to find applications in guidance and control and in seeker technology.
DTIC
Detection; Target Acquisition; Autonomy; Homing Devices; Insects

20030112788 Defence Research and Development Canada, Ottawa, Ontario, Canada
Polarimetric Interferometric SAR: Literature Review and an Assessment of its Utility for DND: TIF Project Memorandum
Mattar, Karim E.; Yeremy, Maureen L.; Livingstone, Chuck; Sep. 2003; 29 pp.; In English
Report No.(s): AD-A418212; DRDC-TM-2003-144; No Copyright; Avail: CASI; A03, Hardcopy

Polarimetric Interferometric Synthetic Aperture Radar (SAR) is a recent area of research that has had significant attention from the mid-1990s. This area of research has combined the utility of two SAR technologies: Polarimetric SAR (PolSAR) and Interferometric SAR (InSAR). Polarimetric SAR provides four channels which can be used to determine the polarimetric ellipse, and hence, structural information of the scatterer. Therefore PolSAR is suitable for target recognition and detection applications. InSAR data combines two SAR image data sets acquired from nearly the same perspective. The phase difference between these images provides information about the topography, or changes in the topography between the two image dates. InSAR methods have been used to map terrains, detect environmental changes and determine velocities of moving targets. By combining both technologies, polarimetric InSAR (Pol InSAR) permits distinction between different distributed targets at different elevations. In particular, most current research is investigating use of this technology for measuring the height of forest, and to help estimate its biomass. Other applications under research include terrain moisture estimation, terrain roughness estimation, and (of more interest in mapping applications) vertical obstruction detection.
DTIC
Polarimetry; Synthetic Aperture Radar; Interferometry; Tracking (Position)

20030112790 Defence Research and Development Canada, Ottawa, Ontario, Canada
Polarimetric Interferometric Experiment Trials for Years 2001 and 2002: Experiment Design Ground Truthing Data Quality and Analysis
Yeremy, Maureen; Livingstone, Chuck; Mattar, Karim; Gallop, Lloyd; Lang, Janice; Sep. 2003; 148 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418214; DRDC-TM-2003-142; No Copyright; Avail: CASI; A07, Hardcopy

Synthetic Aperture Radar (SAR) theory has several disciplines which includes Polarimetric SAR (PolSAR) and Interferometric SAR (InSAR). Recent research in the past decade has introduced a new method which utilizes both of these disciplines and is called Polarimetric Interferometric SAR (Pol InSAR). Research to date has been focussed on determining forest heights from interferograms constructed from PolSAR data which has been decomposed so that the data can be preferentially weighted with respect to dominant environmental scattering mechanisms associated with a forest. In this way, phase difference interferograms can be constructed utilizing forest foliage scattering and ground interaction near the forest floor information, in order to estimate forest heights. While these applications are of some interest to Department of National Defence (DND) Canada (i.e. Mapping and Charting), the Experimental Trials, documented here, were designed for utilizing both conventional Pol InSAR methods and developing new Pol InSAR methods specifically for military applications. Three Trials collected repeat pass Pol InSAR data for several experiments. The data were collected by Environmental Canada's SAR C/X system which has similar properties to the future RADARSAT 2. Key areas of Pol InSAR research associated with this study include: (1) motion effects and motion detection with PolSAR and Pol InSAR data, and (2) the utilization of propagation models for inversion of military targets such as tall obstructions, maritime vessels, internal and external building attributes. The experiment design and ground truthing are documented here in reference to the objectives. Some preliminary results and comments regarding lessons learned are also documented. This technical memorandum is a companion to another DRDC report which documents a Pol InSAR literature review and DND objectives for the Pol InSAR project experiments, and simulation results.
DTIC
Polarimetry; Synthetic Aperture Radar; Interferometry; Data Processing; Tracking (Position)

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20030110842 Tokyo Univ., Japan
Does Laser Ablation Vapor Simulate Impact Vapor?
Sugita, S.; Kadono, T.; Ohno, S.; Hamano, K.; Matsui, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many laser experiments have been done to simulate hypervelocity impact vaporization. Laser simulation has a number of advantages. It can create high-temperature plumes with high repeatability and a high repetition cycle at a relatively low cost. Furthermore, because laser light can penetrate through a glass window (if chosen properly), the target material and vaporization products have virtually no risk of contamination. This is an ideal condition for a chemical analysis. However, there is a critical disadvantage in laser simulation; we do not know if a laser irradiation really simulates a hypervelocity impact. The purpose of this study is to address this problem quantitatively.
Derived from text
Hypervelocity Impact; Laser Ablation; Vapors; Simulation

20030111611 Centre National de la Recherche Scientifique, Nancy, France
Condensation Experimental Set-Up Using Pulsed-Laser Evaporation: Preliminary Results
Toppani, A.; Libourel, G.; Robert, F.; Ghambaja, J.; Zimmermann, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Condensation has long been recognized as the most important process leading to the formation of the main primitive objects of our solar system. However, while theoretical calculations of condensation from a solar gas may predict the main mineralogy of this pristine matter, such as CAIs, some inconsistencies still remain. Furthermore, texture, size, as well as the kinetic of formation of the condensates are still a matter of debate. In order to progress in this field, a new program of condensation experiments was initiated. Previous condensation experiments have been done either at low temperature (between 25 C and 600 C) or at high temperature with gas of simple composition such as MgO-SiO2-H2 or CaMgSi2O6-H2. Here, we have set up a new experimental design allowing to perform heterogeneous condensation from a gas of complex refractory controlled composition up to 1400 C in a pressure range from 10(exp -8) to 1 bar, under controlled oxygen fugacity for any run times.
Derived from text
Pulsed Lasers; Evaporation; Condensation; Experiment Design

20030112068 Nippon Telegraph and Telephone Public Corp., Japan
A Circular Beam Spot and Low Threshold Current Laser Diode With Reverse-V-Shape Layer
Takeshita, T.; Shibata, Y.; Ito, T.; Sakai, Y.; Okamoto, M.; Tohmori, Y.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 101-102; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

A laser with a reverse-V-shape layer exhibits a circular beam spot and low threshold current. The beam aspect ratio of the reverse-V-shape laser is clarified to be insensitive to reverse-V-shape width. The reverse-V-shape layer consists of a strained active layer and passive guide layer, which leads to a low threshold current. The reverse-V-shape layer is attractive as an optical source for optical-communication and information systems.
Author
Semiconductor Lasers; Threshold Currents; Laser Beams

20030112073 Nippon Telegraph and Telephone Public Corp., Japan
Degradation Behavior of 850-nm Vertical-Cavity Surface-Emitting Lasers with an Air-Post Index-Guide Structure
Takeshita, T.; Kagawa, T.; Tateno, K.; Tadanaga, O.; Tohmori, Y.; Amano, C.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 102; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

The degradation mechanism of a vertical-cavity surface-emitting laser (VCSEL) with an air-post structure is analysed for stable optical parallel interconnection communication. It is clarified that the degradation is caused by the behavior of latent

defects in the GaAs active layer. Decreasing the defects in the active region as well as decreasing the threshold current is important for obtaining a longlifetime VCSEL.
Author
Surface Emitting Lasers; Threshold Currents; Laser Cavities; Laser Stability; Semiconductor Lasers; Cavities

20030112141 NASA Marshall Space Flight Center, Huntsville, AL, USA
Solar Pumped Solid State Lasers for Space Solar Power: Experimental Path
Fork, Richard L.; Carrington, Connie K.; Walker, Wesley W.; Cole, Spencer T.; Green, Jason J. A.; Laycock, Rustin L.; [2003]; 1 pp.; In English; International Astronautical Congress, 2 Oct. 2003, Bremen, Germany; Copyright; Avail: Other Sources; Abstract Only

We outline an experimentally based strategy designed to lead to solar pumped solid state laser oscillators useful for space solar power. Our method involves solar pumping a novel solid state gain element specifically designed to provide efficient conversion of sunlight in space to coherent laser light. Kilowatt and higher average power is sought from each gain element. Multiple such modular gain elements can be used to accumulate total average power of interest for power beaming in space, e.g., 100 kilowatts and more. Where desirable the high average power can also be produced as a train of pulses having high peak power (e.g., greater than 10(exp 10 watts). The modular nature of the basic gain element supports an experimental strategy in which the core technology can be validated by experiments on a single gain element. We propose to do this experimental validation both in terrestrial locations and also on a smaller scale in space. We describe a terrestrial experiment that includes diagnostics and the option of locating the laser beam path in vacuum environment. We describe a space based experiment designed to be compatible with the Japanese Experimental Module (JEM) on the International Space Station (ISS). We anticipate the gain elements will be based on low temperature (approx. 100 degrees Kelvin) operation of high thermal conductivity (k approx. 100 W/cm-K) diamond and sapphire (k approx. 4 W/cm-K). The basic gain element will be formed by sequences of thin alternating layers of diamond and Ti:sapphire with special attention given to the material interfaces. We anticipate this strategy will lead to a particularly simple, robust, and easily maintained low mass modelocked multi-element laser oscillator useful for space solar power.
Author
Solid State Lasers; Solar-Pumped Lasers; Oscillators

20030112690 Northrop Grumman Corp., San Antonio, TX, USA
A Study of the Effects of Multiple-Pulsed Laser Exposure on Increment Thresholds
Smith, Peter; Kosnik, William; McLin, Leon; Novar, Brenda; Aug. 2003; 17 pp.; In English
Contract(s)/Grant(s): F41924-02-D-7003; Proj-3257
Report No.(s): AD-A418065; AFRL-HE-BR-TR-2003-0116; No Copyright; Avail: CASI; A03, Hardcopy

Little is known about the effects of brief, repetitive laser pulses in the microsecond and sub-microsecond range on visual adaptation. Although it is generally acknowledged that, for pulsed light exposures from 1 to 150 ms, the total energy of a flash (intensity x duration) determines its brightness or adaptation potential, there are little data supporting this reciprocal relationship in human subjects. The purpose of this study was to compare the increment threshold for a spot target superimposed on an extended source image of a pulsed laser source, and to evaluate whether reciprocity holds. Eight subjects completed a method-of-adjustment determination of increment threshold for a 023 white test spot viewed superimposed on an extended source image (0.61) of a green (532 nm) laser beam. The laser pulse durations were 10 micro s, 100 micro s, 1 ms and 10 ms at 3 Hz and 10Hz. In addition, the effect of continuous wave (CW) exposure was determined. The time-average laser exposure was held constant across all the laser conditions. For the 3 Hz pulse condition, the threshold luminance was much lower than for the CW condition and there was no effect of pulse width, i.e. reciprocity was observed. However, thresholds for the 1 ms and 10 ms pulses at 10 Hz were higher than for the DW case, and this reciprocity failure was interrupted as a brightness enhancement effect More pulse durations and pulse rates must be studied before this failure can be more fully understood.
DTIC
Pulsed Lasers; Physiology; Adaptation; Laser Outputs; Visual Perception

20030112705 University of Central Florida, Orlando, FL
Micro-Fabrication of Spray Cooling Nozzles for High-Power Diode Laser Arrays
Chow, Louis C.; Aug. 28, 2003; 10 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0350; Proj-3484
Report No.(s): AD-A418103; AFRL-SR-AR-TR-03-0354; No Copyright; Avail: CASI; A02, Hardcopy

An important growing field in today's engineering is the development of Micro-Electrical and Mechanical Systems (MEMS). Over the years there have been many different fabrication processes that have been developed to meet these new demands. Most of the current micro-fabrication techniques work well for simple two-dimensional components. However, the demand for more complicated three-dimensional parts requiring a high aspect ratio requires that a new approach must be taken to make these ideas a reality. A novel fabrication method was developed in the late 1980's called stereolithography. This process involved using a low power laser to introduce free radicals in a polymer in which the molecules would cross-link and become solid. Using this ideal the stereolithography process was developed by 3D Systems to fabricate three- dimensional parts in a layer-by-layer manner.
DTIC
Fabrication; Cooling; Spray Nozzles; Lasers; Lithography; Diodes

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MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20030111610 Los Alamos National Lab., NM, USA
Miniature CVD-Diamond Coring Drills for Robotic Sample Collection and Analysis
Vaniman, D. T.; Trava-Airoldi, V. J.; Bish, D. L.; Chipera, S. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The specific application explored in this study is that of X-ray diffraction (XRD). A small robotic instrument for combined X-ray diffraction/X-ray fluorescence (XRD/XRF) analysis has been developed and has proved effective in the determination of mineralogy from XRD data on small (<1 mg) powdered samples of rocks and minerals. One of the obstacles to space applications of this instrument, however, is the need to acquire and insert rock powders robotically. Powdered samples are necessary to obtain accurate mineral identifications and quantitative mineral abundances by XRD. The low X-ray absorption coefficient of diamond permits transmission of X-rays with energies typically used in XRD (e.g., Cu Ka at 8.04 keV) with little attenuation. One of the standard sample mounting systems for powder XRD is based on glass capillaries in which small amounts of sample powder are held and rotated to present a large number of random crystal orientations to the X-ray beam. The capillaries used are made of silica glass with typical wall thicknesses of 10 mm and internal bores of 100-500 mm. A miniature, hollow CVD diamond drill can be as effective as a sample holder, exploiting the lower X-ray absorption coefficient of diamond to compensate for its thicker walls and taking advantage of the absence of amorphous X-ray scattering in crystalline diamond.
Author
Drills; Core Sampling; Diamonds

20030112532 Florida Univ., Gainesville, FL, USA
Design Optimization of Composite Structures under Uncertainty
Haftka, Raphael T.; November 2003; 3 pp.; In English
Contract(s)/Grant(s): NAG1-02042; No Copyright; Avail: CASI; A01, Hardcopy

Design optimization under uncertainty is computationally expensive and is also challenging in terms of alternative formulation. The work under the grant focused on developing methods for design against uncertainty that are applicable to composite structural design with emphasis on response surface techniques. Applications included design of stiffened composite plates for improved damage tolerance, the use of response surfaces for fitting weights obtained by structural optimization, and simultaneous design of structure and inspection periods for fail-safe structures.
Author
Structural Design; Optimization; Fail-Safe Systems; Design Optimization; Composite Structures

20030112686 NASA Glenn Research Center, Cleveland, OH, USA
Superfinished Surfaces for Power Transfer Systems Improvement
Niskanen, Paul; Manesh, Ali; Warren, Alford; Krantz, Timothy; October 2002; 16 pp.; In English; Defense Manufacturing Conference, 2-5 Dec. 2002, Dallas, TX, USA; No Copyright; Avail: CASI; A03, Hardcopy

The continuous demands for high performance and lightweight power train systems resulted in requirements for higher power density gearing systems. However, increasing the load bearing capacity of the gear teeth, without increasing size, places stringent requirements upon metallurgy, dimensional control, and surface finish of the final products. In order to operate the mating parts near the upper bounds of their theoretical design envelope, manufacturing processes are required that are capable of improving the fatigue life and load bearing capacity of precision parts, while producing the required geometric accuracy. Results of the recent experimental studies indicate that the super finishing process is able to achieve these goals. This paper will review the results of our continuing evaluation of the super finish process as applied to aerospace gearing. Two separate evaluations were performed on gears to examine the effects of super finishing on resistance to both pitting and contact fatigue. For the reported experiments, both conventional and super finished test gears were simultaneously manufactured using the same process and the same heat lot of materials. This paper will also provide a brief description of the manufacturing technology used to achieve the results and will compare the results with other published data. In addition, this paper presents a couple of off-the-shelf manufacturing technologies that have been successfully used to super finish test specimens and will provide a glimpse of other emerging super finishing technologies. This is a US Army Manufacturing Technology project. The project was sponsored by the Aviation and Missiles Command (AMCOM) and was being managed and conducted by IIT Research Institute.
Author
Surface Finishing; Control Surfaces; Manufacturing; Gear Teeth

20030112723 California Inst. of Tech., Pasadena, CA
Determination of Strain Fields at the Nanometer Scale with Applications to MEMS Design and Micromechanics
Knauss, Wolfgang G.; Chasiotis, Ioannis; Feb. 2002; 11 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0091
Report No.(s): AD-A418173; AFRL-SR-AR-TR-03-0360; No Copyright; Avail: CASI; A03, Hardcopy

This project focused on the determination of mechanical properties of thin films manufactured by polycrystalline silicon using the surface micromachining method. In addition to the measurement of mechanical properties by using an Atomic Force Microscope (AFM) or a Scanning Tunneling Microscope (STM) with the aid of the Digital Image Correlation Method (DIC), several other aspects of fracture behavior were addressed, including the effects of surface roughness and of notches to the fracture of the specimen in conjunction with grain size. This report summarizes the progress made on this program from August 1998 to September 1999. Several aspects of the material behavior and characteristics were addressed, such as material constants, surface condition, and the material behavior after long treatment by an etchant. The year also resulted in improvements to the loading device of the test setup and work on potential fracture mechanics specimen geometries. In addition, modifications were made to the STM to improve its performance. At the same time, an error analysis on the DIC was conducted, and a new approach to STM/DIC error analysis was investigated. (9 figures)
DTIC
Cracking (Fracturing); Thin Films; Fatigue (Materials); Cracks; Micromachining

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20030111031 Southwest Research Inst., Boulder, CO, USA
Discontinuities in Size-Strength Scaling Laws: Another Source of Wavy Size Distributions
Durda, D. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous studies with numerical collisional models have demonstrated that wave-like departures from traditional, linear power-law equilibrium size distributions can result from a small-size cutoff in the particle population. At small sizes, a particle cutoff may result from the rapid removal of bodies by non-gravitational forces such as Poynting- Robertson drag or the Yarkovsky effect. Another mechanism inducing waves in an equilibrium size distribution is the distinct change in slope in a size-strength scaling law resulting from the transition from strength-scaling for bodies smaller than about 100 200 m in diameter to gravity-scaling for larger objects. As the strengths of larger bodies increase relative to what they would have been had the strength-scaling law continued to larger sizes, their collision lifetimes increase and these excess objects represent an

overabundant source of projectiles for larger objects. Thus, a wave propagates up the size distribution starting at the size corresponding to the minimum in the size-strength scaling law. In this study, I demonstrate that discontinuities in the size-strength scaling law, as might occur at small sizes when particles are no longer homogeneous over the scale of fragmentation, can also induce significant waves in evolved size distributions.
Derived from text
Discontinuity; Scaling Laws; Mathematical Models; Mechanical Properties; Particle Size Distribution; Wave Propagation

20030111810 NASA Glenn Research Center, Cleveland, OH, USA
Oxidation of Ultra-High Temperature Ceramics in Water Vapor
Nguyen, QuynhGiao N.; Opila, Elizabeth J.; Robinson, Raymond C.; [2003]; 30 pp.; In English; 203rd Electrochemical Society Meeting, 27 Apr. - 2 May 2003, Paris, France; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Ultra high temperature ceramics (UHTCs) including HfB2 + SiC (20% by volume), ZrB2 + SiC (20% by volume) and ZrB2 + SiC (14% by volume) + C (30% by volume) have historically been evaluated as reusable thermal protection systems for hypersonic vehicles. This study investigates UHTCs for use as potential combustion and aeropropulsion engine materials. These materials were oxidized in water vapor (90%) using a cyclic vertical furnace at 1 atm. The total exposure time was 10 hours at temperatures of 1200, 1300, and 1400 C. CVD SiC was also evaluated as a baseline comparison. Weight change measurements, X-ray diffraction analyses, surface and cross-sectional SEM and EDS were performed. These results will be compared with tests ran in static air at temperatures of 1327, 1627, and 1927 C. Oxidation comparisons will also be made to the study by Tripp. A small number of high pressure burner rig (HPBR) results at 1100 and 1300 C will also be discussed. Specific weight changes at all three temperatures along with the SIC results are shown. SiC weight change is negligible at such short duration times. HB2 + SiC (HS) performed the best out of all the tested UHTCS for all exposure temperatures. ZrB2 + Sic (ZS) results indicate a slightly lower oxidation rate than that of ZrBl + SiC + C (ZCS) at 1200 and 1400 C, but a clear distinction can not be made based on the limited number of tested samples. Scanning electron micrographs of the cross-sections of all the UHTCs were evaluated. A representative area for HS is presented at 1400 C for 26 hours which was the composition with the least amount of oxidation. A continuous SiO2 scale is present in the outer most edge of the surface. An image of ZCS is presented at 1400 C for 10 hours, which shows the most degradation of all the compositions studied. Here, the oxide surface is a mixture of ZrSiO4, ZrO2 and SO2.
Derived from text
Ceramics; Oxidation; Water Vapor; Refractory Materials

20030111970 Pennsylvania State Univ., University Park, PA
Sustainable Acquisition Process Improvement for Naval Facilities Engineering Command
Sanders, Erin H.; Aug. 2003; 123 pp.; In English
Report No.(s): AD-A417789; No Copyright; Avail: CASI; A06, Hardcopy

Mandated reduction of natural resources consumed by U.S. Federal Facilities has forced agencies to reconsider how facilities are acquired. The process for acquiring federal facilities is guided by laws, executive orders, policies and regulations. While this guidance is intended to create an open and competitive process to achieve lowest cost or best value, conflicts among traditional acquisition processes and new law requirements are emerging. To meet the new requirements, laws must be implemented through effective policy. For over 6 years, the Navy has been acquiring sustainably designed facilities and has recently set sustainable development policy guidelines. To meet these new sustainable development goals, facility acquisition processes must reflect current policy mandates. In this thesis, numerous sustainable acquisition processes are evaluated. Selected processes occurring primarily in the Planning and Programming phases of a construction project are emphasized and represent common practices used by other governmental agencies. Through interviews and case study research, a set of feasible actions aimed to help NAVFAC achieve sustainable development goals are outlined. This thesis provides process improvement recommendations for Naval Facilities Engineering Command. (9 tables, 15 figures, 28 refs.)
DTIC
Policies; Construction; Procedures; Regulations

20030112219 NASA Glenn Research Center, Cleveland, OH, USA
Microstructure and Mechanical Properties of Extruded Gamma Microstructure Met PX
Draper, S. L.; Das, G.; Locci, J.; Whittenberger, J. D.; Lerch, B. A.; Kestler, H.; April 17, 2003; 6 pp.; In English; Gamma Titanium Aluminides 2003, 2003; Copyright; Avail: CASI; A02, Hardcopy

A gamma TiAl alloy with a high Nb content is being assessed as a compressor blade material. The microstructure and mechanical properties of extruded Ti-45Al-X(Nb,B,C) (at.%) were evaluated in both an as-extruded condition and after a lamellar heat treatment. Tensile behavior of both as-extruded and lamellar heat treated specimens was studied in the temperature range of RT to 926 C. In general, the yield stress and ultimate tensile strength reached relatively high values at room temperature and decreased with increasing deformation temperature. The fatigue strength of both microstructures was characterized at 650 C and compared to a baseline TiAl alloy and to a Ni-base superalloy. Tensile and fatigue specimens were also exposed to 800 C for 200 h in air to evaluate the alloy's environmental resistance. A decrease in ductility was observed at room temperature due to the 800 C. exposure but the 650 C fatigue properties were unaffected. Compressive and tensile creep testing between 727 and 1027 C revealed that the creep deformation was reproducible and predictable. Creep strengths reached superalloy-like levels at fast strain rates and lower temperatures but deformation at slower strain rates and/or higher temperature indicated significant weakening for the as-extruded condition. At high temperatures and low stresses, the lamellar microstructure had improved creep properties when compared to the as-extruded material. Microstructural evolution during heat treatment, identification of various phases, and the effect of microstructure on the tensile, fatigue, and creep behaviors is discussed.
Author
Extruding; Heat Resistant Alloys; Mechanical Properties; Microstructure; Titanium Alloys; Aluminum Alloys

20030112224 NASA Glenn Research Center, Cleveland, OH, USA
Combined Mode I and Mode II Fracture of Plasma-Sprayed Thermal Barrier Coatings at Ambient and Elevated Temperatures
Choi, Sung R.; Zhu, Dongming; Miller, Robert A.; [2003]; 31 pp.; In English; 27th Annual International Conference on Advanced Ceramics and Composites: Symposium on Advanced Ceramic Coatings for Structural, Environmental and Functional Applications, 26-31 Jan. 2003, Cocoa Beach, FL, USA; No Copyright; Avail: CASI; A03, Hardcopy

The mode I, mode II, and combined mode I-mode II fracture behavior of ZrO2- 8wt%Y2O3 thermal barrier coatings was determined in asymmetric flexure loading at both ambient and elevated temperatures. Precracks were introduced in test specimens using the single-edge-v-notched beam (SEVNB) method incorporated with final diamond polishing to achieve sharp crack tips. A fracture envelope of KI versus KII was determined for the coating material at ambient and elevated temperatures. Propagation angles of fracture as a function of K(sub I)/K(sub II) were also determined. The mixed-mode fracture behaviors of the coating material were compared with those of monolithic advanced ceramics determined previously. The mixed-mode fracture behavior of the plasma-sprayed thermal barrier coating material was predicted in terms of fracture envelope and propagation angle using mixed-mode fracture theories.
Author
Plasma Spraying; Ambient Temperature; High Temperature; Fracture Mechanics; Thermal Control Coatings

20030112449 NASA Glenn Research Center, Cleveland, OH, USA
Elevated Temperature Creep Deformation in Solid Solution <001> NiAL-3.6Ti Single Crystals
Whittenberger, J. Daniel; Noebe, Ronald D.; Darolia, Ram; [2003]; 26 pp.; In English
Contract(s)/Grant(s): 708-31-04; No Copyright; Avail: CASI; A03, Hardcopy

The 1100 to 1500 K slow plastic strain rate compressive properties of <001> oriented NiAl-3.6Ti single crystals have been measured, and the results suggests that two deformation processes exist. While the intermediate temperature/faster strain rate mechanism is uncertain, plastic flow at elevated temperature/slower strain rates in NiAl-3.6Ti appears to be controlled by solute drag as described by the Cottrell-Jaswon solute drag model for gliding b = a(sub 0)<101> dislocations. While the calculated activation energy of deformation is much higher (approximately 480 kJ/mol) than the activation energy for diffusion (approximately 290 kJ/mol) used in the Cottrell-Jaswon creep model, a forced temperature compensated - power law fit using the activation energy for diffusion was able to adequately (greater than 90%) predict the observed creep properties. Thus we conclude that the rejection of a diffusion controlled mechanism can not be simply based on a large numerical difference between the activation energies for deformation and diffusion.
Author
Creep Properties; Deformation; High Temperature; Single Crystals; Solid Solutions; Mechanical Properties; Titanium; Nickel Alloys; Aluminum Alloys

20030112671 NASA Glenn Research Center, Cleveland, OH, USA

Analytical Modeling of the High Strain Rate Deformation of Polymer Matrix Composites

Goldberg, Robert K.; Roberts, Gary D.; Gilat, Amos; [2003]; 9 pp.; In English; 44th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2003, Norfolk, VA, USA; No Copyright; Avail: CASI; A02, Hardcopy

The results presented here are part of an ongoing research program to develop strain rate dependent deformation and failure models for the analysis of polymer matrix composites subject to high strain rate impact loads. State variable constitutive equations originally developed for metals have been modified in order to model the nonlinear, strain rate dependent deformation of polymeric matrix materials. To account for the effects of hydrostatic stresses, which are significant in polymers, the classical 5 plasticity theory definitions of effective stress and effective plastic strain are modified by applying variations of the Drucker-Prager yield criterion. To verify the revised formulation, the shear and tensile deformation of a representative toughened epoxy is analyzed across a wide range of strain rates (from quasi-static to high strain rates) and the results are compared to experimentally obtained values. For the analyzed polymers, both the tensile and shear stress-strain curves computed using the analytical model correlate well with values obtained through experimental tests. The polymer constitutive equations are implemented within a strength of materials based micromechanics method to predict the nonlinear, strain rate dependent deformation of polymer matrix composites. In the micromechanics, the unit cell is divided up into a number of independently analyzed slices, and laminate theory is then applied to obtain the effective deformation of the unit cell. The composite mechanics are verified by analyzing the deformation of a representative polymer matrix composite (composed using the representative polymer analyzed for the correlation of the polymer constitutive equations) for several fiber orientation angles across a variety of strain rates. The computed values compare favorably to experimentally obtained results.

Author

Mathematical Models; Mechanical Properties; Polymer Matrix Composites; Strain Rate; Deformation

20030112683 NASA Glenn Research Center, Cleveland, OH, USA

Depth-Selective Diagnostics of Thermal Barrier Coatings Incorporating Thermographic Phosphors

Eldridge, J. I.; Bencic, T. J.; Allison, S. W.; Beshears, D. L.; [2003]; 28 pp.; In English; 49th International Instrumentation Symposium, 4-8 May 2003, Orland, FL, USA

Contract(s)/Grant(s): 22-713-82-52; No Copyright; Avail: CASI; A03, Hardcopy

Thermographic phosphors have been previously demonstrated to provide effective non- contact, emissivity-independent surface temperature measurements. Because of the translucent nature of thermal barrier coatings (TBCs), thermographic-phosphor-based temperature measurements can be extended beyond the surface to provide depth-selective temperature measurements by incorporating the thermographic phosphor layer at the depth where the temperature measurement is desired. In this paper, the use of thermographic phosphor (Y2O3:Eu) luminescence decay time measurements is demonstrated for the first time for through-the-thickness temperature readings up to 1000 C with the phosphor placed beneath a 100-micron-thick TBC (plasma-sprayed 8wt% yttria-stabilized zirconia). With an appropriately chosen excitation wavelength and detection configuration, it is shown that sufficient phosphor emission is generated to provide effective temperature measurements, despite the attenuation of both the excitation and emission intensities by the overlying TBC. This depth-selective temperature measurement capability should prove particularly useful for TBC diagnostics, where a large thermal gradient is typically present across the TBC thickness.

Author

Depth; Phosphors; Temperature Gradients; Thermal Control Coatings; Thermography

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20030110620 Case Western Reserve Univ., Cleveland, OH, USA

A Search for Impact Debris in the Pliocene Age Sirius Group, Transantarctic Mountains

Harvey, Ralph P.; Boyd, Hiram; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NAG5-11122; NSF OPP-99-80452; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Sirius Group is a mixed sequence of interbedded diamictite and mudstone of Pliocene age found at scattered locations along the length of the Transantarctic Mountains. Sirius Group rocks are usually considered tillites, but contain some very 'un-tillite' elements. Within section and from site to site, Sirius Group rocks vary considerably in terms of texture and relative abundance of clast lithologies, recording a history that includes shifting influences of glacial, lacustrine, fluvial and wetland processes. The colorful heritage of the Sirius Group has generated a lot of interest due to its potential as a record of changes in the behavior of the East Antarctic icesheet during a climatologically interesting period.
Derived from text
Debris; Lithology; Rocks; Glaciers

20030110628 Geological Survey, Flagstaff, AZ, USA
Visible/Near-Infrared Spectra of Experimentally Shocked Plagioclase Feldspars
Johnson, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NASA Order W-10037; NAG5-3871; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Minerals subjected to high shock pressures exhibit structural changes with increasing pressure (e.g., fractures, deformations, formation of diaplectic glass, and complete melting [1-6]). Petrologic and thermal infrared spectroscopic studies have shown that diaplectic glass (maskelynite) formation in feldspars occurs between ~25-45 GPa, while significant melting occurs above ~45 GPa [7- 12]. Past studies of visible/near-infrared spectra of shocked plagioclase feldspars demonstrated few variations in spectral features with pressure except for a decrease in the absorption feature near 1250 nm and an overall decrease in albedo [13-17]. We report new visible/near-infrared spectra of albite- and anorthiterich rocks experimentally shocked from 17-56 GPa.
Author
Rocks; Spectroscopic Analysis

20030110631 Humboldt Univ., Berlin, Germany
Strain Scanning Across a Shock-deformed Quartzite/Dunite Interface Using Neutron and Synchrotron Radiation
Kenkmann, T.; Walther, K.; Frischbutter, A.; Scheffzuek, C.; Eichhorn, F.; Daymond, M. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The composite and heterogeneous nature of rocks has a profound effect on the characteristics of shock metamorphism in a rock and leads to differences in strain, stress and temperature compared to that expected for a homogenous system. The present study is devoted to obtain a better understanding of shock related processes across planar interfaces. An experimentally shock deformed compound (16-34 GPa) of a strongly foliated quartzite and untextured dunite has been studied in order to determine the residual strain distribution across the interface. For this purpose neutron and synchrotron X-ray diffraction techniques have been applied to the experimentally shock deformed rocks.
Author
Strain Distribution; Quartzite; Dunite; Solid-Solid Interfaces

20030110644 Arizona State Univ., Tempe, AZ, USA
Composition and Spectra of Several Hawaiian Rock Coatings
Minitti, Michelle E.; Weitz, Catherine M.; Lane, Melissa D.; Bishop, Janice L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We acquired five samples of rock coatings from the Big Island of Hawaii. The coatings appear distinct in color and morphology. Both reflectance and thermal emission spectra were acquired for the coatings and for uncoated portions of the samples. SEM analyses provided compositional information about the coatings. Our goal is to apply the results of Hawaiian rock coatings to potential weathering rinds on Martian rocks.
Derived from text
Planetary Geology; Composition (Property); Emission Spectra; Rocks

20030110653 Geological Survey, Flagstaff, AZ, USA
Amphitrites-Peneus Paterae/Malea Planum Geology
Plescia, J. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Amphitrites Peneus Paterae complex lies on the southern rim of Hellas in Malea Planum. It is a low relief volcanic construct with two large calderas. A volcanic origin was proposed on the basis of Mariner 9 and Viking data. MOLA altimetry and MOC images provide new insight into the volcanic, aeolian and polar processes that have occurred in the region. Fig. 1 illustrates the shaded MOLA-based topography.
Derived from text
Volcanoes; Geology; Mars Surface; Topography

20030110659 Museum fuer Naturkunde, Berlin, Germany
Shock Metamorphism of Impactite Lithologies of the ICDP Chicxulub Drill Core YAX-1
Schmitt, R. T.; Stoeffler, D.; Wittmann, A.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The ICDP Chicxulub drillcore YAX-1 exposes about 100 m of allochthonus polymict impact breccias in a depth of 794.63 to 894.94 m [1]. In this preliminary study we focus on the shock effects and shock metamorphism of these impactites. Methods: 26 thin sections of the impactites from Yax-1 have been investigated for shock effects by optical microscopy and REM. The shock classification of the components using the method described in [2].
Author
Breccia; Metamorphism (Geology); Craters

20030110675 Museum fuer Naturkunde, Berlin, Germany
Clastic Polymict Dikes in the 'Megablock' Sequence of the ICDP-Chicxulub Drill Core Yax-1
Wittmann, A.; Kenkmann, T.; Schmitt, R. T.; Stoeffler, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): DFG-KE732/8; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Yaxcopoil borehole (Yax-1) penetrates below the suevitic units through 600 m of sediments (894.9 m-1510.9 m). These rocks are most likely of Cretaceous age and are regarded as a displaced megablock . The stratified sequence was intruded by suevitic dikes (910 m, 916 m), one impact melt dike (1347 m) and several clastic, polymict dikes. The latter are the focus of this study. We present our preliminary petrographic and structural investigations of the clastic dikes obtained by macroscopical, microscopical and SEM inspection.
Author
Craters; Impact Melts; Petrography

20030110769 Bayreuth Univ., Germany
On the Shock Behaviour of Anhydrite: Experimental Results and Natural Observations
Langenhorst, F.; Deutsch, A.; Hornemann, U.; Ivanov, B. A.; Lounejeva, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): DFG-LA-830/4-4; DFG-DE-401/15-4; DFG-HO-1446/3-4; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Bolide impacts into carbonate and evaporite target rocks liberate large amounts of the toxic gases such as CO2 and SOx and, hence, probably have significantly changed Earth's climate. In case of the 65 Ma old Chicxulub impact and the related Cretaceous/Tertiary (K/T) boundary, it has been argued that the perturbation of the atmosphere with these gases was sufficient to considerably modify its radiative balance and to increase rain acidity. Recent theoretical assessments indicate that in the context of the Chicxulub event, global warming due to CO2 input was minor compared to cooling due to SOx gases. Despite this potential importance of impact-released SOx gases, the shock-metamorphic behaviour of sulfates is much less studied than that of carbonates. To address the shock behavior of sulfates, we performed a series of shock experiments designed for complete recovery of the shocked material, and sampled anhydrite-rich impact breccias from the recently available Chicxulub drill cores.
Author
Shock Tests; Meteorite Craters; Metamorphism (Geology); Sulfates; Breccia

20030110788 NASA Johnson Space Center, Houston, TX, USA

Crystallization and Alteration Ages of the Antarctic Nakhlite Yamato 000593

Musawa, K.; Shih, C.-Y.; Wiesmann, H.; Nyquist, L. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nakhlites are unbrecciated, olivine-bearing clinopyroxenites that probably came from Mars. A total of eight nakhlites have been identified, including five recent finds: two samples (104 g and 456 g) from the hot desert of Morocco (NWA 817 and NWA 998), and three samples, a total weight of approx.15 kg, from the Yamato Mountains of Antarctica (Y000593, Y000749 and Y000802). Preliminary isotopic results for Y000593 have been given by Shih et al.. In this report, we present Rb-Sr and Sm-Nd isochron data for Y000593 and discuss the age correlation with other nakhlites and the timing of aqueous alteration on Mars.

Derived from text

Nakhlites; Crystallization; Isotopes

20030110794 NASA Johnson Space Center, Houston, TX, USA

Modern Microbial Fossilization Processes as Signatures for Interpreting Ancient Terrestrial and Extraterrestrial Microbial Forms

Morris, Penny A.; Wentworth, Susan J.; Nelman, Mayra; Byrne, Monica; Longazo, Teresa; Galindo, Charles; McKay, David S.; Sams, Clarence; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): NAG9-1113; NAG9-1114; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Terrestrial biotas from microbially dominated hypersaline environments will help us understand microbial fossilization processes. Hypersaline tolerant biota from Storr's Lake, San Salvador Island (Bahamas), Mono Lake (California), and the Dead Sea (Israel) represent marine and nonmarine sites for comparative studies of potential analogs for interpreting some Mars meteorites and Mars sample return rocks [1,2,3,4,5,6]. The purpose of this study is to compare microbial fossilization processes, the dominant associated minerals, and potential diagenic implications.

Author

Rocks; Lakes; Microorganisms

20030110806 Academy of Sciences of the Ukraine, Ukraine

The Structure of High Lonsdaleite Diamond Grains from the Impactites of the Belilovka (Zapadnaja) Astrobleme (Ukraine)

Olenik, G. S.; Valter, A. A.; Erjomenko, G. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Belilovka (Zapadnaja) astrobleme is situated on the Ukrainian shield and appear to be deeply eroded explosive meteorite crater with the present diameter Dsub1 about 4 km and the initial one was estimated to be Dsub2 about 5,5 km. The impactites of this astrobleme have a high content of diamonds: up to 8 ppm in the representative geological sampling [1]. Belilovka impact diamond grains have an average lonsdaleite content some higher than a Popigai ones.The most lonsdaleite-rich variety of impact diamond grains is the black graphite-bearing one with lonsdaleite : cubic diamond ratio estimated by X-Ray data near 1. Such grain was studied in this work.

Author

Meteorite Craters; Meteoritic Diamonds

20030110917 Arizona State Univ., Tempe, AZ, USA

The Distribution and Significance of Shock-induced High-Pressure Minerals in Chondrite Skip Wilson

Aramovich, C. J.; Sharp, T. G.; Wolf, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The goals of this study are to 1) use the igneous melt-vein assemblages to constrain the P-T conditions of crystallization during shock, 2) determine the distribution of high-pressure minerals associated with shock-induced melt veins, 3) determine

if the transformed polycrystalline inclusions in the melt vein can be explained in terms of the localized high temperatures rather than localized pressure and temperature excursions.
Derived from text
Chondrites; Meteoritic Composition; Shock Heating; Impact Melts

20030111011 Verish (Robert S.), Sunland, CA, USA
Dale Dry Lake: New Classification, Revised Recovery Information
Verish, R. S.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper reports on a recent characterization of the Dale Dry Lake meteorite by researchers at UCLA. This stone is now classified as an unequilibrated chondrite.
Author
Chondrites; Meteorites; Classifications

20030111018 National Inst. of Polar Research, Tokyo, Japan
An Anomalous Eucrite, Dhofar 007, and a Possible Genetic Relationship with Mesosiderites
Yamaguchi, A.; Setoyanagi, T.; Ebihara, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An achondrite, Dhofar 007 (approximately 27 kg) was found in the Oman desert and was initially classified as a cumulate eucrite. However, Yamaguchi et al. showed that a coarse-grained clast (CG clast) in Dhofar 007 has a high abundance of metallic phases and the high bulk Ni and Co contents, and suggested a possible relationship with mesosiderites. We performed an additional petrologic and geochemical study to better understand the differentiation, shock, and thermal history of Dhofar 007. We compared Dhofar 007 to HED meteorites and mesosiderites to fill the gap in our knowledge of the geologic history of these meteorite groups.
Derived from text
Achondrites; Geochemistry; Iron Meteorites

20030111039 Consejo Superior de Investigaciones Cientificas, Torrejon de Ardoz, Spain
An Alternative Hypothesis for the Origin of Ferroan Ringwoodite in the Pumice of El Gasco (Caceres, Spain)
Diaz-Martinez-E.; Ormoe, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ferroan ringwoodite was recently identified by XRD in pumiceous rocks from northern Caceres province (Extremadura, western Spain), and confirmed by electron microprobe analysis. The quartz-rich vitrocrystalline rock crops out atop a hill near the village of El Gasco. The outcrop was originally interpreted as volcanic in origin, and more recently reinterpreted as impact-related based on the presence of high-temperature and high-pressure mineral phases such as lechatelierite (silica glass), hercynite, ferroan ringwoodite (iron silicate spinel), and iron droplets. The geochemistry confirms that the pumiceous rock originated through partial melting of the quartzite from the local substrate. A volcanic origin (rhyolite) was discarded based on geochemistry and petrology, and an anthropogenic origin (slag) or lightning-strike origin (fulgurite) were discarded based on the large volume involved and absence of ore minerals. An estimated volume exceeding 50 cu m has already been extracted for industrial use and local craftsmanship.
Author
Petrogenesis; Rocks; Impact Melts; Iron Meteorites; Meteorite Collisions

20030111076 California Univ., Santa Cruz, CA, USA
Modeling Asteroid Impact Dynamics: Catastrophic Disruption of Three Distinct Structure Types
Hart, S. D.; Asphaug, E.; Durda, D.; Flynn, G. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper reports the outcome of highspeed collision experiments in three distinct structure types. The purpose was to make qualitative and quantitative comparisons of possible asteroid structure types, specifically aggregates (to simulate a rubble pile body), fractured bodies and solid bodies. The benefits of such a study are numerous and will help to demonstrate the types

of processes that form the space environment that surrounds the Earth. Helping to shed light on the collision history of our solar system, these experiments could also help us to predict future impact events. There have been numerous impact experiments in the past, but relatively few have dealt with the comparison of impacts of similar energy into distinct structure types. All of the bodies consisted of a porphorytic basalt with olivine phenocrysts, in order to best simulate the consistency of a chondritic meteorite [1]. The experiments were conducted at the Ames Vertical Gun Range (AVGR) in October 2001 and June 2002.
Author
Meteorite Collisions; Asteroid Collisions; Impact

20030111086 Wien Univ., Austria
Scanning Electron Microscopy, Cathodoluminescence, and Raman Spectroscopy of Experimentally Shock Metamorphosed Quartzite
Gucsik, Arnold; Koeberl, Christian; Brandstatter, Franz; Libowitzky, Eugen; Reimold, Wolf Uwe; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cathodoluminescence (CL) is an optical phenomenon that is based on the generation of visible radiation through sample excitation by high-energy electrons (in general, with energies of the incident beam of 5-25 kV, the depth of penetration is 1-3 m). Wavelengths of the cathodoluminescence emissions range from the ultraviolet (UV) to the infrared (IR) and result from a variety of defects (e.g., various structural imperfections, such as poor ordering, radiation damage, shock damage) and impurities in the crystal structure of a mineral. So far, no systematic study has been made regarding the changes of CL properties (optical appearance in CL images, and the characteristics of CL spectra) with shock pressure in quartz. As quartz is one of the most common rock-forming minerals, for which ample information on shock-related changes of a large variety of mineralogical, crystallographic, and petrographic parameters exists, we undertook such an investigation.
Author
Scanning Electron Microscopy; Cathodoluminescence; Raman Spectroscopy; Quartzite

20030111188 Geological Survey, Flagstaff, AZ, USA
Thermal Emission Spectrometer Mosaics of Impact Craters: Progress on Shocked Plagioclase Detections
Johnson, J. R.; Staid, M. I.; Titus, T. N.; Gaddis, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

High shock pressures disorder the mineral lattice of plagioclase feldspars and cause weakening and shifts in thermal infrared absorption bands related to an increase in diaplectic glass content, particularly at shock pressures above ~20-25 GPa [1- 9]. We are continuing our investigation of spectral deconvolutions of TES mosaics and mosaics using standard TES orbits for eight impact crater areas. Using a combination of mineral laboratory spectra and spectra of experimentally shocked bytownite feldspars [5] to deconvolve the TES spectra, we find that locations of shocked feldspar detections are not restricted to ejecta near large craters.
Author
Craters; Feldspars; Emission Spectra

20030111215 Minnesota Univ., Minneapolis, MN, USA
Melt Redistribution in Dynamic Systems: Applications to Core Formation
Hustoft, J. W.; Kohlstedt, D. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Samples of olivine + Fe-S were fabricated by hot-pressing a mechanical mixture of the two phases. Olivine powders with a starting grain size of approx. 10 microns were prepared by crushing crystals of San Carlos olivine followed by pulverization in a fluid energy mill. Iron sulfide powder with a particle size of approx. 5 microns was prepared from a 2:1 mixture of reagent grade iron sulfide (FeS) plus iron. Rods 20 mm in length by 10 mm in diameter were cold-pressed into iron capsules with a uniaxial stress of approx. 200 MPa. These rods were then hot-pressed at 1523 K and 300 MPa for 4 h to obtain a starting material with <2% porosity. Samples for shear experiments were cut perpendicular to the long axis of these rods. The discs were shaped into ellipses approx. 6 mm by approx. 8 mm with a thickness ranging from 0.6 to 1.0 mm. An iron foil strain marker was inserted into a cut made along the minor axis. The sample was placed between two thoriated tungsten pistons cut at 45 deg to the long axis and then placed into an iron sleeve capped by alumina discs. The sample was then sheared in a gas

pressure-medium apparatus at a temperature of 1523 K and a confining pressure of 300 MPa.
Author
Melts (Crystal Growth); Olivine; Iron Compounds; Sulfides

20030111323 Academy of Sciences (USSR), Moscow, USSR
Impacts Do Not Initiate Volcanic Eruptions
Ivanov, B. A.; Melosh, H. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): RFBS-01-05-64564-a; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A theme that runs through many papers on meteorite impact is the idea that large impacts can induce volcanic eruptions through decompression melting of the underlying rocks. We perform numerical simulations of the impact of an asteroid with a diameter of 20 km striking at 15 km/s into a target with a near surface temperature gradient of 13 K km/1 ('cold' case) or 30 K km/1 ('hot' case). The impact ultimately creates a 250 to 300 km diameter crater with approximately 10,000 to 20,000 cu km of impact melt. However, the crater collapses almost flat and the pressure field returns almost to the initial lithostat. Even an impact this large is insufficient to raise mantle material above the peridotite solidus due to decompression only. The probability that such an impact coincides with the much more frequent occurrence of Large Igneous Provinces seems to be low. We conclude that it is unlikely that a large impact struck such a province any time in post-heavy bombardment Earth history.
Author
Numerical Analysis; Meteorite Collisions; Meteorite Craters

20030111359 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Redox Chemistry: Atacama Desert Soils as a Terrestrial Analog
Quinn, R. C.; Grunthaner, F. J.; Taylor, C. L.; Zent, A. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The motivation for this work is to perform quantitative site characterizations of soil chemical processes to allow further development and field validation of the Mars Oxidant Instrument (MOI). The MOI is an in situ survey instrument designed to establish the presence of reactive chemical species in the martian soil, dust, or atmosphere, and to provide detailed reaction model system measurements to enable comprehensive Earthbased study. Functioning as a survey instrument, MOI tests the broad range of hypotheses explaining the reactivity of the martian surface material that have been put forth since the Viking experiments. This work is currently being carried out under the NASA ASTEP funded AstroBioLab (Jeffery Bada, PI). A second objective is to use Atacama field and Viking data to perform comparative studies, with the goal of furthering the understanding of the formation mechanisms and properties of martian oxidants.
Author
Deserts; Soils

20030111368 Stanford Univ., Stanford, CA, USA
Compositional Grading in an Impact-produced Spherule Bed, Barberton Greenstone Belt, South Africa: A Key to Condensation History of Rock Vapor Clouds
Krull, A. E.; Lowe, D. R.; Byerly, G. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NCC2-721; NAG5-98421; NSF EAR-99-09684; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The chemical and physical processes by which spherules form during the condensation of impact-produced rock vapor clouds are poorly understood. Although efforts have been made to model the processes of spherule formation, there is presently a paucity of field data to constrain the resulting theoretical models. The present study examines the vertical compositional variability in a single early Archean spherule bed in the Barberton Greenstone Belt (BGB), South Africa, in order to better identify the process by which impact vapor clouds condense and spherules form and accumulate. The BGB spherule beds are suitable for this type of study because of their great thickness, often exceeding 25cm of pure spherules, due to the massive sizes of the impactors. Two main problems complicate analysis of vertical compositional variability of graded spherule beds: (1) differential settling of particles in both the vapor and water column due to density and size differences and (2) turbulence within the vapor cloud. The present study compares sections of spherule bed S3 from four different depositional environments

in the Barberton Greenstone Belt: (1) The Sheba Mine section (SAF-381) was deposited under fairly low energy conditions in deep water, providing a nice fallout sequence, and also has abundant Ni-rich spinels; (2) Jay's Chert section (SAF-380) was deposited in subaerial to shallow-water conditions with extensive post-depositional reworking by currents. The spherules also have preserved spinels; (3) the Loop Road section (loc. SAF-295; samp. KSA-7) was moderately reworked and has only rare preservation of spinels; and (4) the shallow-water Barite Syncline section (loc. SAF-206; samp KSA-1) has few to no spinels preserved and is not reworked. Although all of the spherule beds have been altered by silica diagenesis and K-metasomatism, most of the compositional differences between these sections appear to reflect their diagenetic histories, possibly related to their differing depositional environments. Sulfate diagenesis in the Barite Syncline and Loop road sections may account for the loss of spinels.
Author
Spherules; Condensates; Meteorite Collisions; Rocks; Vaporizing

20030111370 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Elements of the Chicxulub Impact Structure as Revealed in SRTM and Surface GPS Topographic Data
Kinsland, Gary L.; Sanchez, Gary; Kobrick, Michael; Cardador, Manuel Hurtado; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pope et al. [1] utilized the elevations from the Petroleos Mexicanos (PEMEX) gravity data files to show that the main component of the surface expression of the Chicxulub Impact Structure is a roughly semi-circular, lowrelief depression about 90 km in diameter. They also identified other topographic features and the elements of the buried impact, which possibly led to the development of these features. These are summarized in Table 1. Kinsland et al. [2] presented a connection between these topographic anomalies, small gravity anomalies and buried structure of the impact. Very recently we have acquired digital topography data from NASA s Shuttle Radar Topography Mission (SRTM). Our subset covers 6 square degrees from 20deg N 91degW to 22deg N 88degW (corner to corner) with a pixel size of about 90m. This area includes all of the identified portion of the crater on land.
Author
Craters; Image Analysis; Topography

20030111372 Auburn Univ., AL, USA
The Albion Impactoclastic Breccia (Albion Diamictite Bed): Cumulative Grain-Size Frequency Curves and Possible Modes of Emplacement
King, D. T., Jr.; Petruny, L. W.; Pope, K. O.; Ocampo, A. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Albion impactoclastic breccia [1] (named the Albion diamictite bed by [2]) in Albion Island, Belize (Figure 1), and nearby areas in Quintana Roo, Mexico, is a very coarse, carbonate clast-rich unit that was formed by ballistic sedimentation and ejecta debris-flow processes in the aftermath of the Chicxulub impact event on the Yucat n Peninsula of M xico. The Albion impactoclastic breccia is a parabreccia (sensu [3]), meaning that if the matrix could be removed the remaining clasts would collapse. The Albion impactoclastic breccia (~15 m) is underlain by a ~ 1-2 m-thick, fine-grained impactoclastic unit containing accretionary lapilli and clay clasts (named the Albion spheroid bed by [2]; Figure 2)). This finer grained unit underlies the breccia and together these two impactoclastic units comprise a mappable, unconformity-bounded stratigraphic interval between upper Maastrichtian dolostones and lower Tertiary thin-bedded limestones in the study area [2].
Author
Breccia; Craters

20030111388 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Magnetic Analysis Techniques Applied to Desert Varnish
Schmidgall, E. R.; Moskowitz, B. M.; Dahlberg, E. D.; Kuhlman, K. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Desert varnish is a black or reddish coating commonly found on rock samples from arid regions. Typically, the coating is very thin, less than half a millimeter thick. Previous research has shown that the primary components of desert varnish are silicon oxide clay minerals (~60%), manganese and iron oxides (~20-30%), and trace amounts of other compounds [1]. Desert

varnish is thought to originate when windborne particles containing iron and manganese oxides are deposited onto rock surfaces where manganese oxidizing bacteria concentrate the manganese and form the varnish [4,5]. If desert varnish is indeed biogenic, then the presence of desert varnish on rock surfaces could serve as a biomarker, indicating the presence of microorganisms. This idea has considerable appeal, especially for Martian exploration [6]. Magnetic analysis techniques have not been extensively applied to desert varnish. The only previous magnetic study reported that based on room temperature demagnetization experiments, there were noticeable differences in magnetic properties between a sample of desert varnish and the substrate sandstone [7]. Based upon the results of the demagnetization experiments, the authors concluded that the primary magnetic component of desert varnish was either magnetite (Fe3O4) or maghemite (Fe2O3).
Derived from text
Deserts; Magnetic Properties

20030111390 Cologne Univ., Germany
Arsenic and Sb Abundances in the Earth Mantle
Schmidt, G.; Palme, H.; Spettel, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mantle derived peridotite xenoliths ranging in modal composition between fertile lherzolites and modally metasomatized harzburgites has been analyzed by instrumental neutron activation analysis (INAA) for As, Sb and REE. In many melt depleted mantle samples (harzburgites) the incompatible element concentrations are much higher than those estimated for the fertile mantle. The reason for this is that the subcontinental lithospheric mantle stabilised by melt extraction postdated by processes of trace element enrichment and/or mantle metasomatism. The rarely determined elements As and Sb in mantle rocks have been tried to use as geochemical tracers for understanding fluid-related processes postdating melt extraction processes.
Author
Earth Mantle; Neutron Activation Analysis

20030111437 Instituto Nacional de Tecnica Aeroespacial, Torrejon de Ardoz, Spain
Crater Dimensions from Impacts at Sea
Ormoe, J.; Lindstroem, M.; Shuvalov, V. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Studies of marine-target impact structures indicate a significant difference in the cratering mechanism to the better known land-target crater, often used as standard in impact cratering. The marine-target crater develops, basically, in a target with layers of different strength. The resulting crater often shows an outer shallow crater surrounding an inner crater in the more rigid basement. Neither the outer, nor the inner crater does directly express the shape of the transient crater. It develops in both seafloor and water mass and, hence, differs significantly from land target impacts. So, how to compare the diameter of a marine-target crater with other impact craters? It appears that a combination of numerical modeling and geological fieldwork is the best way of determining the size of the transient crater for a marine-target crater and, hence, the magnitude of the event.
Derived from text
Cratering; Ocean Bottom; Meteorite Craters; Meteoritic Damage; Size (Dimensions); Craters

20030111458 California Inst. of Tech., Pasadena, CA, USA
Basin Forming Impacts: Heterogeneity as a Unifying Construct
OKeefe, John; Ahrens, Thomas J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Chicxulub crater is considered to be an archetype for basin forming impacts and is the object of extensive field measurements and modeling. We have new modeling results using the geologic strength/damage model, GEODAM, that reproduces the major features found in the Chicxulub field measurements. These include inverted stratigraphy, peak rings, terracing, Moho penetrating annular faults, Moho undulation, and melt layering. In support of this effort, we developed a Mohr-Coulomb scaling law, which explicitly accounts for the effects of internal friction and the brittle-ductile transition in the basin forming region.
Derived from text
Heterogeneity; Meteorite Craters; Impact Damage; Meteoritic Damage

20030111499 New Mexico State Univ., Las Cruces, NM, USA

Toward Understanding the Conditions Required for Plate Tectonics to Occur on Earth-like Planets

Solomatov, V. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous studies of initiation of plate tectonics were concerned mostly with the present day Earth where plate tectonics is actively occurring [13]. Understanding of how plate tectonics starts and can be sustained for a long time on an Earthlike planet is a different problem. Investigation of this problem began only recently [46]. This problem is also important for understanding evolution and tectonics of other terrestrial planets in the Solar System. These planets do not have plate tectonics at present but could have had plate tectonics in the past. Planets beyond the Solar System are of interest as well from the perspective of how life begins: the biosphere is strongly affected by plate tectonics and may not evolve to higher forms without plate tectonics. In particular, plate tectonics is known to play a key role in the longterm stability of planetary climate. These problems require some level of predictive power which in turn requires a better insight into the physical mechanisms of plate tectonics. The purpose of this study is to investigate initiation of plate tectonics on a most likely model of a terrestrial planet with predominantly internal heat sources and in the strongly time dependent regime of stagnant lid convection.

Author

Terrestrial Planets; Plates (Tectonics)

20030111558 NASA Johnson Space Center, Houston, TX, USA

Three-Dimensional Morphological Analysis of ALH84001 Magnetite Using Electron Tomography

Thomas-Keprta, Kathie L.; Clemett, Simon J.; Shimmin, Joel; Morphew, Mary; McIntosh, J. Richard; Bazylinski, Dennis A.; Kirschvink, Joseph L.; Wentworth, Susan J.; McKay, David S.; Vali, Hojatollah, et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report here the crystal morphologies of MV-1 and ALH84001 magnetites as calculated by back-projection using electron tomography. In the present study, we used a 300 keV TEM with a field emission gun (Tecnai F-30 from FEI Inc.), equipped with a 2048 x 2048 pixel CCD camera from Gatan Inc. to image magnetite crystals over tilt ranges of approx. +/- 72 deg in 2 deg tilt intervals. The images were aligned for back-projection, either manually, or through the use of fiducial 5 nm Au spheres affixed to the specimen prior to microscopy. Three-dimensional (3-D) reconstructions were computed using weighted back-projection of the tilted views. The tomograms were viewed and analyzed as a series of slices 1.0 nm thick, taken parallel to the specimen-supporting grid, using the IMOD software package. The shape of each magnetite crystal was determined by defining the external contour of a given magnetite in each slice and assembling a stack of these contours in 3-D. To aid in visualization, the stacked contour array was reduced to an optimal mesh by Delaunay triangulation. The surface normal to each of the triangles in the mesh was calculated and the triangle faces colored according to the orientation of that surface normal relative to the principal crystallographic axis of magnetite. Green surfaces correspond to {111} orientations, blue surfaces to {100} orientations, and red surfaces to {110} orientations. Triangles whose surface normal did not correspond to one of the principal axes were colored gray. Within the experimental and numerical uncertainties of the deconvolution, the tomographic reconstruction of both MV-1 and ALH84001 magnetites are equivalent and correspond to a truncated hexa-octahedral morphology.

Author

SNC Meteorites; Morphology; Magnetite; Tomography; Crystal Structure

20030111574 Academy of Sciences (USSR), Moscow, USSR

Ejecta Formation and Deposition After the Mjolnir Impact

Shuvalov, V.; Dypvik, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mjolnir submarine crater (40 km in diameter and located in the Barents Sea) is interpreted as formed by the impact of an 1.5 to 2 km in diameter asteroid into a 200-400 m deep epicontinental paleo-Barents Sea. The target area consisted of a sedimentary sequence of Devonian to Jurassic age, at least 6 km thick, overlying older, well lithified sedimentary strata. The simulation of Shuvalov et al. modeled the formation of the Mjolnir Crater, but the ejecta formation and distribution were not discussed in detail. In a case as that of the Mjolnir Crater, being buried beneath sediments and water in the Barents Sea, understanding the ejecta formation may be particularly important since ejecta are the most easily accessible crater products.

In this study we consider the influence of water layer and impact angle on ejecta distribution and apply the results for the Mjolnir Crater.
Derived from text
Craters; Ejecta; Cratering; Meteoritic Damage

20030111584 NASA Johnson Space Center, Houston, TX, USA
Dynamic Crystallization Experiments on LEW97008: Experimental Reproduction of Chondroid Textures
Nettles, J. W.; Le, L.; Lofgren, G. E.; McSween, H. Y, Jr.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Dynamic crystallization experiments were conducted using LEW97008 (L3.4) as starting material. Experiments were melted at temperatures well below its liquidus (1250-1450 C) in order to document the textural and compositional changes that occur in UOC material with modest amounts of partial melting and subsequent crystallization. The textures of the experimental products compare very well to natural chondroids (partially melted nebular particles that would become chondrules if more completely melted). Thus it is possible to use the textures in these experiments as a guide to unraveling the melting and cooling histories of natural chondroids. The Antarctic meteorite LEW97008 was chosen as the starting material for our experiments. As an L3.4 it is slightly more metamorphosed than would ordinarily be preferred, but this meteorite is unusually fresh for an Antarctic meteorite, which made it attractive.
Derived from text
Chondrule; Cooling; Melting; Meteorites; Meteoritic Composition

20030111618 Academy of Sciences (USSR), Moscow, USSR
Numerical Modeling of the Eltanin Impact
Shuvalov, V. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): RFBR-00-05-81152; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Eltanin is the only presently known impact structure formed during the fall of a cosmic body into a deep (4-5 km) oceanic basin. The evidence for the impact origin of this structure is the discovery in 1981 of an iridium anomaly in the bottom deposits. Subsequent studies showed that the meteoritic material was present in three sedimentary rocks spaced at 500 km. Unmelted fragments of the impactor with sizes less than 2 cm were also found. According to the estimates made by Gersonde and Kyte, the impact structure of Eltanin was formed by the impact of an asteroid 0.5-2 km in size that occurred 2.2 Myr ago. No traces of crater have been discovered. In this paper I used numerical simulations to estimate a probable impactor size, to follow the fate of a projectile, and to calculate an initial tsunami amplitude. To simulate the main stages of the impact I used the multi-material multi-dimensional hydrocode SOVA. The SOVA code is close in its characteristics to the CTH code, which is widely used in the USA. To calculate the thermodynamic parameters I used the tabular equation of state for air, the Tillotson equation of state for water and basalt sea floor, and ANEOS for the projectile (consisting of dunite). The ocean depth was considered to be 4 km.
Derived from text
Asteroids; Craters; Mathematical Models; Asteroid Collisions; Tsunami Waves; Ocean Bottom

20030111620 Brown Univ., Providence, RI, USA
Transient Crater Growth in Low Density Targets
Schultz, P. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent studies suggest that impacts into highly porous target materials require a new cratering regime controlled by compressional effects (1). Such research is important for interpreting the geologic history of small bodies and for the upcoming Deep Impact mission in 2005. An alternative view (2) suggests that even highly porous targets density of 0.2g/cc) undergo gravity controlled growth and that previous studies underestimated the effects of an ambient atmospheres as previously documented (3,4). The present study re-examines these conflicting views.
Author
Cratering; Porous Materials

20030111651 Tokyo Univ., Japan

Global Methane Production by Iron Meteorites Impacts on Early Earth

Sekine, Y.; Sugita, S.; Kadono, T.; Matsui, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impacts of planetisimals on early Earth have been considered to affect the origin and evolution of life and atmosphere (1). We suggest an importance of organic synthesis due to catalytic reaction like Fischer-Tropsch catalysis over the hot iron condensates. When condensed particles, formed in an expanding impact vapor plume, reenter into the atmosphere, those would be heated by the drag of atmosphere (2) and form a stagnant layer. In such a high temperature condensate layer, catalytic reaction like Fischer-Tropsch catalysis over the hot iron condensates may proceed rapidly.

Derived from text

Catalysis; Fischer-Tropsch Process; Iron Meteorites; Methane; Paleontology; Geochemistry

20030112413 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Temperature Data Assimilation with Salinity Corrections: Validation for the NSIPP Ocean Data Assimilation System in the Tropical Pacific Ocean, 1993-1998

Troccoli, Alberto; Rienecker, Michele M.; Keppenne, Christian L.; Johnson, Gregory C.; July 2003; 33 pp.; In English

Report No.(s): NASA/TM-2003-104606/VOL24; Rept-2003-02419-0/VOL24; NAS 1.15:104606/VOL24; No Copyright; Avail: CASI; A03, Hardcopy

The NASA Seasonal-to-Interannual Prediction Project (NSIPP) has developed an Ocean data assimilation system to initialize the quasi-isopycnal ocean model used in our experimental coupled-model forecast system. Initial tests of the system have focused on the assimilation of temperature profiles in an optimal interpolation framework. It is now recognized that correction of temperature only often introduces spurious water masses. The resulting density distribution can be statically unstable and also have a detrimental impact on the velocity distribution. Several simple schemes have been developed to try to correct these deficiencies. Here the salinity field is corrected by using a scheme which assumes that the temperature-salinity relationship of the model background is preserved during the assimilation. The scheme was first introduced for a zlevel model by Troccoli and Haines (1999). A large set of subsurface observations of salinity and temperature is used to cross-validate two data assimilation experiments run for the 6-year period 1993-1998. In these two experiments only subsurface temperature observations are used, but in one case the salinity field is also updated whenever temperature observations are available.

Author

Ocean Data Acquisitions Systems; Temperature Profiles; Annual Variations; NASA Programs; Salinity; Pacific Ocean; Tropical Regions

20030112775 NASA Ames Research Center, Moffett Field, CA, USA

Uptake of Small Organic Compounds by Sulfuric Acid Aerosols: Dissolution and Reaction

Iraci, L. T.; Michelsen, R. R.; Ashbourn, S. F. M.; Staton, S. J. R.; [2003]; 1 pp.; In English; 22nd Annual American Association for Aerosol Research, 21-24 Oct. 2003, Anaheim, CA, USA

Contract(s)/Grant(s): 622-67-21-10; No Copyright; Avail: CASI; A01, Hardcopy

To assess the role of oxygenated volatile organic compounds in the upper troposphere and lower stratosphere, the interactions of a series of small organic compounds with low-temperature aqueous sulfuric acid will be evaluated. The total amount of organic material which may be taken up from the gas phase by dissolution, surface layer formation, and reaction during the particle lifetime will be quantified. Our current results for acetaldehyde uptake on 40 - 80 wt% sulfuric acid solutions will be compared to those of methanol, formaldehyde, and acetone to investigate the relationships between chemical functionality and heterogeneous activity. Where possible, equilibrium uptake will be ascribed to component pathways (hydration, protonation, etc.) to facilitate evaluation of other species not yet studied in low temperature aqueous sulfuric acid.

Author

Organic Compounds; Stratosphere; Sulfuric Acid; Troposphere; Volatile Organic Compounds; Dissolving; Chemical Reactions

20030112777 NASA Ames Research Center, Moffett Field, CA, USA

Vertically Resolved Aerosol Optical Properties over the ARM SGP Site

Schmid, B.; Jonsson, H.; Strawa, A.; Provencal, B.; Covert, D.; Arnott, P.; Bucholtz, A.; Pilewskie, P.; Pommier, J.; Rissman,

T., et al.; [2003]; 1 pp.; In English; American Association for Aerosol Research Poster, 2003, Annaheim, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

In order to meet one of its goals - to relate observations of radiative fluxes and radiances to the atmospheric composition - the Department of Energy's Atmospheric Radiation Measurement (ARM) program has pursued measurements and modeling activities that attempt to determine how aerosols impact atmospheric radiative transfer, both directly and indirectly. However, significant discrepancies between aerosol properties measured in situ or remotely remain. To this end, the ARM program will conduct an Aerosol Intensive Operational Period (IOP) in May 2003 at the ARM Southern Great Plains (SGP) site in north central Oklahoma. The IOP involves airborne measurements from two airplanes over the heavily instrumented SGP site. We will give an overview of early airborne results obtained aboard Center for Interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS) Twin Otter aircraft. The aircraft will carry instrumentation to perform in-situ measurements of aerosol absorption, scattering, extinction and particle size including such novel techniques as the photoacoustic and cavity ring-down methods. Aerosol optical depth and extinction will be measured with the NASA Ames Airborne Tracking 14-channel sunphotometer. Furthermore up- and downwelling solar (broadband and spectral) and infrared radiation will be measured using three different instruments. The up-looking radiation instruments will be mounted on a newly developed stabilized platform, which will keep the instruments level up to aircraft pitch and roll angles of 10 degrees. Additional effort will be directed toward measurement of cloud condensation nucleus concentration as a function of supersaturation and relating CCN concentration to aerosol composition and size distribution. This relation is central to description of the aerosol indirect effect.

Author

Aerosols; Atmospheric Composition; Optical Properties; Airborne Equipment

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20030110612 Centre National de la Recherche Scientifique, Orsay, France

A New Tool to Investigate Infrared Spectra, Based on Wavelet Filtering: Application to Hawaii

Gendrin, A.; Erard, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A new method to analyze imaging spectrometry data is presented here. The method is based on wavelet filtering of the original data and permits automated detection and characterization of spectral features in large data sets. The method is developed in the frame of the OMEGA/Mars-Express data processing pipe-line. Its capabilities are here assessed on an AVIRIS image cube acquired over the Hawaii volcanoes, where it allows one to identify spectral units consistent with previous, independent studies.

Author

Volcanoes; Infrared Spectrometers; Wavelet Analysis; Remote Sensing; Imaging Spectrometers; Infrared Imagery

20030111841 Science Applications International Corp., USA

Retrospective Data Assimilation for GEOS-4

Todling, Ricardo; Giering, Ralf; Kaminski, Thomas; Zhu, Yan-Qiu; Guo, Jing; [2003]; 1 pp.; In English; EGS-AGU-EUG Joint Assembly, 6-11 Apr. 2003, Nice, France; No Copyright; Avail: Other Sources; Abstract Only

The NASA/Goddard Earth Observing System 3 (GEOS-3) has recently been replaced operationally by GEOS-4. One of the major components of the new system is the finite-volume general circulation model (GCM) of Lin and Rood. Updating the GEOS-3 retrospective data assimilation system of Zhu et al. to GEOS-4 requires two main steps: (i) developing the adjoint of the finite-volume GCM; and (ii) developing the adjoint of the procedures interfacing the GCM with the Physical-space Statistical Analysis System. These required adjoints are being developed automatically through the use of the Transformation of Algorithms in Fortran compiler of Giering and Kaminski. In this presentation we discuss the current status of development and plans for the near future as well as show preliminary results.

Author

Data Processing; GEOS Satellites (ESA); Finite Volume Method; Atmospheric General Circulation Models

20030111965 Massachusetts Inst. of Tech., Cambridge, MA

A Radiocarbon Method and Multi-Tracer Approach to Quantifying Groundwater Discharge to Coastal Waters

Gramling, Carolyn M.; Sep. 2003; 351 pp.; In English

Report No.(s): AD-A417788; MIT/WHOI-2003-15; No Copyright; Avail: CASI; A16, Hardcopy

Groundwater discharge into estuaries and the coastal ocean is an important mechanism for the transport of dissolved chemical species to coastal waters. Because many dissolved species are present in groundwater in concentrations that are orders of magnitude higher than typical river concentrations, groundwater-borne nutrients and pollutants can have a substantial impact on the chemistry and biology of estuaries and the coastal ocean. However, direct fluxes of groundwater into the coastal ocean (submarine groundwater discharge, or SGD) can be difficult to quantify. Geochemical tracers of groundwater discharge can reflect the cumulative SGD flux from numerous small, widely dispersed, and perhaps ephemeral sources such as springs, seeps, and diffuse discharge. The natural radiocarbon content (DELTA 14C) of dissolved inorganic carbon (DIC) was developed as a tracer of fresh, terrestrially driven fluxes from confined aquifers. This DELTA 14C method was tested during five sampling periods from November 1999 to April 2002 in two small estuaries in southeastern North Carolina. In coastal North Carolina, fresh water artesian discharge is characterized by a low DELTA 14C signature acquired from the carbonate aquifer rock. Mixing models were used to evaluate the inputs from potential sources of DIC-DELTA 14C to each estuary, including seawater, springs, fresh water stream inputs, and salt marsh respiration DIC additions. These calculations showed that artesian discharge dominated the total fresh water input to these estuaries during nearly all sampling periods. These new DELTA 14C-based SGD estimates were compared with groundwater flux estimates derived from radium isotopes and from radon-222. It is clear that these tracers reflect different components of the total SGD. This multi-tracer approach provides a comprehensive assessment of the various components contributing to the total SGD.

DTIC

Ground Water; Mixing; Coastal Water; Coasts

20030112749 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA

Evaluating the Synergistic Use of Low-Altitude AVIRIS and AIRSAR Data for Land Cover Mapping in Northeast Yellowstone National Park

Berglund, Judith; Spruce, Joseph; February 09, 2001; 2 pp.; In English

Contract(s)/Grant(s): NAS13-650

Report No.(s): SE-2001-02-00011-SSC; No Copyright; Avail: CASI; A01, Hardcopy

Current land cover maps are needed by Yellowstone National Park (YNP) managers to assist them in protecting and preserving native flora and fauna. Synergistic use of hyperspectral and radar imagery offers great promise for mapping habitat in terms of cover type composition and structure. In response, a study was conducted to assess the utility of combining low-altitude AVIRIS and AIRSAR data for mapping land cover in a portion of northeast YNP. Land cover maps were produced from individual AVIRIS and AIRSAR data sets, as well as from a hybrid data stack of selected AVIRIS and AIRSAR data bands. The three resulting classifications were compared to field survey data and aerial photography to assess apparent benefits of hyperspectral/SAR data fusion for land cover mapping. Preliminary results will be presented.

Author

Aerial Photography; Mapping; Plants (Botany); Radar Imagery; Canopies (Vegetation); Animals; Multisensor Fusion

20030112782 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Synergism of MODIS Aerosol Remote Sensing from Terra and Aqua

Ichoku, Charles; Kaufman, Yoram J.; Remer, Lorraine A.; [2003]; 1 pp.; In English; EGS-AGU-EUG Joint Assembly, 6-11 Apr. 2003, Nice, France; No Copyright; Avail: Other Sources; Abstract Only

The MODerate-resolution Imaging Spectro-radiometer (MODIS) sensors, aboard the Earth Observing System (EOS) Terra and Aqua satellites, are showing excellent competence at measuring the global distribution and properties of aerosols. Terra and Aqua were launched on December 18, 1999 and May 4, 2002 respectively, with daytime equator crossing times of approximately 10:30 am and 1:30 pm respectively. Several aerosol parameters are retrieved at 10-km spatial resolution from MODIS daytime data over land and ocean surfaces. The parameters retrieved include: aerosol optical thickness (AOT) at 0.47, 0.55 and 0.66 micron wavelengths over land, and at 0.47, 0.55, 0.66, 0.87, 1.2, 1.6, and 2.1 microns over ocean; Angstrom exponent over land and ocean; and effective radii, and the proportion of AOT contributed by the small mode aerosols over ocean. Since the beginning of its operation, the quality of Terra-MODIS aerosol products (especially AOT) have been evaluated periodically by cross-correlation with equivalent data sets acquired by ground-based (and occasionally also airborne) sunphotometers, particularly those coordinated within the framework of the AErosol Robotic NETwork (AERONET). Terra-MODIS AOT data have been found to meet or exceed pre-launch accuracy expectations, and have been

applied to various studies dealing with local, regional, and global aerosol monitoring. The results of these Terra-MODIS aerosol data validation efforts and studies have been reported in several scientific papers and conferences. Although Aqua-MODIS is still young, it is already yielding formidable aerosol data products, which are also subjected to careful periodic evaluation similar to that implemented for the Terra-MODIS products. This paper presents results of validation of Aqua-MODIS aerosol products with AERONET, as well as comparative evaluation against corresponding Terra-MODIS data. In addition, we show interesting independent and synergistic applications of MODIS aerosol data from both Terra and Aqua. In certain situations, this combined analysis of Terra- and Aqua-MODIS data offers an insight into the diurnal cycle of aerosol loading.
Author
Remote Sensing; Aerosols; Imaging Spectrometers; MODIS (Radiometry)

20030112803 Naval Research Lab., Monterey, CA
Digital Mapping, Charting, and Geodesy Analysis Program (DMAP). Technical Review of Tactical Ocean Data - Levels 3 (TOD3)
Breckenridge, John L.; Mesick, Hillary C.; Shaw, Kevin B.; Oct. 30, 2003; 17 pp.; In English
Contract(s)/Grant(s): Proj-74-7441-B3
Report No.(s): AD-A418248; NRL/MR/7440--03-8706; No Copyright; Avail: CASI; A03, Hardcopy

The Tactical Ocean Data-Level 3 (TOD3) Performance Specification offers a definition of the content and format for this emerging standard Mapping, Chanting, & Geodesy (MC&G) product. As a vector-type product, TOD3 is designed to portray seafloor configuration, particularly in shallow water areas between 20 meters and 200 meters, along with non-submarine contacts data in a manner suitable for supporting subsurface navigation. TOD3 design is based upon the need for using it in conjunction with the Digital Nautical Chart (DNC) data for providing complete navigation information. This report presents a technical review of the TOD3 as evaluated by the Naval Digital MC&G Analysis Program at Stennis Space Center.
DTIC
Digital Data; Computer Aided Mapping; Nautical Charts

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *28 Propellants and Fuels*.

20030111821 NASA Ames Research Center, Moffett Field, CA, USA, Eloret Corp., USA, Computer Sciences Corp., USA
A Dynamic Pathway for Stone-Wales Bond Rotation on Carbon Nanotubes through Diamond-Like Bonds
Wei, Chen-Yu; Srivastava, Deepak; Cho, Kyeong-Jae; Menon, Madhu; July 24, 2003; 11 pp.; In English
Contract(s)/Grant(s): DTT559-99-D-00437; NASA-AS-03; NASA-02-465679; DOE-00-63857; NSF ITR-02-21916; Copyright; Avail: CASI; A03, Hardcopy

A new lower energy barrier with a two-step pathway of Stone-Wales (SW) ,ond rotation on carbon nanotubes (CNTs) is found through molecular dynamics (MD) simulations of CNTs under tension. The first step involves going over to a stable sp3-like metastable configuration with half rotated and partially tilted C-C bond. The second step involves going over to the fully rotated C-C bond with the formation of a SW defect in the nanotube. The energy barrier for this two-step dynamic pathway is significantly lower than the previously known static barrier for in-plane rotation of the C-C bond on a tensile strained (> 4%) CNT.
Author
Molecular Dynamics; Carbon Nanotubes; Bonding

20030111913 Naval Postgraduate School, Monterey, CA
Germany's Energy Demand and Supply Until 2020: Implications for Germany's Foreign Energy Policy
Stellmann, Lars; Jun. 2003; 73 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417545; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this thesis is to provide an overview of Germany's energy supply options until 2020, the political implications and the respective consequences for Germany's foreign energy policy. The oil and gas supply situation for Germany will become more complex in the upcoming decade. Since oil imports from the UK and Syria are expected to cease

after 2005, 18% of the current oil supply will have to be substituted within this decade. Russia may not be available to provide the amount necessary. The gas situation is somewhat less urgent, as a supply shift will have to take place only after 2010, when the Norwegian and Dutch gas reserves cease to satisfy the export demand. The only regions that will be able to provide oil and gas on a global level to meet the growing world demand will be the Middle East, Russia and other Caspian Sea neighbors. Germany's welfare is directly dependent on its economical success. As a highly industrialized country, Germany should take a tremendous interest not only in the future development of the international energy market, but also in attempting to influence the development immediately following that of its domestic needs.
DTIC
Energy Consumption; Energy Policy; International Trade

20030111952 NASA Glenn Research Center, Cleveland, OH, USA
Integrated Micro-Power System (IMPS) Development at NASA Glenn Research Center
Wilt, David; Hepp, Aloysius; Moran, Matt; Jenkins, Phillip; Scheiman, David; Raffaelle, Ryne; [2003]; 9 pp.; In English; The Electrochemical Society 202nd Meeting, 20-24 Oct. 2002, Salt Lake City, UT, USA
Contract(s)/Grant(s): 22-755-60-07; Copyright; Avail: CASI; A02, Hardcopy
Glenn Research Center (GRC) has a long history of energy related technology developments for large space related power systems, including photovoltaics, thermo-mechanical energy conversion, electrochemical energy storage. mechanical energy storage, power management and distribution and power system design. Recently, many of these technologies have begun to be adapted for small, distributed power system applications or Integrated Micro-Power Systems (IMPS). This paper will describe the IMPS component and system demonstration efforts to date.
Author
Energy Conversion; Integrated Energy Systems; Electric Energy Storage; Microelectromechanical Systems

20030112026 Netherlands Energy Research Foundation, Petten
CO2 Capture in SOFC-GT Systems
Jansen, D.; Dijkstra, J. W.; Jun. 2003; 16 pp.
Report No.(s): PB2004-101324; ECN-RX-03-022; No Copyright; Avail: CASI; A03, Hardcopy
A promising solution for the high penalties associated with CO2 capture in power generation systems could be the use of Solid Oxide Fuel Cells (SOFC's), or a combination thereof with a gas turbine (GT). A novel concept has been introduced for SOFC-GT systems with CO2 capture using a water gas shift membrane reactor burner (WGSMR-burner). Two SOFC-GT systems using this concept have been evaluated for their thermodynamic efficiency. The carbon capture penalty calculated is less than 50% of that of state-of-the-art CO2 capture systems.
NTIS
Electric Generators; Carbon Dioxide; Fuel Cells

20030112034 Netherlands Energy Research Foundation, Petten
Power Quality Behaviour of Different Photovoltaic Inverter Topologies
Heskes, P. J. M.; Enslin, J. H. R.; Aug. 2003; In English
Report No.(s): PB2004-101325; ECN-RX-03-056; No Copyright; Avail: National Technical Information Service (NTIS)
In this paper several inverter topology concepts from the group of small, single-phase, self-commutated PV inveters will be discussed. Current-feedback loop and different kinds of reference sources of these PV inverters will also be discussed. Active and passive reductions of harmonic current emission are investigated. Laboratory measurements on the harmonic interaction between the inverter and a model of the public electricity network were made on a number of commercially available inverters. In this paper results of one single inverter are presented.
NTIS
Power Supplies; Inverters; Photovoltaic Conversion

20030112592 NASA Marshall Space Flight Center, Huntsville, AL, USA
The 2002 NASA Aerospace Battery Workshop
Brewer, J. C., Compiler; April 2003; In English; The 2002 NASA Aerospace Battery Workshop, 19-21 Nov. 2002, Huntsville, AL, USA; See also 20030112593 - 20030112622; Original contains color illustrations
Report No.(s): NASA/CP-2003-212344; M-1072; NAS 1.55:212344; No Copyright; Avail: CASI; C01, CD-ROM
This document contains the proceedings of the 35th annual NASA Aerospace Battery Workshop, hosted by the Marshall

Space Flight Center, November 19-21, 2002. The workshop was attended by scientists and engineers from various agencies of the U.S. Government, aerospace contractors, and battery manufacturers, as well as international participation in like kind. The subjects covered included nickel-hydrogen, lithium-ion, nickel-metal hydride, lithium-sulfur, lithium-iron disulfide, and silver-zinc technologies.
Author
Conferences; Electric Batteries; Technology Utilization

20030112593 NASA Glenn Research Center, Cleveland, OH, USA
Optimal Battery Charging for Damage Mitigation
Hartley, Tom T.; Lorenzo, Carl F.; The 2002 NASA Aerospace Battery Workshop; April 2003; 37 pp.; In English; See also 20030112592; Original contains color illustrations
Contract(s)/Grant(s): NCC3-820; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our control philosophy is to charge the NiH2 cell in such a way that the damage incurred during the charging period is minimized, thus extending its cycle life. This requires nonlinear dynamic model of NiH2 cell and a damage rate model. We must do this first. This control philosophy is generally considered damage mitigating control or life-extending control. This presentation covers how NiH2 cells function, electrode behavior, an essentialized model, damage mechanisms for NiH2 batteries, battery continuum damage modeling, and battery life models. The presentation includes graphs and a chart illustrating how charging a NiH2 battery with different voltages and currents affects damages the battery and affects its life. The presentation concludes with diagrams of control system architectures for tracking battery recharging.
Derived from text
Recharging; Nickel Hydrogen Batteries; Damage; Control Systems Design; Life (Durability)

20030112597 NASA Johnson Space Center, Houston, TX, USA
Safety and Abuse Testing of Energizer LiFeS2 AA Cells
Jeevarajan, Judith A.; Baldwin, Laura; Bragg, Bobby J.; The 2002 NASA Aerospace Battery Workshop; April 2003; 16 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The LiFeS2 test program was part of the study on state-of-the-art batteries/cells available in the commercial market. It was carried out in an effort to replace alkaline AA cells for Shuttle and Station applications. A large number of alkaline cells are used for numerous Shuttle and Station applications as loose cells. Other government agencies reported good performance and abuse tolerance of the AA LiFeS2 cells. In this study, only abuse testing was performed on the cells to determine their tolerance. The tests carried out were over-discharge, external short circuit, heat-to-vent, vibration and drop.
Derived from text
Alkaline Batteries; Lithium Sulfur Batteries; Vibration Tests; Performance Tests

20030112603 NASA Johnson Space Center, Houston, TX, USA
Safety Performance of Small Lithium-Ion Cells in High Voltage Batteries
Cowles, Philip R.; Darcy, Eric C.; Davies, Frank J.; Jeevarajan, Judith A.; Spurrett, Robert P.; The 2002 NASA Aerospace Battery Workshop; April 2003; 33 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Topics covered include: Small-cell EAPU work done by NASA-JSC & COM DEV; Looking at safety features (short circuit protection - PTCs); Early tests showed that long strings do not withstand short circuit; a) Some PTCs experience large negative voltages; b) Destructive results. Solution: group cells into shorter substrings, with bypass diodes Work included: a) Tests with single cells shorted; b) Tests with single cells with imposed-negative voltages; c) 6s, 7s and 8s string shorts; and d) Tests with protection scheme in place, on 12s and 41s x 5p.
Derived from text
Electric Batteries; Lithium; Metal Ions; Short Circuits; Electrolytic Cells

20030112608 Sion Power Corp., Tucson, AZ, USA
Performance of Li-S(tm)Cells: Under USABC Dynamic Stress Test (DST) and LEO Regime
Kim, Joon; Kettner, Rick; The 2002 NASA Aerospace Battery Workshop; March 2003; 25 pp.; In English; See also 20030112592; Original contains color illustrations
Contract(s)/Grant(s): USABC-103; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A Sion Power Corp. prototype Li-S cell has been successfully demonstrated. Its attributes include:(1) Very good power delivery capability at temperatures to -40 C; (2) Stable voltage profiles during Dynamic Stress Test (DST) cycle life test indicating potential electric vehicle applications; (3) Consistent cycle behavior under LEO test regime; (4) Cells can be reconditioned, if necessary. Li-S technology offers solutions for high energy density (light weight or longer life per cycle) and high power applications. Opportunities in Space and UAV (Unmanned Air Vehicle) Programs are being targeted.
Derived from text
Lithium Sulfur Batteries; Stress Analysis; Cyclic Loads

20030112609 RBC Technologies, College Station, TX, USA
Long Life, High Energy Silver-Zinc Batteries
Kainthla, Ramesh; Coffey, Brendan; The 2002 NASA Aerospace Battery Workshop; April 2003; 32 pp.; In English; See also 20030112592; Original contains color illustrations
Contract(s)/Grant(s): NIST-70NANB9H3031; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation includes: 1) an introduction to RBC Technologies; 2) Rechargeable Zinc Alkaline (RZA(tm)) Systems which include MnO2/Zn, Ni/Zn, Ag/Zn, and Zn/Air; and 3) RZA Silver/Zinc Battery Developments. Conclusions include the following: 1)Issues with long term wet life and cycle life of the silver/zinc battery system are being overcome through the use of new anode formulations and separator designs; 2) Performance may exceed 200 cycles to 80% of initial capacity and ultimate wet-life of > 36 months; and 3) Rechargeable silver/zinc batteries available in prismatic and cylindrical formats may provide a high energy, high power alternative to lithium-ion in military/aerospace applications.
Derived from text
Electric Batteries; Silver Zinc Batteries; Energy Storage; Service Life

20030112610 Philips Research Labs., Eindhoven, Netherlands
Lithylene(tm) Free Form Battery Technology
Bordes, Ben; Feil, Hans; Chiang, Cyril; The 2002 NASA Aerospace Battery Workshop; April 2003; 42 pp.; In English; See also 20030112592; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation discusses the following issues related to Philips' Lithylene(tm) battery development: 1) battery service life; 2) space applications; 3) and manufacturing methods.
CASI
Electric Batteries; Service Life; Technology Utilization; Lithium Batteries

20030112611 Yardney Technical Products, Inc., Pawcatuck, CT, USA
Update of LEO and GEO Cycling on Lithium-Ion Cell and Batteries
Gitzendanner, R.; Puglia, F.; Deroy, C.; Santee, S.; The 2002 NASA Aerospace Battery Workshop; April 2003; 27 pp.; In English; See also 20030112592; Original contains color illustrations
Contract(s)/Grant(s): F33615-98-C-2898; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation summarizes progress made on the 5 batteries developed for the MSP01 Mars Lander Program. The following topics for each research center are discussed: 1) JPL -Further Mars Mission Simulation Testing; 2) NRL -Full Sky Astrometric Mapping Explorer (FAME), Slightly elliptical GEO-type mission, Scheduled for launch in 2005; 3) NASA Glenn -LEO cycling at low temperatures; 4) Wright Patterson Air Force Base, LEO cycling at Room Temperature (continuation of pack-level tests; and 5) Lockheed Martin Astronautics (Returned to JPL), LEO cycling at reduced charge voltages. Conclusions reached include: 1) Extensive Database of Cell and Battery Level performance to Aerospace Application Regimes; 2) LEO and GEO cycle data to date extrapolates to meeting Mission Requirements with substantial margin; 3) Battery-level testing continuing to show most important 'real-world' data. Take home message: Cell balancing is an important consideration in battery design.
Derived from text
Electric Batteries; Accelerated Life Tests; Service Life; Balancing

20030112619 South Carolina Univ., Columbia, SC, USA
Capacity Fade of Li-Ion Cells: Experimental Studies and Mathematical Modeling
Ramadass, P.; Haran, Bala S.; White, Ralph E.; Popov, Branko N.; The 2002 NASA Aerospace Battery Workshop; April 2003; 44 pp.; In English; See also 20030112592; Original contains color illustrations
Contract(s)/Grant(s): NRO-00-C-1034; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objectives of this research were to: 1) Perform experiments to quantify capacity fade of Li-ion cells, and 2) Develop a capacity fade model to predict capacity fade of Li-ion cells.
CASI
Mathematical Models; Capacitance-Voltage Characteristics; Lithium Batteries; Recharging

20030112621 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Testing Update on 20 and 25-Ah Lithium Ion Cells
Bruce, Gregg C.; Mardikian, Pamella; Edwards, Sherri; Bugga, Kumar; Chin, Keith; Smart, Marshall; Surampudi, Subbarao; The 2002 NASA Aerospace Battery Workshop; April 2003; 27 pp.; In English; See also 20030112592; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Eagle-Picher Energy Products has worked on lithium ion batteries for approximately 8 years. During that period EPEPC developed and delivered several cell sizes on a program funded by the USAF and Canadian DND. Designs are wound cylindrical cells from 7 to 40-Ah. Most cells delivered were approximately 25-Ah due to requirements of Mars missions. Several iterations of cells were manufactured and delivered for evaluation. The first design was 20-Ah, Design I, and the second was a 25-Ah, Design II.
Derived from text
Lithium; Metal Ions; Electric Batteries

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20030109443
Air CHIEF, Version 10.0 (on CD-ROM)
Jan. 2003; In English
Report No.(s): PB2004-500030; EPA/454/C-03/001; No Copyright; Avail: National Technical Information Service (NTIS)

The Clearing House For Inventories And Emission Factors (Air CHIEF) CD-ROM gives the public and private sector users access to air emission data specific to estimating the types and quantities of pollutants that may be emitted from a wide variety of sources. Updated annually, Air CHIEF offers on one disc literally thousands of pages contained in some of EPA's most widely used and requested documents. Included are the US EPA Emission Factor and Inventory Group's most popular emission estimation tools. Included on the CD-ROM are: - Compilation of Air Pollutant Emission Factors (AP-42), Fifth Edition, Volume 1: Stationary Point and Area. This contains information on over 200 stationary source categories. It includes brief descriptions of processes used, potential sources of air emissions from the processes and in many cases common methods used to control these air emissions. Methodologies for estimating the quantity of air pollutant emissions are presented in the form of Emission Factors. - Sources (including Supplements A, B, C and D). These characterize the source categories for which emissions of a toxic substance have been identified. These volumes include general descriptions of the emitting processes, identifying potential release points and emission factors: Compilation of Air Pollutant Emission Factors (AP-42), AP-42 Background Files; Locating and Estimating Document Series; Emission Inventory Improvement Program Documents; Source Classification codes(SCC)/Area and Mobile Source (AMS) Codes. The latest National Emission Inventory documentation for criteria and hazardous air pollutants has been added to the CD. Also included on Air CHIEF are the installable copies of these software programs: Factor Information Retrieval (FIRE), PC BEIS, PMCALC and TANKS.
NTIS
Air Pollution; Exhaust Emission; Computer Programs; Inventories

20030111867 National Oceanic and Atmospheric Administration, Research Triangle Park, NC, USA, DynCorp, USA
Intercomparison of Alternative Vegetation Databases for Regional Air Quality Modeling
Pierce, T.; Pleim, J.; Kinnee, E.; Joyce, L.; 2003; 4 pp.; In English
Report No.(s): PB2004-101000; EPA/600/A-03-047; No Copyright; Avail: CASI; A01, Hardcopy

Vegetation cover data are used to characterize many air quality model processes, including the calculation of heat, moisture, and momentum fluxes with the Penn State/NCAR Mesoscale Meteorological Model (MM5) and the estimate of biogenic emissions with the Biogenic Emissions Inventory System (BEIS) (Byun and Ching, 1999). This paper compares vegetation cover and isoprene emissions estimated from three contemporary databases: (1) the North American Land Cover Characteristics (NALCC) version 2 database, (2) the Biogenic Emissions Landcover Database (BELD3), and (3) the National

Land Cover Database (NLCD). Each of these databases may be suitable for use with regional-scale air quality models.
NTIS
Data Bases; Air Quality; Vegetation

20030111870 RAND Corp., USA, National Oceanic and Atmospheric Administration, Research Triangle Park, NC, USA
Climate-Air Quality Scale Continuum and the Global Emission Inventory Activity
Middleton, P.; Benjey, W. G.; 2003; 16 pp.; In English
Report No.(s): PB2004-101303; EPA/600/A-03/043; No Copyright; Avail: CASI; A03, Hardcopy

The Global Emissions Inventory Activity (GEIA), a core program activity of the International Global Atmospheric Chemistry (IGAC) Project of the International Geosphere-Biosphere Program, develops data and other related information on key chemical emissions to the atmosphere and communicates through its virtual center at www.geiacenter.org. GEIA inventories are developed by international teams and are quality assured through peer review publications. GEIA inventories are traditionally provided on a one degree latitude by one degree longitude grid, as annual and/or seasonal averages, and are aggregated over emission category sectors for individual chemical inventories. As researchers and decision makers world wide become more concerned about the relationship of global climate change and regional air quality, additional flexibility in tools, more highly resolved spatial scales of inventory development, and enhanced coordination among inventory developers will be needed. To address these growing needs, GEIA plans to distribute other important and quality assured emission information through its web site. New information will include underlying data sets from which the emission data were derived (e.g., activity data), global and regional emission inventory data at finer spatial resolutions and/or more refined temporal resolutions and expanded time periods, algorithms for modeling processes selected natural emissions, references to promising new approaches to emission estimates, such as satellite imagery and inverse modeling, and brief summaries of the state of knowledge regarding emissions of individual chemicals and source categories.
NTIS
Atmospheric Chemistry; Climate Change; Air Quality

20030111991 Environmental Protection Agency, Research Triangle Park, NC, ManTech Environmental Technology, Inc., Research Triangle Park, NC, USA
Optimization of High-Speed GC/TOFMS for Method TO-14 Analysis
Berkley, R. E.; Akard, M. L.; Gardner, B. D.; Oliver, K. D.; Jacumin, H. H.; 2003; 10 pp.; In English
Report No.(s): PB2004-100890; No Copyright; Avail: CASI; A02, Hardcopy

A fast gas chromatography/mass spectrometry (GC/MS) system (FGCMS) consisting of a high-speed gas chromatograph equipped with a narrow bandwidth injection accessory and a time-of-flight mass spectrometer detector is being optimized for analysis of Method TO-14 target compounds. The system consists entirely of commercially-available components. Turn-around time between sample injections has been reduced to six minutes, in contrast to an hour for conventional Method TO-14. Instrument configuration, control, and date processing procedures under development are described.
NTIS
Air Pollution; Gas Chromatography; Mass Spectroscopy; Organic Compounds; Pollution Monitoring

20030112128 NASA Ames Research Center, Moffett Field, CA, USA
Regenerable Incinerator Exhaust Purification and Trace Contaminant Control System
Finn, John E.; Cho, Shelia Y.; LeVan, M. Douglas; [2003]; 1 pp.; In English; Advanced Life Support PI Meeting, 7 Nov. 2003, Alexandria, VA, USA
Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Other Sources; Abstract Only

In this novel approach to air purification, contaminants removed from a process air stream by a high-capacity adsorbent are displaced periodically by a warm, high-humidity, reverse-flow air stream. Displaced contaminants flow into a closed regeneration loop, in which organic compounds are oxidized catalytically and acid gases are removed by a gas- water contactor (which also serves as the source of the water vapor). These features are expected to result in a design that has few expendables and lower energy consumption than alternative regenerable techniques. The joint project between NASA Ames Research Center and Vanderbilt University has completed its third year. Breadboard development continues at NASA Ames, while Vanderbilt has completed most of its adsorption equilibria development. Vanderbilt has completed its fixed-bed apparatus for investigation of dynamic adsorption and desorption processes for trace organic compounds and water vapor, and is continuing

its development of the mathematical model describing the column dynamics.
Author
Contaminants; Air Purification; Trace Contaminants; Adsorbents

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GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20030110634 NASA Johnson Space Center, Houston, TX, USA
Initial Assessment of the Excavation and Deposition of Impact Lithologies Exposed by the Chicxulub Scientific Drilling Project, Yaxcopoil, Mexico
Kring, David A.; Horz, Friedrich; Zurcher, Lukas; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NSF EAR-01-26055; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Chicxulub Scientific Drilling Project (www.icdp-online.de) recovered a continuous core from a depth of 404 m (in Tertiary cover) to 1511 m (in a megablock of Cretaceous target sediments), penetrating approx. 100 m of melt-bearing impactites between 794 and 895 m. The Yaxcopoil-1 (YAX-1) borehole is approx. 60-65 km from the center of the Chicxulub structure, which is approx. 15 km beyond the limit of the estimated approx. 50 km radius transient crater (excavation cavity), but within the rim of the estimated approx. 90 km radius final crater. In general, the impactite sequence is incredibly rich in impact melts of unusual textural variety and complexity, quite unlike melt-bearing impact formations from other terrestrial craters.
Author
Meteorite Craters; Lithology; Impact Melts; Core Sampling

20030110708 Chicago Univ., Chicago, IL, USA
The Origin of the Terrestrial Atmosphere: Early Fractionation and Cometary Accretion
Dauphas, Nicolas; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Despite decades of efforts aimed at unraveling its origin, the terrestrial atmosphere is still considered to be one of the most puzzling enigmas in earth sciences. Remote observations will provide information on the atmospheres of extra-solar planets, some of these may prove to be hospitable for life. Understanding the origin of Earth's atmosphere thus improves our knowledge of the sources and processes that permitted the emergence of life within the solar system and beyond. Noble gases are sensitive tracers for investigating this question. Indeed, they span a large range of atomic masses, have many isotopes, and are chemically inert.
Author
Earth Atmosphere; Atmospheric Composition; Rare Gases; Xenon; Fractionation

20030110709 Washington Univ., Saint Louis, MO, USA
Remote Mapping of the Kau Desert, Hawaii: Silica in a Mars Analog Terrain
Deal, K. S.; Arvidson, R. E.; Jolliff, B. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Ka'u Desert, a relatively young semiarid terrain located southwest of Kilauea caldera, exhibits a wide variety of lava flows, ash deposits, solfataras, and other volcanic landforms. Active solfataras emit sulfurous gases and steam that deposit silica, native sulfur, and gypsum on the surrounding surfaces. Ash and tephra deposits are being reworked through aeolian activity, in places forming weak silica-cemented duricrusts and partially mantling even the youngest (1971, 1974) pahoehoe flows. These same flows commonly exhibit very thin (<15 micron) silica and titanium-rich coatings. Multiple remote sensing datasets as well as field and laboratory observations were used to evaluate the character of these materials and map their distribution in a manner parallel to what will be possible with current and upcoming Mars datasets. The surprisingly common presence of silica and its influence in the spectral properties of nearly all identified materials has important implications for

remote mapping of the Martian surface, both for VISIR reflectance and thermal emission spectroscopy.
Author
Hawaii; Mars Surface; Volcanoes; Analogies; Remote Sensing; Planetary Mapping

20030110807 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
No Nd-142 Excess in the Early Archean Isua Gneiss IE 715-28
Papanastassiou, D. A.; Sharma, M.; Ngo, H. H.; Wasserburg, G. J.; Dymek, R. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): RTOP 344-31-55-01; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is abundant evidence for the existence of 146Sm in the early solar system and for preservation of effects in the 146Sm-142Nd system in differentiated meteorites ([1]; see recent discussion in Stewart et al. 1994). Information from the 182Hf-182W system, as revised by new careful work [2-3] also indicates that the Earth s core formed relatively early. It is in principle possible for early-formed crust and mantle reservoirs on Earth to have preserved evidence for 146Sm if such reservoirs were produced with high Sm/Nd fractionation and if they have remained isolated and closed since ~4.3 Ga. The mean life of 146Sm of 149 Ma is sufficiently long to make this an intriguing possibility.
Author
Neodymium Isotopes; Isotope Ratios; Earth Core; Lunar Mantle

20030110882 Production Geoscience Ltd., Banchory, UK
Silverpit: The Morphology of a Terrestrial Multi-ringed Impact Structure
Allen, Philip J.; Stewart, Simon A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Silverpit impact structure was discovered during 2001 on three-dimensional (3D) seismic data obtained during routine hydrocarbon exploration in the southern North Sea [1]. It is now known that five commercially-acquired 3D seismic datasets partially cover the structure and approximately 80% of Silverpit is imaged by high-resolution 3D data (Figure 1). A better understanding of the processes involved in creating the Silverpit structure should offer insights into the genesis of similar structures elsewhere in the solar system.
Derived from text
Morphology; Craters

20030110889 Kuwait Univ., Safat, Kuwait
Wadi Na'am Structure: A Possible Concealed Impact Feature from Central Southwest Saudi Arabia
Al-Mishwat, A. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Wadi Na am Structure is interpreted as a possible concealed impact feature of Precambrian age that is buried under the lower Paleozoic sedimentary supra-crustal cover rocks. Localized post-Ordovician reactivation of the structure and its sedimentary mask is invoked in order to produce the observed surface expressions of the underlying geometry. In this interpretation, the folds are viewed as mimics of the underlying topography of the outer rim of the structure, which is thought to possess annular multiple rings configuration. The circular fractures most plausibly reflect surface manifestations of circular normal faults common within many impact structures [3]. Gradual radial decrease in the dip of the sandstone within the structure is accounted for by a more intense central rejuvenation of such faults than at the periphery. The central gabbro masses represent the possible upper tip of a central uplift whose elevated central position inside the structure may have been accentuated by the proposed subsequent reactivation. All of the above features are utilized as general criteria for recognition of impact structures [3]. Future investigations, including drilling, petrography and SAR interferometry, will aid in the documentation and verification of the Wadi Na am Structure.
Derived from text
Topography; Craters

20030110945 Scripps Institution of Oceanography, San Diego, CA, USA
Comprehensive Processing of the Apollo Lunar Seismic Event Data
Bulow, R. C.; Johnson, C. L.; Shearer, P. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Great significance has been ascribed to the supposed similarity or identity (both terms have been used) between the shapes of some magnetite crystals from the Martian meteorite ALH84001 and terrestrial magnetotactic bacteria, and specifically those from strain MV-1. An implied presupposition is that those shapes are sufficiently well known for measurements of such similarities or identities to be reliable. Bright-field imaging using transmission electron microscopy (TEM) is the major instrumental method that has been used to determine the shapes. We recently introduced the use of high-angle annular dark-field (HAADF) electron tomography to determine the three-dimensional shapes of magnetite nanocrystals with greater accuracy, and we showed that there is sufficient uncertainty to be skeptical about morphological conclusions. Several programs to view and filter the data are used to improve data quality. Data with various irregularities such as timing errors or telemetry problems are corrected or removed. These modifications allow for modern processing techniques to be applied consistently to the remaining data. Based on our preliminary analyses we estimate 97.6% of the data are usable for further study.
Derived from text
Data Acquisition; Lunar Surface; Seismology; Imaging Techniques

20030111025 Arizona Univ., Tucson, AZ, USA
Vanadium, Cr, Si, and the Mg/Si Ratio of the Earth
Drake, Michael J.; Domanik, Kenneth; Bailey, Edward; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-9435; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Experiments investigating the partitioning of V, Cr, and Si between metal and silicate at various pressures, temperatures, redox state, and composition demonstrate that V and Cr are always more siderophile than Si. The relatively high abundances of V and Cr in the Earth's upper mantle indicate that the high Mg/Si ratio of the Earth's upper mantle cannot be attributed to extraction of Si into the core and must be an intrinsic bulk property of the silicate Earth.
Author
Earth Mantle; Silicates; Vanadium; Chromium; Planetary Composition; Siderophile Elements

20030111153 Calgary Univ., Alberta, Canada
Three Dimensional Gravity Field Modelling of the Chicxulub Impact Crater
Hildebrand, A. R.; Millar, J. D.; Pilkington, M.; Lawton, D. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The structure of the Chicxulub crater has been actively investigated by potential field modeling, seismic reflection and refraction surveys, and drilling during the decade since its recognition as the crater responsible for mass extinction which terminated the Cretaceous Period. Given the data sets that are now available to delineate crater structure a surprisingly diverse number of structural models remain proposed. For example, crater diameters ranging from the originally proposed 180 km to ~300 km are still current in the literature, and collapsed disruption cavity sizes the observable parameter which leads to assessment of the impact s environmental perturbation) range from ~85 km to >120 km. We feel that the available data provide enough constraints to remove most of the variability in published sizes for the structural elements of Chicxulub. We have undertaken 3D modeling of the gravity field over the crater to refine our working structural model [e.g. 2, 3], and to compare our results with those of another 3D modeling effort [4]. The 3D gravity model also establishes an interesting target for scientific drilling.
Author
Craters; Three Dimensional Models; Gravitational Fields

20030111182 Arizona State Univ., Tempe, AZ, USA
Determining the Biogenicity of Microfossils in the Apex Chert, Western Australia, Using Transmission Electron Microscopy
DeGregorio, B. T.; Sharp, T. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NCC2-1051; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For over a decade, the oldest evidence for life on this planet has been microfossils in the 3.5 Ga Apex Chert in Western

Australia. Recently, the biogenicity of these carbon-rich structures has been called into question through reanalysis of the local geology and reinterpretation of the original thin sections. Although initially described as a stratiform, bedded chert of siliceous clasts, the unit is now thought to be a brecciated hydrothermal vein chert. The high temperatures of a hydrothermal environment would probably have detrimental effects to early non-hyperthermophilic life, compared to that of a shallow sea. Conversely, a hydrothermal origin would suggest that if the microfossils were valid, they might have been hyperthermophilic. Apex Chert controversy. The Apex Chert microfossils were originally described as septate filaments composed of kerogen similar in morphology to Proterozoic and modern cyanobacteria. However new thin section analysis shows that these carbonaceous structures are not simple filaments. Many of the original microfossils are branched and have variable thickness when the plane of focus is changed. Hydrothermal alteration of organic remains has also been suggested for the creation of these strange morphologies. Another point of contention lies with the nature of the carbon material in these proposed microfossils. Kerogen is structurally amorphous, but transforms into well-ordered graphite under high pressures and temperatures. Raman spectrometry of the carbonaceous material in the proposed microfossils has been interpreted both as partially graphitized kerogen and amorphous graphite. However, these results are inconclusive, since Raman spectrometry cannot adequately discriminate between kerogen and disordered graphite. There are also opposing views for the origin of the carbon in the Apex Chert. The carbon would be biogenic if the proposed microfossils are indeed the remains of former living organisms. However, an inorganic Fischer- Tropsch-type synthesis is also a possible explanation for the formation of large-aggregate carbonaceous particles and could also account for the depletion of (13)C observed.
Author
Microorganisms; Fossils; Precambrian Period; Microstructure; Rocks

20030111203 Open Univ., Milton Keynes, UK
Organic Geochemistry of a Hydrocarbon-rich Calcarenite from the Chicxulub Scientific Drilling Program
Gilmour, I.; Sephton, M. A.; Morgan, J. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Terrestrial impact craters appear to be unique in the geological environment in that they contain evidence for a wide variety of carbonaceous phases ranging from shock-produced diamonds to hydrocarbons in fluid inclusions. Some of these materials, such as diamond, are a direct result of the impact process. However, at some craters, carbonaceous material has been incorporated into impactites and other rocks post-impact, possibly as a result of hydrothermal activity. Part of the rationale for the Chicxulub Scientific Drilling Project (CSDP) was to investigate the post-impact environment associated with such a large structure, seismic data indicates the diameter of the transient cavity was around 100 km. The instigation of hydrothermal systems following an impact and the consequent mobilization and migration of organic matter and other biologically important nutrients is one mechanism that has been proposed for the development of potential habitats for primitive organisms on Mars. At around a depth of 1.4 km the CSDP recovered core material that was rich in hydrocarbons. This section of the core consists of a laminated black calcarenite that contains intraclasts, synsedimentary microfaulting and soft sedimentary deformation features. This study examines the organic geochemistry of this hydrocarbon-rich material in an attempt to ascertain whether these hydrocarbons are associated with the migration and emplacement of organic matter by postimpact hydrothermal activity. The sample used for our investigation is number 1756 from core box 419 and comes from a depth of 1405.085 m.
Author
Meteorite Craters; Carbonaceous Materials; Geochemistry; Hydrocarbons

20030111206 Maryland Univ., College Park, MD, USA
Osmium Isotope Constraints on the Proportion of Bolide Component in Chicxulub Impact Melts
Gelinas, A.; Walker, R. J.; Kring, D. A.; Zurcher, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-10425; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent drilling has produced the samples of impact melt breccias examined here. All samples examined here are from the YAX-1 borehole [7]. Two main types of impact breccias have been studied. The first type is a green altered impact meltrock found in the lower portion of the impact sequence. The texture of the rock is microcrystalline and is composed of pyroxene, plagioclase, and alkali feldspars. Its composition is consistent with continental margin rocks. It is generally massive with some flow structure. The rock was brecciated and altered after solidfication and contains small amounts of both shocked and unshocked clasts of the impacted lithologies. These lithologies include lithic quartzite, and isolated feldspar crystals. The compositions of these rocks are similar to those seen in meltrocks sampled by the Yucatan-6 borehole [8-9]. Our study includes

samples YAX-1_861.4, YAX-1_863.51, and YAX- 1_876.46, which represent both the top and lower portion of the green impact meltrock. The middle sample in the sequence has the least amount of (mineralogical) alteration [10]. The second type of melt breccia under study is a brown altered impact meltrock. It also has a microcrystalline texture and both shocked and unshocked clasts of the target material. Even though this rock type has been altered, remnant schleiren, metaquartzite, and micritic calcite have been identified. Sample YAX-1_841.32 is representative of this type of rock. It was recovered from a polymict breccia in the middle of the impact sequence.
Author
Impact Melts; Bolides

20030111426 Witwatersrand Univ., Johannesburg, South Africa
Central Uplift Formation in Very Large Impact Structures: Evidence from the Vredefort Dome
Lana, C.; Gibson, R. L.; Reimold, W. U.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 80-km-wide Vredefort dome is a deeply eroded remnant of the central uplift of the Vredefort Impact Structure. It exposes upturned Archean to Paleo-proterozoic supracrustal strata and a core of Archean crystalline gneisses that have previously been interpreted as an on-edge profile of the crust and upper mantle. Our structural analysis of the gneisses in the core of the dome indicates that substantial impact-related rotation is restricted to a narrow zone close to the contact with the supracrustal strata and that the rocks responded in an essentially ductile way during doming (no megabreccia development). Furthermore, the strong orientation asymmetry of the supracrustal sequence, which is overturned in the NW sector and moderately steeply dipping in the SE sector, is attributed to symmetric rotation of an originally NW-dipping sequence, rather than asymmetric impact or post impact tilting. Ductile deformation recorded in the basement complex is essentially Archean and, except for the pseudotachylitic breccias, no other impact-related deformation has been identified. The mechanism of fabric rotation and its relationship with the pseudotachylites are discussed.
Author
Precambrian Period; Earth Crust; Impact Damage; Cratering; Planetary Mapping

20030111442 Cologne Univ., Germany
Evidence for Collisional Erosion of the Earth
Palme, H.; ONeill, H. St.C.; Benz, W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Fe/Mg ratio of the whole Earth is at least 10% higher than the Fe/Mg ratio of the average solar system. Improved estimates of the chemical composition of the primitive upper mantle yield an MgO content of 36.33 0.4 wt% [1], which transforms into a whole Earth Mg content of 14.90 wt%, assuming 32% for the mass of the core and that the core is Mg-free. The FeO content of the Earth s mantle is well established at 8.10 0.05 %. Adding to this the Earth s core (85 wt% Fe) gives a whole Earth Fe content of 31.52 wt%. The resulting Fe/Mg ratio is 2.12. whereas the CI-ratio, representative of that of the solar system, is 1.92 0.08 [2]. Thus the Earth has about 12 wt% more Fe than CI-meteorites and the average solar system.
Author
Iron; Earth Core; Earth Mantle

20030111447 New Mexico Univ., Albuquerque, NM, USA
Determination of Planetary Basalt Parentage: A Simple Technique Using the Electron Microprobe
Papike, J. J.; Karner, J. M.; Shearer, C. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous studies have demonstrated the usefulness of major and minor elements in silicate phases to understand differences among basaltic systems and the influence of different planetary environments on basalt chemistry (e.g., Papike [1]). Intriguing data displays presented by Papike [1] include a plot of Mn vs. Fe (atoms per formula unit, afu) for pyroxene and olivine and a plot showing the anorthite content of plagioclase from different planetary basalts. Here we combine portions of these plots (Fig. 4) and provide all new data for olivine and plagioclase.
Derived from text
Basalt; Planetary Geology

20030111488 California Inst. of Tech., Pasadena, CA, USA

Yarrabubba, Western Australia: A Large, Deeply Eroded, Ancient Impact Structure in the Yilgarn Craton

Macdonald, F. A.; Bunting, J. A.; Cina, Sara E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Shock-metamorphic effects including shatter cones, planar deformation features (PDFs) in quartz grains, and both E- and S-type pseudotachylites were discovered in deeply eroded Archean granites near the Yarrabubba homestead in Western Australia (119 deg 50 min E, 27 deg 10 min S). Preliminary estimates indicate that the Yarrabubba impact structure is of a Paleoproterozoic age and at least 30 km in diameter.

Author

Precambrian Period; Meteorite Craters; Granite

20030111634 California Inst. of Tech., Pasadena, CA, USA

Erosion of Planetary Atmosphere Due to Surface Waves Induced by Giant Impact

Shen, A. H.; Ahrens, T. J.; Ni, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The idea of erosion of planetary atmosphere by giant impact was introduced by early works of Arrhenius et al. [1], Benlow and Meaows[2], Ringwood [3] and Cameron [4]. This idea was further expanded by other researchers to study the blow-off of atmosphere by other mechanisms due to the impactor [5-7]. Ahrens [8] described the degree of atmosphere erosion due to the surface wave induced by a giant impact on planetary surface. He also calculated the amount of erosion achievable at different surface wave velocity. Chen and Ahrens [9] further simulated the amplification of particle velocity in the atmosphere column perturbed by the planetary surface with 2 km/s velocity using a gravity-added Lagrangian hydrodynamic code, WONDY [10]. With this simple model, Chen and Ahrens demonstrated that the motion of the planetary surface is sufficient to launch the air particles to escape velocity. Ni and Ahrens [11] constructed the propagation of surface wave due to a giant impact with 1027 J energy on a hypothetical, homogenous planet about the same size as the Earth. Their main result is a series of the surface velocities at several stations of equal distances (10 separation) from the impact point. In this contribution, we report our effort in further modification of the WONDY code so that the surface velocities determined by Ni and Ahrens can be imported to WONDY as a time sequence of boundary conditions.

Author

Computer Programs; Earth Atmosphere; Erosion

20030111655 Lamont-Doherty Geological Observatory, Palisades, NY, USA

Multidisciplinary Methods of Finding and Verifying Abyssal Impact Craters: Results and Uncertainties

Abbott, Dallas H.; Glatz, Christy A.; Burckle, L.; Nunes, Alice A.; Puchtel, I. S.; Humayun, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Because they are vulnerable to erosion and deformation that obscures and removes them, only about 1/6 of the impact craters that formed during the last 120 Ma have been discovered. Until recently, all of these craters were found on land or on the continental shelf. This left 59% of the Earth (the abyssal ocean basins) with no known impact craters. Abyssal impact craters form on true oceanic crust, typically at water depths of 2000 meters or greater. Because they are covered by water and are on strong oceanic lithosphere, abyssal impact craters are less vulnerable to erosion and deformation than continental impact craters. Thus, abyssal impact craters should preserve a nearly complete ejecta blanket and impact melt body that could potentially provide great insight into impact processes. Another issue is the importance of Ir in identifying impact layers. Although there are a number of strewn tektite fields with an inferred or known submarine source crater, only the Eltanin impact layer has a documented Ir anomaly and an inferred abyssal source crater. In this abstract, we present evidence for the presence of two previously unknown abyssal impact craters, a prospective source crater for the late Pliocene Eltanin impact layer and the late Miocene Ewing impact layer.

Author

Ocean Bottom; Craters; Identifying

20030111673 Maryland Univ., Baltimore, MD, USA

Insights into the Emplacement of Rock Avalanches on Mars

Bulmer, M. H.; Glaze, L.; Shockey, K. M.; Barnouin-Jha, O. S.; Murphy, W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Chaos Jumbles, California (40 deg.32 min. N, 121 deg. 32 min. W) originated from a volcanic dome that forms part of the Chaos Crags. The initial event of the Chaos Crags eruptive sequence was the formation of a tuff cone followed by two pyroclastic flows. A series of domes then formed which were also partially destroyed by pyroclastic events. The Jumbles were formed by the collapse of a dome in cold rock avalanches that cover 6.8 sq km. Based on tree growth and lichenometry three deposits were identified whose time interval has been suggested as ranging from 1000 s years to a single event. The deposit consists of a monolithologic breccia of Chaos Crags dacite blocks in a matrix of pulverized dacite. Well-defined large-scale folds, ridges and furrows can be identified on these deposits. Similar features are noted on landslides on Mars as well as the Olympus Mons aureoles and their process of formation remains enigmatic. This study used geomorphic, topographic and statistical analysis of the Chaos Jumbles rock avalanches. These data have resulted in the identification of geomorphic features that were missed or unresolved in remotely sensed data. These features are evidence for previously unrecognized deposits and an emplacement mechanism that is momentum-driven requiring no interstitial medium. Our study highlights the need for combining digital datasets (such as images and topography) when attempting to interpret the emplacement of landslides on Mars.

Derived from text

Mars Volcanoes; Volcanology; Rocks; Geomorphology

20030111864 Army Engineer Research and Development Center, Vicksburg, MS, USA

Third US-Japan Workshop on Advanced Research on Earthquake Engineering for Dams, San Diego, California, 22-23 June 2002

Hall, Robert L.; Yamaguchi, Yoshikazu; Matheu, Enrique E.; Duron, Ziyad H.; Aug. 2003; 416 pp.; In English

Report No.(s): AD-A417586; ERDC/GSL-TR-03-13; No Copyright; Avail: CASI; A18, Hardcopy

This report summarizes a workshop organized by the U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS, and the Public Works Research Institute of Japan (PWRI) under the auspices of the Task Committee on Dams of the Panel on Wind and Seismic Effects, part of the U.S.- Japan Cooperative Program in Natural Resources. The workshop was held in San Diego, CA, 22-23 June 2002, as part of the preconference activities of the 22nd U.S. Society on Dams Annual Meeting and Conference held at the same location 24-28 June 2002. The Workshop provided a valuable forum for the exchange of technical information related to seismic evaluation criteria for dams, numerical techniques for seismic analysis, seismic design and evaluation of appurtenant structures, instrumentation, condition assessment, seismic upgrade and rehabilitation, foundation problems, case studies, as well as many other general topics of interest. The workshop was attended by 64 U.S. participants, 10 Japanese participants, and 16 participants from other countries (Canada, China, Colombia, Dominican Republic, New Zealand, Republic of Korea, Republic of Panama, and Spain).

DTIC

Dams; Earthquakes; Japan; Research and Development; California; Conferences; Armed Forces (United States)

20030111996 Calgary Univ., Alberta, Canada

Laboratory-Based Atmospheric Turbulence Experiments: C(sup 2)(n) - Epsilon Characterization and Non- Kolmogorov Propagation

Hugo, Ronald J.; Sep. 12, 2003; 60 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0343

Report No.(s): AD-A417797; AFRL-SR-AR-TR-03-0404; No Copyright; Avail: CASI; A04, Hardcopy

Fluid-mechanic and optical-based measurements have been used to examine the nature of turbulence statistics in a heated axisymmetric jet. Single-component streamwise velocity fluctuation spectra have indicated the flow to have a -5/3 spectral slope within 7 jet diameters of the jet's exit. Structure functions computed using both angle of arrival and optical phase were found to be inconclusive at identifying non- Kolmogorov statistics within the jet. Spectral slopes of angle- of-arrival signals were found to be useful at indicating anisotropy in the optical turbulence in a region that appeared Kolmogorov using single-component fluid mechanic measurements. Subsequent two-component velocity measurements have verified the optically-detected flow anisotropy. Anisotropy occurs in flow regions where there are large differences between longitudinal and lateral velocity components. Both fluid- mechanic and optical statistics collected along the major flow axis (longitudinal

direction) have Kolmogorov statistics, while data collected in directions transverse to the major flow axis (lateral direction) have non-Kolmogorov statistics.
DTIC
Fluid Mechanics; Atmospheric Turbulence; Velocity Measurement; Optical Measurement

20030112125
Sensor Development Thermospheric Neutral Wind Measurements
Heelis, R. A.; May 15, 2002; 11 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0028; Proj-2310
Report No.(s): AD-A417309; UTD-STR-A002-01-630117; AFRL-VS-TR-2003-1555; No Copyright; Avail: CASI; A03, Hardcopy

This report describes progress made in the development of novel new sensors to measure the thermospheric neutral wind velocity from space. The measurements depend upon the supersonic velocity of the spacecraft to determine a velocity vector from measurement of the kinetic energy of the gas along the sensor look direction and the angle of arrival of the gas with respect to that look direction. Two sensors are utilized; one to measure the kinetic energy of the gas and another to measure the arrival angle. The arrival angle is determined from the differential pressure in two adjacent chambers with small entrance apertures. Different pressures in each chamber result from different angles of attack with respect to the chamber apertures. The kinetic energy of the gas with respect to the sensor normal is measured by examining the ions resulting from ionization of the neutrals that flow, undisturbed through an ion source. During this period of activity flight sensors have been designed and constructed for operation as part of the Air Force C/NOFS mission. Pre-flight performance simulation and verification has also been undertaken.
DTIC
Wind Velocity Measurement; Thermosphere; Wind Velocity

20030112411 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Paleo-Pole Positions from Martian Magnetic Anomaly Data
Taylor, Patrick T.; Frawley, James J.; [2003]; 21 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Magnetic component anomaly maps were made from five mapping cycles of the Mars Global Surveyor s magnetometer data. Our goal was to find and isolate positive and negative anomaly pairs which would indicate magnetization of a single source body. From these anomalies we could compute the direction of the magnetizing vector and subsequently the location of the magnetic pole existing at the time of magnetization. We found nine suitable anomaly pairs and from these we computed four North and 3 South poles with two at approximately 60 degrees north latitude. These results suggest that during the existence of the Martian main magnetic field it experienced several reversals.
Author
Magnetic Anomalies; Mars Surface; Geophysics; Data Reduction; Magnetic Poles

20030112478 Sonoquest/Advanced Ultrasonics Research, Wellesley Hills, MA
Characterization of Seismoacoustic Properties of Marine Sediments
Chamuel, Jacques R.; Sep. 2003; 45 pp.; In English
Contract(s)/Grant(s): N00014-02-C-0377
Report No.(s): AD-A417984; JRC-27-2003; No Copyright; Avail: CASI; A03, Hardcopy

Experimental findings are presented on fundamental seismoacoustic characteristics of unconsolidated sediments not explained by existing theories. Precision measurements of the compressional velocity 'C(p)' in coarse water-saturated sand revealed that C(p) decreased by 14% as frequency increased from 80 to 880 kHz, while the Biot theory predicted an increase of < 1 %. Measured dispersion in saturated fine sand and glass beads had a similar trend. Data from Kings Bay Experiment by Chotiros (1995) were replotted indicating that C(p) decreased by 6% as frequency increased from 5 to 60 kHz. C(p) in drained sand and glass beads remained near the saturated value 1750m/s in contrast with the 85% decrease predicted by the low-frequency Biot-Gassman theory. Time- dependent stiffening was detected in drained sediments. Visualization of capillary mechanisms using seawater and glass microplates provided physical insight into grain to grain coupling and time-dependent properties. Unique features were observed on crystallization in confined geometry, solid-like behavior of confined seawater, cavitation, and shear coupling. Capillary experiments on gassy sediments showed that when air was injected in water-saturated

sand, oblique 45 degrees fracture cracks formed in the sand as it became locally unsaturated. The cracks were perpendicular to each other originating from the air source location.
DTIC
Underwater Acoustics; Sediments

20030112496 Texas Univ., Austin, TX, USA
Corporate Donations of Geophysical Data
Dutton, Shirley; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 190-193; In English; See also 20030112480; Copyright; Avail: Other Sources

Some recent donations from private industry of geophysical data that had been completely proprietary and now are in the public domain, are discussed. Three energy companies recently donated large collections of rock samples to The University of Texas at Austin. These companies have developed a business model for donating proprietary rock data to the academic community. These donations allow valuable, irreplaceable physical collections to enter the public domain. These donations were made possible by the accompanying donations of the physical space in which to store the rocks, and financial resources toward the cost of curating the cores and making them available to others. Government grants have made a very important contribution to enabling The University of Texas to accept these donations by providing critical funds for the initial operating expenses while an endowment builds.
Derived from text
Geophysics; Rocks; Industries; Commerce; Data Processing

20030112655 Wisconsin Univ., Madison, WI
Methods for Improving Seismic Event Location Processing
Thurber, Clifford H.; Du, Wen-xuan; Zhang, Haijiang; Lutter, William J.; Jan. 2001; 11 pp.; In English
Contract(s)/Grant(s): DTRAO1-O1-C-0085; Proj-DTRA
Report No.(s): AD-A418047; AFRL-VS-TR-2003-1603; No Copyright; Avail: CASI; A03, Hardcopy

Our research program consists of four components, each involving some aspect of multiple-event analysis: (1) high-precision waveform cross-correlation (WCC) for arrival time estimation, (2) robust event clustering, (3) waveform decomposition and source wavelet deconvolution reshaping, (4) double-difference (DD) multiple-event locations and tomography. Our research focused initially on the development and testing of these seismic analysis methods using 'ground-truth' (GT) datasets at different scales (local and regional), and is being followed by the application of these methods to a 'test bed' regional-distance seismic dataset, including tests on real-time and simulated real-time data streams. Here we highlight some of the more significant project achievements from components 1, 2 and 4.
DTIC
Detection; Seismology; Tomography; Waveforms

20030112659 Royal Norwegian Council for Scientific and Industrial Research, Kjeller
Semiannual Technical Summary, 1 July - 31 December 2002
Ringdal, Frode; Feb. 2003; 96 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08650-01-C-0055
Report No.(s): AD-A418010; NORSAR-SCIENTIFIC REPT-1-2003; No Copyright; Avail: CASI; A05, Hardcopy

This report describes the research activities carried out at NORSAR under Contract No. F0865O-O1 -0-0055 for the period 1 July - 31 December 2002. In addition, it provides summary information on operation and maintenance (O&M) activities at the Norwegian National Data Center (NDC) during the same period Research activities described in this report, as well as transmission of selected data to the USA NDC, are funded by the USA Department of Defense. The O&M activities, including operation of transmission links within Norway and to Vienna, Austria, are being funded jointly by the CTBTO/PTS and the Norwegian Government, with the understanding that the funding of MS-related activities will gradually be transferred to the CTBTO/PTS. The O&M statistics presented in this report are included for the purpose of completeness, and in order to maintain consistency with earlier reporting practice.
DTIC
Defense Program; Maintenance; Seismic Waves

20030112756 Naval Postgraduate School, Monterey, CA
Development of Four-Element End-Fire Array as Seismo-Acoustic Sonar Source
Rumph, Steven E.; Sep. 2003; 107 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418288; No Copyright; Avail: CASI; A06, Hardcopy

Because the inherent dangers of buried mines still possess the ability to deny or severely limit the projection of naval forces ashore, continued research and development of landmine detection capabilities is paramount. One promising method for buried mine detection, still in the early development stages, is the use of Seismo-Acoustic waves for target echo location. The goal of the research described in this thesis was to design and develop a four-element end-fire array to be used as a Seismo-Acoustic SONAR source to preferentially excite Rayleigh waves. A four-element end-fire array, consisting of four vertical-motion inertial mass shakers spaced 25 cm apart (approximately one-quarter wavelength), was deployed on the sand in the near-surf zone of Del Monte Beach. The beam of the array was directed to end-fire by using a delay/pulse generator to individually trigger four function generators. Testing at the beach was conducted and results have shown nice end-fire beam patterns at a radius of 3.5 meters with approximately 15 dB suppression to the rear of the array relative to the forward direction.
DTIC
Seismic Waves; Acoustics; Sonar

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20030111430 Army Cold Regions Research and Engineering Lab., Hanover, NH, USA
Potential for a Time-sequenced 100,000-Year Record of Micrometeorites at South Pole
Lever, J. H.; Taylor, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A neutrino observatory planned for South Pole offers an opportunity to collect a time-sequenced 100,000-yr record of micrometeorites and terrestrial dust deposited in Antarctic ice with 20-100-yr resolution. This unprecedented record bears on numerous studies including the evolution of near-Earth cosmic-dust and the provenance of micrometeorites, the relationship between ET influx and global climate change, and the provenance of biogenic materials in Antarctic ice. We describe here a proposed collection system and selected science plans for the project.
Derived from text
Micrometeorites; Climate Change; Climatology; Antarctic Regions; Cosmic Dust

20030111524 Tokyo Univ., Japan
Climate Change of Mars: Effects of Obliquity Changes
Nakamura, T.; Tajika, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Behaviors of the Martian climate system has been investigated in several studies. If the Martian climate was warm owing to the greenhouse effect of CO2 in the past, a drastic climate change (climate jump or climate collapse) due to decrease in the amount of CO2 in the system must have occurred during the evolution from a warm condition to the present cold condition. On the other hand, it is suggested that pulses of CO2 injected into the atmosphere could place the atmosphere back into a warm state with higher atmospheric pressure. However, these previous studies considered the climate system under the condition of the present obliquity. It is known that the obliquity of Mars could have changed greatly (from 0 to 60) on short timescales. The obliquity change would have profound effects on the climate system of Mars because it alters the latitudinal distribution of the solar radiation. Francois et al. argued that permanent CO2 ice caps are stable only under the low obliquity. They proposed that, if the obliquity increases, the atmospheric pressure increases and, therefore, the permanent ice caps become unstable due to enhanced heat transport from the low latitude. Although it is one of the controlling factors for the stability of the permanent CO2 ice, other factors may play important roles. For example, when the obliquity becomes large, the solar radiation income onto the pole increases. Also, if the atmospheric pressure increases, the planetary albedo, the greenhouse effect, and the freezing point of CO2 should change. The energy balance at the pole will depend on all these factors. In this study, we evaluate these effects and discuss the stability of the permanent CO2 ice more quantitatively from the viewpoint of the energy balance. We also discuss effects of low solar luminosity on behaviors of the Martian climate.
Derived from text
Climate Change; Mars Environment; Carbon Dioxide; Greenhouse Effect; Heat Transfer; Solar Radiation

20030111776 NASA Marshall Space Flight Center, Huntsville, AL, USA

Lightning and Precipitation: Observational Analysis of LIS and PR

Adamo, C.; Solomon, R.; Goodman, S.; Dietrich, S.; Mugnai, A.; [2003]; 2 pp.; In English; European Geoscience 5th Plinius Conference, 1-3 Oct. 2003, Corsica, France; No Copyright; Avail: Other Sources; Abstract Only

Lightning flash rate can identify areas of convective rainfall when the storms are dominated by ice-phase precipitation. Modeling and observational studies indicate that cloud electrification and microphysics are very closely related and it is of great interest to understand the relationship between lightning and cloud microphysical quantities. Analyzing data from the Lightning Image Sensor (LIS) and the Precipitation Radar (PR), we show a quantitative relationship between microphysical characteristics of thunderclouds and lightning flash rate. We have performed a complete analysis of all data available over the Mediterranean during the TRMM mission and show a range of reflective profiles as a function of lightning activity for both convective and stratiform regimes as well as seasonal variations. Due to the increasing global coverage of lightning detection networks, this kind of study can used to extend the knowledge about thunderstorms and discriminate between different regimes in regions where radar measurements are readilly available.

Author

Lightning; Rain; Precipitation (Meteorology); Cloud Physics; Meteorological Radar; Annual Variations

20030111814 NASA Ames Research Center, Moffett Field, CA, USA

Microphysical Modelling of the 1999-2000 Arctic Winter, 3, Impact of Homogeneous Freezing on PSCs

Drdla, K.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Simulations of the 1999-2000 winter have tested the effect on polar stratospheric clouds (PSCs) of the homogeneous freezing of liquid ternary solutions into nitric acid trihydrate (NAT) and nitric acid dihydrate (NAD). Proposed laboratory-derived volume-based and surface-based homogeneous freezing rates have both been examined, including different assumptions about the extrapolation of laboratory measurements to atmospheric conditions. Widespread PSC formation and denitrification are possible in several of the scenarios examined. However, the simulations are all unable to explain the solid-phase PSCs observed early in the 1999-2000 winter, and are unable to reproduce the measured extent of vortex denitrification. These problems can both be attributed to the relatively cold temperatures, more than 5 K below the NAT condensation point, necessary for effective homogeneous freezing. Therefore synoptic-scale homogeneous freezing appears unlikely to be the primary mechanism responsible for solid-phase PSC formation.

Author

Polar Meteorology; Ice Clouds; Arctic Regions

20030111840

Estimation of Model Error Variances During Data Assimilation

Dee, Dick; [2003]; 1 pp.; In English; EGS-AGU-EUG Joint Assembly Meeting, 6-11 Apr. 2003, Nice, France

Report No.(s): EAE03-A-02659; No Copyright; Avail: Other Sources; Abstract Only

Data assimilation is all about understanding the error characteristics of the data and models that are used in the assimilation process. Reliable error estimates are needed to implement observational quality control, bias correction of observations and model fields, and intelligent data selection. Meaningful covariance specifications are obviously required for the analysis as well, since the impact of any single observation strongly depends on the assumed structure of the background errors. Operational atmospheric data assimilation systems still rely primarily on climatological background error covariances. To obtain error estimates that reflect both the character of the flow and the current state of the observing system, it is necessary to solve three problems: (1) how to account for the short-term evolution of errors in the initial conditions; (2) how to estimate the additional component of error caused by model defects; and (3) how to compute the error reduction in the analysis due to observational information. Various approaches are now available that provide approximate solutions to the first and third of these problems. However, the useful accuracy of these solutions very much depends on the size and character of the model errors and the ability to account for them. Model errors represent the real-world forcing of the error evolution in a data assimilation system. Clearly, meaningful model error estimates and/or statistics must be based on information external to the model itself. The most obvious information source is observational, and since the volume of available geophysical data is growing rapidly, there is some hope that a purely statistical approach to model error estimation can be viable. This requires that the observation errors themselves are well understood and quantifiable. We will discuss some of these challenges and present a new sequential scheme for estimating model error variances from observations in the context of an atmospheric data assimilation system.

Author

Data Processing; Error Analysis; Data Systems; Atmospheric Models

20030111855 Massachusetts Inst. of Tech., Cambridge, MA, USA
Laboratory Studies of Heterogeneous Chemical Processes of Atmospheric Importance
Molina, Mario J.; January 2003; 13 pp.; In English
Contract(s)/Grant(s): NAG5-12707; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this study is to conduct measurements of chemical kinetics parameters for heterogeneous reactions of importance in the stratosphere and the troposphere. It involves the elucidation of the mechanism of the interaction of HC1 vapor with ice surfaces, which is the first step in the heterogeneous chlorine activation processes, as well as the investigation of the atmospheric oxidation mechanism of soot particles emitted by biomass and fossil fuels. The techniques being employed include turbulent flow- chemical ionization mass spectrometry and optical ellipsometry, among others. The next section summarizes our research activities during the first year of the project, and the section that follows consists of the statement of work for the second year.
Author
Heterogeneity; Chemical Reactions; Atmospheric Chemistry; Vapors; Turbulent Flow

20030111887
Great Lakes Ice Cover, First Ice, Last Ice, and Ice Duration: Winters 1973-2002
Assel, R. A.; Sep. 2003; In English
Report No.(s): PB2004-101155; NOAA/TM GLERL-125; No Copyright; Avail: National Technical Information Service (NTIS)

A 30-winter digital ice cover data set consisting of 1210 ice charts was established for the Great Lakes. The data set is an update of a 28-winter data set given in Assel et al. (2002). The temporal and spatial distribution patterns of the dates of first ice, dates of last ice, and ice duration over the 30-winter base period are analyzed for the combined Great Lakes and for each Great Lake over the 30-winter period. Average and the composite extremes over the 30 winters are presented. Analysis methods are described, and results are summarized in a series of plots, charts, and tables. The complete data set is available as part of an official National Oceanic and Atmospheric Administration Atlas (Assel, 2003).
NTIS
Great Lakes (North America); Ice

20030111964 National Oceanic and Atmospheric Administration, Ann Arbor, MI, USA
Great Lakes Ice Cover Digital Data Set for Winters 1973-2000
Assel, R. A.; Norton, D. C.; Cronk, K. C.; Jun. 2002; In English
Report No.(s): PB2004-100866; NOAA/TM-GLERL-121; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this report is to provide an overview of a new digital ice chart data set developed at the Great Lakes Environmental Research Laboratory (GLERL). The sources of the ice charts, information on ice codes, and file naming convention, structure, and formats are presented and discussed. The temporal and spatial distribution of the digital ice chart data is also discussed.
NTIS
Great Lakes (North America); Ice Mapping; Digital Data

20030111982 National Oceanic and Atmospheric Administration, Ann Arbor, MI, USA
Electronic Atlas of Great Lakes Ice Cover, Winters 1973-2002
Sep. 2003; In English
Report No.(s): PB2004-500023; No Copyright; Avail: National Technical Information Service (NTIS)

Volume 1: Original Ice Charts. The original ice chart data set consists of over 1200 digitized ice charts. These ice charts display observed ice cover over each Great Lake throughout every winter season from 1973 to 2002. Ice chart data is available as Arc/Info Export, ASCII grids, and graphic files. Volume 2: Analysis Products. There are three analysis products. The first product includes ice charts of the following: dates of the first reported ice, dates of the last reported ice, and ice duration for each winter, as well as, the maximum, minimum and average ice cover concentrations. The second product is the 30-year annual daily ice cover time series. The daily time series was used to create: 1) computer animations of spatial patterns of ice cover for each winter, 2) line plots of lake averaged ice cover for each lake over the 30 winters. The third product is weekly statistics. There are weekly ice charts and grids of: maximum, 3rd quartile, median, 1st quartile, and minimum ice cover concentrations for the 30-winter base period. The weekly statistics are based on the original ice chart data set and not on the

daily time series. The results of this analysis are published here as an electronic NOAA Great Lakes Ice Atlas.
NTIS
Great Lakes (North America); Ice Mapping; Digital Data

20030112099 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity Studies for Space-based Measurement of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight
Mao, Jianping; Kawa, S. Randolph; [2003]; 42 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

A series of sensitivity studies is carried out to explore the feasibility of space-based global carbon dioxide (CO2) measurements for global and regional carbon cycle studies. The detection method uses absorption of reflected sunlight in the CO2 vibration-rotation band at 1.58 microns. The sensitivities of the detected radiances are calculated using the line-by-line model (LBLRTM), implemented with the DISORT (Discrete Ordinates Radiative Transfer) model to include atmospheric scattering in this band. The results indicate that (a) the small (approx.1%) changes in CO2 near the Earth's surface are detectable in this CO2 band provided adequate sensor signal-to-noise ratio and spectral resolution are achievable; (b) the radiance signal or sensitivity to CO2 change near the surface is not significantly diminished even in the presence of aerosols and/or thin cirrus clouds in the atmosphere; (c) the modification of sunlight path length by scattering of aerosols and cirrus clouds could lead to large systematic errors in the retrieval; therefore, ancillary aerosol/cirrus cloud data are important to reduce retrieval errors; (d) CO2 retrieval requires good knowledge of the atmospheric temperature profile, e.g. approximately 1K RMS error in layer temperature; (e) the atmospheric path length, over which the CO2 absorption occurs, must be known in order to correctly interpret horizontal gradients of CO2 from the total column CO2 measurement; thus an additional sensor for surface pressure measurement needs to be attached for a complete measurement package.
Author
Aerosols; Atmospheric Composition; Carbon Dioxide Concentration; Sensitivity; Absorption Spectra; Cirrus Clouds

20030112119 NASA Ames Research Center, Moffett Field, CA, USA
Sunlight Transmission through Desert Dust and Marine Aerosols: Diffuse Light Corrections to Sun Photometry and Pyrheliometry
Russell, P. B.; Livingston, J. M.; Dubovik, O.; Ramirez, S. A.; Wang, J.; Redemann, J.; Schmid, B.; Box, M.; Holben, B. N.; [2003]; 3 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Desert dust and marine aerosols are receiving increased scientific attention because of their prevalence on intercontinental scales and their potentially large effects on Earth radiation and climate, as well as on other aerosols, clouds, and precipitation. The relatively large size of desert dust and marine aerosols produces scattering phase functions that are strongly forward-peaked. Hence, Sun photometry and pyrheliometry of these aerosols are more subject to diffuse-light errors than is the case for smaller aerosols. Here we quantify these diffuse-light effects for common Sun photometer and pyrheliometer fields of view (FOV), using a data base on dust and marine aerosols derived from (1) AERONET measurements of sky radiance and solar beam transmission and (2) in situ measurements of aerosol layer size distribution and chemical composition. Accounting for particle non-sphericity is important when deriving dust size distribution from both AERONET and in situ aerodynamic measurements. We express our results in terms of correction factors that can be applied to Sun photometer and pyrheliometer measurements of aerosol optical depth (AOD). We find that the corrections are negligible (less than approximately 1% of AOD) for Sun photometers with narrow FOV (half-angle eta less than degree), but that they can be as large as 10% of AOD at 354 nm wavelength for Sun photometers with eta = 1.85 degrees. For pyrheliometers (which can have eta up to approximately 2.8 degrees), corrections can be as large as 16% at 354 nm. We find that AOD correction factors are well correlated with AOD wavelength dependence (hence Angstrom exponent). We provide best-fit equations for determining correction factors from Angstrom exponents of uncorrected AOD spectra, and we demonstrate their application to vertical profiles of multiwavelength AOD.
Author
Aerosols; Dust; Photometry; Pyroheliometers; Deserts; Marine Meteorology; Sunlight

20030112228 Old Dominion Univ., Norfolk, VA, USA
Engineering Feasibility and Trade Studies for the NASA/VSGC MicroMaps Space Mission
Abdelkhalik, Ossama O.; Nairouz, Bassem; Weaver, Timothy; Newman, Brett; September 2003; 101 pp.; In English
Contract(s)/Grant(s): 23-622-63-02
Report No.(s): NASA/CR-2003-212652; L-16151; NAS 1.26:212652; No Copyright; Avail: CASI; A06, Hardcopy

Knowledge of airborne CO concentrations is critical for accurate scientific prediction of global scale atmospheric behavior. MicroMaps is an existing NASA owned gas filter radiometer instrument designed for space-based measurement of atmospheric CO vertical profiles. Due to programmatic changes, the instrument does not have access to the space environment and is in storage. MicroMaps hardware has significant potential for filling a critical scientific need, thus motivating concept studies for new and innovative scientific spaceflight missions that would leverage the MicroMaps heritage and investment, and contribute to new CO distribution data. This report describes engineering feasibility and trade studies for the NASA/VSGC MicroMaps Space Mission. Conceptual studies encompass: 1) overall mission analysis and synthesis methodology, 2) major subsystem studies and detailed requirements development for an orbital platform option consisting of a small, single purpose spacecraft, 3) assessment of orbital platform option consisting of the International Space Station, and 4) survey of potential launch opportunities for gaining assess to orbit. Investigations are of a preliminary first-order nature. Results and recommendations from these activities are envisioned to support future MicroMaps Mission design decisions regarding program down select options leading to more advanced and mature phases.
Author
Feasibility; Aerospace Environments; Mission Planning; Carbon Monoxide; Atmospheric Chemistry

20030112238 NASA Ames Research Center, Moffett Field, CA, USA
The Discrepancy Between Measured and Modeled Downwelling Solar Irradiance at the Ground: Dependence on Water Vapor
Pilewskie, P.; Rabbette, M.; Bergstrom, R.; Marquez, J.; Schmid, B.; Russell, P. B.; Geophysical Research Letters; November 2003; ISSN 0094-8276; Volume 27, No. 1, pp. 137-140; In English
Contract(s)/Grant(s): NCC2-1164
Report No.(s): Paper-1999GL011085; Copyright; Avail: Other Sources
Moderate resolution spectra of the downwelling solar irradiance at the ground in north central Oklahoma were measured during the Department of Energy Atmospheric Radiation Measurement Program Intensive Observation period in the fall of 1997. Spectra obtained under cloud-free conditions were compared with calculations using a coarse resolution radiative transfer model to examine the dependency of model-measurement bias on water vapor. It was found that the bias was correlated with water vapor and increased at a rate of 9 W/sq m per cm of water. The source of the discrepancy remains undetermined because of the complex depth, on water vapor. dependencies of other variables, most notably aerosol optical depth, on water vapor.
Author
Atmospheric Models; Solar Radiation; Irradiance; Solar Spectra; Water Vapor; Bias

20030112274 Georgia Inst. for Research, Atlanta, GA, USA
Measurement of OH, H2SO4, MSA, and HNO3 Aboard the P-3B Aircraft
Eisele, F. L.; [2003]; 91 pp.; In English
Contract(s)/Grant(s): NCC1-421; Georgia Tech Proj. G-35-663; No Copyright; Avail: CASI; A05, Hardcopy
This paper addresses the measurement of OH, H2SO4, MSA, and HNO3 aboard the P-3B aircraft under the following headings: 1) Performance Report; 2) Highlights of OH, H2SO4, and MSA Measurements Made Aboard the NASA P-3B During TRACE-P; 3) Development and characteristics of an airborne-based instrument used to measure nitric acid during the NASA TRACE-P field experiment.
CASI
P-3 Aircraft; Air Sampling

20030112316 Woods Hole Oceanographic Inst., MA
SecNav / CBLAST 2002 Field Experiment. Deployment/Recovery Cruises and Data Report, F/V Nobska, June 19-20, 2002, F/V Nobska, September 4 and 9, 2002, Mooring Data, June 19 - September 9, 2002
Hutto, Lara; Lord, Jeff; Bouchard, Paul; Weller, Robert; Pritchard, Mark; Sep. 2003; 124 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0029; N00014-99-1-0090
Report No.(s): AD-A418152; WHOI-2003-07; No Copyright; Avail: CASI; A06, Hardcopy
During the summer of 2002, six surface moorings and one subsurface mooring were deployed south of Martha's Vineyard, Cape Cod, Massachusetts. The moorings were deployed from June to September 2002 to collect meteorological and oceanographic data This was done both to support the Coupled Boundary Layer Air-Sea Transfer Low wind (CBLAST-Low)

cooperative experiment and to address the question of regional predictability in the littoral regime under research supported by a Secretary of the Navy/Chief of Naval Operations (CNO) Chair. The aim was to capture the mesoscale development and response of inner shelf waters to local synoptic atmospheric, tidal and larger scale oceanic forcing under predominantly low wind conditions. This report covers the operational aspects of the 2002 experiment, including deployment, recovery, and mooring setups, as well as basic data returns.
DTIC
Meteorology; Oceanography; Mesoscale Phenomena

20030112477 North Carolina State Univ., Raleigh, NC
The Role of Terrain and Convection on Microfront Formation Leading to Severe Low-Level Turbulence
Cetola, Jeffrey D.; Oct. 2003; 341 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417983; CI02-1292; No Copyright; Avail: CASI; A15, Hardcopy

Two low-level convectively-induced turbulence (CIT) events east of the Appalachian Mountains are investigated utilizing observations, satellite, radar, and numerical simulations. Both events had an inordinate amount of low-level turbulence reported, but one event had more than twice as many severe or greater reports. The events were compared-to include the 72 hours leading up to the turbulence reports-and similarities and differences at the various scales from the synoptic to meso-alpha, meso-beta, meso-gamma, and microscale are noted. The case of weaker turbulence featured a meridional wave pattern with ridging over the East Coast and a single upper-level jet closely coupled with the large-scale frontal system. The stronger turbulence case possessed a zonal wave pattern with a vortex over eastern Canada and both a polar jet and subtropical jet. These differences are reflected in the low-level temperature and potential vorticity patterns and affected the hydraulic structures as well-with the stronger turbulence environment more prone to a blocking-type regime. Hydrostatic mountain waves were observed for both events. Stronger cross-mountain flow combined with a strong low-level leeside inversion resulted in a more vigorous mountain wave with a stronger downstream isentropic upfold (mid-level cold pool) in the stronger turbulence event. This mid-level cold pool was deformed by the large-scale jet resulting in a mid-level cold front (downstream from the surface cold front), surface pressure rises to the lee of the Allegheny Mountains, and ultimately a surface cold surge (edgewave) that merges with warm air from the south. The phasing of the mid-level cold pool and the convergence with the northerly cold surge and southerly warm air results in kata-frontogenesis and cellular convection that transits the severe turbulence location in space and time. Convection in the weaker turbulence case was lineal in structure and tied to the large-scale cold anafront.
DTIC
Turbulence; Terrain

20030112645 Naval Postgraduate School, Monterey, CA
Evaluation of EM Propagation Models Using Data from Wallops Island Experiment (2000)
Moys, Andrew J.; Sep. 2003; 162 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418227; No Copyright; Avail: CASI; A08, Hardcopy

The Royal Navy and the USA Navy emphasise utilising the environment to achieve a tactical edge Such approaches are outlined in Sea Power 21 This thesis recognizes accurate characterisation of the physical battlespace as vital to concepts of both self-defence (Sea Shield) and strike (Sea Strike), Electromagnetic (EM) propagation is presented as a vital factor in the performance of a wide variety of ship, land, and airborne sensors and weapon systems. Atmospheric influences on EM propagation are related to gradients of temperature and humidity within the atmosphere It is emphasised that modern maritime warfare is increasingly concentrated in the coastal theatre, an area in which atmosphere variability is often at maxima in both the vertical and horizontal, This thesis examines, using currently available technology and operational methods, how well the physical EM battlespace is described, Propagation models from the UK and US are used to evaluate the propagation environment within the coastal zone, using measured data, collected from the East Coast of the USA, at Wallops Island during 2000, as a comparison The main findings relate to the large potential errors, due the inability to measure and characterize the variability of the coastal environment under simulated, operational scenarios,
DTIC
Airborne Equipment; Coasts; Electromagnetic Wave Transmission

20030112745 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity of Assimilated Tropical Tropospheric Ozone to the Meteorological Analyses
Hayashi, Hiroo; Stajner, Ivanka; Pawson, Steven; Thompson, Anne M.; [2002]; 1 pp.; In English; American Geophysical Union Fall Meeting, 6-10 Dec. 2002, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Tropical tropospheric ozone fields from two different experiments performed with an off-line ozone assimilation system developed in NASA's Data Assimilation Office (DAO) are examined. Assimilated ozone fields from the two experiments are compared with the collocated ozone profiles from the Southern Hemispheric Additional Ozonesondes (SHADOZ) network. Results are presented for 1998. The ozone assimilation system includes a chemistry-transport model, which uses analyzed winds from the Goddard Earth Observing System (GEOS) Data Assimilation System (DAS). The two experiments use wind fields from different versions of GEOS DAS: an operational version of the GEOS-2 system and a prototype of the GEOS-4 system. While both versions of the DAS utilize the Physical-space Statistical Analysis System and use comparable observations, they use entirely different general circulation models and data insertion techniques. The shape of the annual-mean vertical profile of the assimilated ozone fields is sensitive to the meteorological analyses, with the GEOS-4-based ozone being closest to the observations. This indicates that the resolved transport in GEOS-4 is more realistic than in GEOS-2. Remaining uncertainties include quantification of the representation of sub-grid-scale processes in the transport calculations, which plays an important role in the locations and seasons where convection dominates the transport.
Author
Ozone; Sensitivity; Tropical Regions; Data Acquisition; Meteorology

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OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20030110728 Maine Univ., Orono, ME, USA
Identifying an Oceanic Impact Crater Through Sedimentology
Glatz, C. A.; Abbott, D. H.; Nunes, A. A.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

Currently there are no confirmed impact craters on the oceanic crust. The fundamental reason for this lack of subaqueous impacts is that unlike their terrestrial counterparts, marine impact structures are not easily recognizable. Deep ocean impact craters have been simulated by Gault and Sonnett and are found to be cylindrically shaped. The formation of the crater and uplift of the central peak create mega turbidite/gravity flows and mega tsunami that scour the ocean floor, losing energy as it moves outward from the impact site.The resurgence of water into the transient crater erode the crater walls and rims leaving a topographically subdued crater. A large enough impact will excavate into the oceanic crust which, if mixing with a bolide, can create an iron enriched impact ejecta layer. Seventy percent of the impact ejecta is located within 1.5x the crater radius. The ejecta layer may extend further from the impact site than would be expected for a terrestrial impact of equal size, due to the oscillations of the tsunami. A plausible sedimentation pattern for an abyssal ocean impact crater would show an overabundance of sediment at the site of impact extending well past the rim transitioning into partial and/or complete denudation of the oceanic crust. We have found a site which fits this pattern of sedimentation. The site also has topographic features consistent with models of deep ocean impact craters. A high susceptibility layer is present which contains impact related ejecta. If this crater is confirmed then the sedimentological pattern listed above may be used to find other abyssal ocean impact craters.
Author
Sedimentary Rocks; Water Depth; Craters; Identifying; Ocean Bottom; Impact Damage

20030111299 Arizona Univ., Tucson, AZ, USA
Impact-generated Tsunamis: An Over-rated Hazard
Melosh, H. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-11493; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A number of authors have suggested that oceanic waves (tsunami) created by the impact of relatively small asteroids into the Earth's oceans might cause widespread devastation to coastal cities. If correct, this suggests that asteroids > 100 m in diameter may pose a serious hazard to humanity and could require a substantial expansion of the current efforts to identify earth-crossing asteroids > 1 km in diameter. The debate on this hazard was recently altered by the release of a document previously inaccessible to the scientific community. In 1968 the US Office of Naval Research commissioned a summary of several decades of research into the hazard proposed by waves generated by nuclear explosions in the ocean. Authored by tsunami expert William Van Dorn, this 173-page report entitled Handbook of Explosion-Generated Water Waves affords new

insight into the process of impact wave formation, propagation, and run up onto the shoreline.
Derived from text
Water Waves; Oceans; Hazards; Wave Propagation; Tsunami Waves

20030112409 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Further Studies on Oceanic Biogeochemistry and Carbon Cycling
Signorini, S. R.; McClain, C. R.; July 2003; 57 pp.; In English
Report No.(s): NASA/TM-2003-212245; Rept-2003-02527-0; NAS 1.15:212245; No Copyright; Avail: CASI; A04, Hardcopy

This TM consists of two chapters. Chapter I describes the development of a coupled, one-dimensional biogeochemical model using turbulence closure mixed layer (TCMLM) dynamics. The model is applied to the Sargasso Sea at the BATS (Bermuda Atlantic Time Series) site and the results are compared with a previous model study in the same region described in NASNTP-2001-209991. The use of the TCMLM contributed to some improvements in the model simulation of chlorophyll, PAR, nitrate, phosphate, and oxygen, but most importantly, the current model achieved good agreement with the data with much more realistic background eddy diffusivity. However, off-line calculations of horizontal transport of biogeochemical properties revealed that one-dimensional dynamics can only provide a limited assessment of the nutrient and carbon balances at BATS. Future studies in the BATS region will require comprehensive three-dimensional field studies, combined with three-dimensional eddy resolving numerical experiments, to adequately quantify the impact of the local and remote forcing on ecosystem dynamics and carbon cycling. Chapter II addresses the sensitivity of global sea-air CO, flux estimates to wind speed, temperature, and salinity. Sensitivity analyses of sea-air CO, flux to wind speed climatologies, gas transfer algorithms, SSS and SST were conducted for the global oceans and regional domains. Large uncertainties in the global sea-air flux are identified, primarily due to the different gas transfer algorithms used. The sensitivity of the sea-air flux to SST and SSS is similar in magnitude to the effect of using different wind climatologies. Globally, the mean ocean uptake of CO, changes by 5 to 16%, depending upon the combination of SST and SSS used.
Author
Biogeochemistry; Oceanography; Mathematical Models; Carbon Cycle; Turbulence

20030112414 NASA Goddard Space Flight Center, Greenbelt, MD, USA
BENCAL Cruise Report
Hooker, Stanford B., Editor; Firestone, Elaine R., Editor; Barlow, Ray; Sessions, Heather; Silulwane, Nonkqubela; Engel, Hermann; Aiken, James; Fishwick, James; Martinez-Vicente, Victor; Morel, Andre, et al.; September 2003; ISSN 1522-8789; 71 pp.; In English
Report No.(s): NASA/TM-2003-206892/VOL27; Rept-2003-01909-0/VOL27; NAS 1.15:206892/VOL27; Copyright; Avail: CASI; A04, Hardcopy

This report documents the scientific activities on board the South African Fisheries Research Ship (FRS) Africana during an ocean color calibration and validation cruise in the Benguela upwelling ecosystem (BEN-CAL), 4-17 October 2002. The cruise, denoted Afncana voyage 170, was staged in the southern Benguela between Cape Town and the Orange River within the region 14-18.5 deg E,29-34 deg S, with 15 scientists participat- ing from seven different international organizations. Uniquely in October 2002, four high-precision ocean color sensors were operational, and these included the Moderate Resolution Imaging Spectroradiometer (MODIS) instruments on the Aqua and Terra spacecraft, the Medium Resolution Imaging Spectrometer (MERIS), and the Sea-viewing Wide Field-of-view Sensor (SeaWiFS). SeaWiFS imagery was transmitted daily to the ship to assist in choosing the vessel's course and selecting stations for bio-optical deployments. There were four primary objectives of the cruise. The first was to conduct bio-optical measurements with above- and in-water optical instruments to vicariously calibrate the satellite sensors. The second was to interrelate diverse measurements of the apparent optical properties (AOPs) at satellite sensor wavelengths with inherent optical properties (IOPs) and bio-optically active constituents of seawater such as particles, pigments, and dissolved compounds. The third was to determine the interrelationships between optical properties, phytoplankton pigment composition, photosynthetic rates, and primary production, while the fourth objective was to collect samples for a second pigment round-robin intercalibration experiment. Weather conditions were generally very favorable, and a range of hyperspectral and fixed wavelength AOP instruments were deployed during daylight hours. Various IOP instruments were used to determine the absorption, attenuation, scattering, and backscattering properties of particulate matter and dissolved substances, while a Fast Repetition Rate Fluorometer (FRRF) was deployed to acquire data on phytoplankton photosynthetic activity. Hydrographic profiling was conducted routinely during the cruise, and seawater samples were collected for measurements of salinity, oxygen, inorganic nutrients, pigments, particulate organic carbon, suspended particulate material, and primary production. Location of stations and times of optical deployments

were selected to coincide with satellite overpasses whenever possible, and to cover a large range in trophic conditions.
Author
Ecosystems; Upwelling Water; Republic of South Africa; Remote Sensing; Oceanography

20030112415 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Tower-Perturbation Measurements in Above-Water Radiometry
Hooker, Stanford B., Editor; Firestone, Elaine R., Editor; Zibordi, Giuseppe; Berthon, Jean-Francois; DAlimonte, Davide; vanderLinde, Dirk; Brown, James W.; June 2003; ISSN 1522-8789; 44 pp.; In English
Report No.(s): NASA/TM-2003-206892/VOL23; Rept-2003-01914-0/VOL23; NAS 1.15:206892/VOL23; Copyright; Avail: CASI; A03, Hardcopy

This report documents the scientific activities which took place during June 2001 and June 2002 on the Acqua Alta Oceanographic Tower (AAOT) in the northern Adriatic Sea. The primary objective of these field campaigns was to quantify the effect of platform perturbations (principally reflections of sunlight onto the sea surface) on above-water measurements of water-leaving radiances. The deployment goals documented in this report were to: a) collect an extensive and simultaneous set of above- and in-water optical measurements under predominantly clear-sky conditions; b) establish the vertical properties of the water column using a variety of ancillary measurements, many of which were taken coincidently with the optical measurements; and c) determine the bulk properties of the environment using a diversity of atmospheric, biogeochemical, and meteorological techniques. A preliminary assessment of the data collected during the two field campaigns shows the perturbation in above-water radiometry caused by a large offshore structure is very similar to that caused by a large research vessel.
Author
Oceanography; Perturbation; Radiometers; Sea-Viewing Wide Field-of-View Sensor; Sea Water

20030112416 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New Laboratory Methods for Characterizing the Immersion Factors for Irradiance
Hooker, Stanford B., Editor; Firestone, Elaine R., Editor; Zibordi, Giuseppe; DAlimonte, Davide; vaderLinde, Dirk; Brown, James W.; July 2003; ISSN 1522-8789; 41 pp.; In English
Report No.(s): NASA/TM-2003-206892/VOL26; Rept-2003-01911-0/VOL26; Copyright; Avail: CASI; A03, Hardcopy

The experimental determination of the immersion factor, I(sub f)(lambda), of irradiance collectors is a requirement of any in-water radiometer. The eighth SeaWiFS Intercalibration Round-Robin Experiment (SIRREX-8) showed different implementations, at different laboratories, of the same I(sub f)(lambda) measurement protocol. The different implementations make use of different setups, volumes, and water types. Consequently, they exhibit different accuracies and require different execution times for characterizing an irradiance sensor. In view of standardizing the characterization of I(sub f)(lambda) values for in-water radiometers, together with an increase in the accuracy of methods and a decrease in the execution time, alternative methods are presented, and assessed versus the traditional method. The proposed new laboratory methods include: a) the continuous method, in which optical measurements taken with discrete water depths are substituted by continuous profiles created by removing the water from the water vessel at a constant flow rate (which significantly reduces the time required for the characterization of a single radiometer); and b) the Compact Portable Advanced Characterization Tank (ComPACT) method, in which the commonly used large tanks are replaced by a small water vessel, thereby allowing the determination of I(sub f)(lambda) values with a small water volume, and more importantly, permitting I(sub f)(lambda) characterizations with pure water. Intercomparisons between the continuous and the traditional method showed results within the variance of I(sub f) (lambda) determinations. The use of the continuous method, however, showed a much shorter realization time. Intercomparisons between the ComPACT and the traditional method showed generally higher I(sub f)(lambda) values for the former. This is in agreement with the generalized expectations of a reduction in scattering effects, because of the use of pure water with the ComPACT method versus the use of tap water with the traditional method.
Author
Irradiance; Postlaunch Reports; Sea-Viewing Wide Field-of-View Sensor; Oceanography; Submerging

20030112426 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Validation of an In-Water, Tower-Shading Correction Scheme
Hooker, Stanford B., Editor; Firestone, Elaine R., Editor; Doyle, John P.; Zibordi, Giuseppe; vanderLinde, Dirk; July 2003; ISSN 1522-8789; 40 pp.; In English
Report No.(s): NASA/TM-2003-206892VOL25; Rept-2003-01912-0/VOL25; Copyright; Avail: CASI; A03, Hardcopy

Large offshore structures used for the deployment of optical instruments can significantly perturb the intensity of the light field surrounding the optical measurement point, where different portions of the visible spectrum are subject to different shadowing effects. These effects degrade the quality of the acquired optical data and can reduce the accuracy of several derived quantities, such as those obtained by applying bio-optical algorithms directly to the shadow-perturbed data. As a result, optical remote sensing calibration and validation studies can be impaired if shadowing artifacts are not fully accounted for. In this work, the general in-water shadowing problem is examined for a particular case study. Backward Monte Carlo (MC) radiative transfer computations- performed in a vertically stratified, horizontally inhomogeneous, and realistic ocean-atmosphere system are shown to accurately simulate the shadow-induced relative percent errors affecting the radiance and irradiance data profiles acquired close to an oceanographic tower. Multiparameter optical data processing has provided adequate representation of experimental uncertainties allowing consistent comparison with simulations. The more detailed simulations at the subsurface depth appear to be essentially equivalent to those obtained assuming a simplified ocean-atmosphere system, except in highly stratified waters. MC computations performed in the simplified system can be assumed, therefore, to accurately simulate the optical measurements conducted under more complex sampling conditions (i.e., within waters presenting moderate stratification at most). A previously reported correction scheme, based on the simplified MC simulations, and developed for subsurface shadow-removal processing of in-water optical data taken close to the investigated oceanographic tower, is then validated adequately under most experimental conditions. It appears feasible to generalize the present tower-specific approach to solve other optical sensor shadowing problems pertaining to differently shaped deployment platforms, and also including surrounding structures and instrument casings.
Author
Monte Carlo Method; Oceanography; Optical Measuring Instruments; Remote Sensing; Correction; Sea Water

20030112428 NASA Goddard Space Flight Center, Greenbelt, MD, USA
SeaWiFS Postlaunch Technical Report Series Cumulative Index: Volumes 1-23
Hooker, Stanford B., Editor; Firestone, Elaine R., Editor; August 2003; ISSN 1522-8789; 40 pp.; In English
Report No.(s): NASA/TM-2003-206892/VOL24; Rept-2003-01913-0/VOL24; Copyright; Avail: CASI; A03, Hardcopy

The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) is the follow-on ocean color instrument to the Coastal Zone Color Scanner (CZCS), which ceased operations in 1986, after an eight-year mission. SeaWiFS was launched on 1 August 1997, onboard the OrbView-2 satellite, built by Orbital Sciences Corporation (OSC). The SeaWiFS Project at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC), undertook the responsibility of documenting all aspects of this mission, which is critical to the ocean color and marine science communities. The start of this documentation was titled the SeaWiFS Technical Report Series, which ended after 43 volumes were published. A follow-on series was started, titled the Sea WiFS Postlaunch Technical Report Series. This particular volume of the so-called Postlaunch Series serves as a reference, or guidebook, to the previous 23 volumes and consists of 4 sections including an errata, an index to key words and phrases, a list of acronyms used, and a list of all references cited. The editors will publish a cumulative index of this type after every five volumes.
Author
Postlaunch Reports; Sea-Viewing Wide Field-of-View Sensor; NASA Programs; Indexes (Documentation)

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20030109379 New England Medical Center Hospitals, Boston, MA, USA
Role of p53 in Mammary Epithelial Cell Senescence
Dimri, Goberdhan P.; May 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0509
Report No.(s): AD-A417603; No Copyright; Avail: CASI; A02, Hardcopy

Preselect ion and postselection human mammary epithelial cells (HMECs) differ greatly in replicative potential. In this report, we studied the role of p53 in senescence of preselection and postselection HMECs. Western blot analysis of early (proliferating) and late (senescing) preselection and postselection HMECs showed that postselection HMECs have higher level of p53, which is upregulated during senescence. postselection HMECs also showed higher expression of p53 target gene p21.

On the other hand, there was no increase in p53 level and its target gene p21 in senescent preselection cells. DNA binding assays using p53 binding site of p21 promoter and extracts prepared from early and late passage postselection cells suggest that p53 binding activity increases with senescence in postselection HMECs. We also studied posttranslational modifications of p53 in HMECs using antibodies specific for various phosphorylated and acetylated form of p53. Results suggest there are no major differences in acetylation or phosphorylation of p53 in preselection and postselection HMECs. However, postselection HMECs contained higher level of p53 phosphorylated at Ser-38. Taken together, these results suggest p53 plays an important role in senescence of postselection HMECs, but not in senescence of preselection HMECs.
DTIC
Mammary Glands; Phosphorylation; Cancer

20030109380 Mayo Clinic, Jacksonville, FL, USA
New Inhibitors of the Peripheral Site in Acetylcholinesterase that Specifically Block Organophosphorylation
Rosenberry, Terrone L.; Apr. 2003; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-02-2-0024
Report No.(s): AD-A417604; No Copyright; Avail: CASI; A03, Hardcopy

Examination of the enzyme structure for acetylcholinesterase (AChE) reveals two sites of ligand interaction: The peripheral site (P-site) located at the entrance of the gorge, and the acylation site (A-site) at the base of the gorge. Our goal is to develop high affinity cyclic peptide ligands specific for the P-site while allowing the passage of acetylcholine to the A-site for use by personnel at risk for nerve gas exposure. Our strategy involves the covalent tethering of cyclic inhibitors via a methanethiosulfonate (MTS) linkage to a cysteine on the AChE mutant, H287C. To validate this approach we used cat ionic ligands with demonstrated affinity for the AChE A-site that are attached to MTS tethers of various lengths. After labeling we separated modified from unmodified enzymes using affinity chromatography on acridinium resin. Enzymes modified with ligands having a significant effect on the A-site elute in a NaCl wash, while unmodified enzyme elutes only with the AChE inhibitor decamethonium. We compared the substrate dependence of hydrolysis rates on the substrate concentration for unmodified H287C as well as 3 modified enzymes and found that 2 of the modified enzymes shifted the hydrolysis curve, with large increases in K(app) and K(12) Selective inhibition by propidium at the P-site and tacrine at the A-site measure the effect of labeling. We compared K(12) values and found that the shortest tethers had little effect on K(12) Medium length tethers interfered with propidium binding to the P-site while K(12) values for tacrine inhibition increased progressively as the size of the tethered ligand increases.
DTIC
Acetyl Compounds; Cholinesterase

20030109381 Beth Israel Deaconess Medical Center, Boston, MA, USA
Structural Basis for BRCA1 Function in Breast Cancer
Ladias, John A.; Apr. 2003; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0300
Report No.(s): AD-A417605; No Copyright; Avail: CASI; A03, Hardcopy

The Breast Cancer Susceptibility gene 1 (BRCA1) encodes an 1863-amino acid protein that plays a central role in the pathogenesis of hereditary breast cancer. The BRCA1 protein contains an N-terminal RING finger and two C-terminal BRCT domains (BRCT1 and BRCT2), which are critical for BRCA1- mediated tumor suppression and are targets for cancer-causing mutations. The BRCA1 RING interacts with the RING domain of BARD1, another protein involved in breast cancer pathogenesis, and with the C-terminal domain of BAP1 (amino acids 598-729), a ubiquitin hydrolase that enhances BRCA1-mediated cell growth suppression, whereas the BRCA1 BRCT domains interact with the C-terminal region of BACH1 (amino acids 888-1063), a helicase- like protein that contributes to the BRCA1 DNA repair function. The present project focuses on the elucidation of the structural basis of the BRCA1 RING and BRCT domain interaction with the proteins BARD1, BAP1, and BACH1, using X-ray crystallography. In the first year of the award we completed the Tasks 1a, 1b, and 1c of the original Statement of Work. For the remaining years of the award, we propose to determine the crystal structures of the BRCA1 (residues 1-3 04)/BRAP1 (residues 598-729), BRCA1 (residues 1-304)/BARD 1 (residues 25- 189), and BRCA1 (residues 1650-1863)/BACH1 (residues 888-1063) protein complexes.
DTIC
Cancer; Mammary Glands; Proteins

20030110696 NASA Ames Research Center, Moffett Field, CA, USA

The Licancabur Project: Exploring the Limits of Life in the Highest Lake on Earth as an Analog to Martian Paleolakes

Cabrol, N. A.; Grin, E. A.; McKay, C. P.; Friedmann, I.; Diaz, G. Chong; Demergasso, C.; Kisse, K.; Grigorszky, I.; Friedmann, R. Ocampo; Hock, A., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Licancabur volcano (6017 m) hosts the highest and one of the least explored lakes in the world in its summit crater. It is located 22 deg.50 min. South / 67 deg.53 min. West at the boundary of Chile and Bolivia in the High-Andes. In a freezing environment, the lake located in volcano-tectonic environment combines low-oxygen, low atmospheric pressure due to altitude, and high-UV radiation (see table). However, its bottom water temperature remains above 0 C year-round. These conditions make Licancabur a unique analog to Martian paleolakes considered high-priority sites for the search for life on Mars.

Derived from text

Craters; Extraterrestrial Life; Freezing; Lakes; Life Sciences; Mars (Planet)

20030110876 Maryland Univ., College Park, MD, USA

The Effect of Biosynthetic Networks on Mass-dependent Sulfur Isotope Fractionations

Farquhar, J.; Johnston, D. T.; Wing, B. A.; Habicht, K. S.; Canfield, D. E.; Airieau, S.; Thiemens, M. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Biosynthetic reaction networks can influence mass-dependent isotopic fractionations of multiple sulfur isotopes and an understanding of these relationships is necessary in order to use sulfur isotope data as supporting evidence of specific sulfur metabolisms.

Author

Biosynthesis; Metabolism; Sulfur

20030111749 Texas A&M Univ., College Station, TX

Single-Molecule Detection of Proteins in Supported Bilayers: Applications in Device Fabrication and Sensor Technology

Cremer, Paul S.; Oct. 24, 2003; 5 pp.; In English

Contract(s)/Grant(s): N00014-02-0710

Report No.(s): AD-A417870; No Copyright; Avail: CASI; A01, Hardcopy

Two single molecule fluorescent microscopes were designed and built for exploring membrane protein assembly. The first system, which was designed for use with solid supported membranes, is being used to explore the mechanistic details of alpha-hemolysin assembly. On the other hand, the second system was fabricated for use with black lipid membranes. It is being employed to correlate ion channel insertion into bilayers with changes in current. The first results with these systems already show great promise.

DTIC

Molecular Biology; Detection; Fabrication; Proteins; Biotechnology

20030111755 Pittsburgh Univ., Pittsburgh, PA

Cell Motility in Tumor Invasion

Wells, Alan; Lauffenburger, Douglas A.; Turner, Timothy; Jul. 2003; 55 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0093

Report No.(s): AD-A417877; No Copyright; Avail: CASI; A04, Hardcopy

Our overall objective is to understand how dysregulation of cell migration contributes to tumor cell invasiveness in prostate cancer. A combination of correlative epidemiological studies and basic experimental investigations demonstrate a role for upregulated EGF receptor (EGFR) signaling of motility in tumor progression. EGFR-mediated cell motility has been demonstrated to be critical for tumor invasion. Our central premise is that prostate tumor cell invasiveness can be inhibited by interfering with the specific motility-associated calpain activation that governs the critical underlying biophysical process of de-adhesion. Prior work has shown that integrin/matrix binding and growth factor stimulation jointly regulate cell locomotion. These studies have identified cell/substratum adhesiveness, especially the ability of a cell to detach at its trailing edge, as a primary governor of cell locomotion. We have recently found that this tail detachment is regulated by calpain

activation. We are employing a set of model prostate tumor cell lines including a panel of syngeneic androgen-independent DU-145 cells that vary in invasiveness. Our findings in the first year showed that disruption of calpain activation and de-adhesion can block tumor invasiveness in vitro. This has been extended in the second year to demonstrate that this also applies in animal models of tumor invasiveness.
DTIC
Cells (Biology); Prostate Gland; Tumors; Migration; Epidemiology

20030111757 South Carolina Univ., Columbia, SC
Interrelationships of Prenatal and Postnatal Growth, Hormones, Diet, and Breast Cancer
Sanderson, Maureen; Jun. 2003; 70 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0340
Report No.(s): AD-A417878; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this Career Development Award was to expand Dr. Sanderson's current breast cancer research from the effect of intrauterine exposure to estrogen on breast cancer to the interrelationships of prenatal and postnatal growth, hormones, diet and breast cancer. Based on these interrelationships, we hypothesized that insulin resistance will be positively associated with breast cancer. Further, we hypothesized that genetic susceptibility, and adolescent/ adult diet and physical activity will modify the effect of insulin resistance on breast cancer. Specific aims were: 1) to undergo intensive training in cancer biology, and nutritional, molecular and genetic epidemiology, 2) to obtain finding to conduct case-control studies of the insulin resistance-breast cancer relationship, and 3) to obtain finding to conduct a cohort study of the association between prenatal and postnatal growth and infant hormone levels. During the third year of the study, Dr. Sanderson helped develop a course in Nutritional Epidemiology, conducted analyses of dietary intake, anthropometric measurements and insulin-like growth factor from the Shanghai Breast Cancer Study, submitted a proposal for a HBCU/MI Partnership Award to the Department of Defense to investigate insulin resistance and breast cancer, and participated in the Lower Rio Grande Valley Nutrition Intervention Research Initiative consortium.
DTIC
Cancer; Diets; Mammary Glands; Pituitary Hormones; Genetics

20030111771 Cold Spring Harbor Lab., New York, NY, USA
Whole Genome Epigenetics
Carmell, Michelle A.; Hannon, Gregory J.; May 2003; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0343
Report No.(s): AD-A417880; No Copyright; Avail: CASI; A03, Hardcopy

An understanding of the cancer cell begins with knowledge of the genetic alterations that lead to neoplastic transformation. Much progress has been made in identifying areas of deletion, amplification and mutation in tumors. However, this is only part of the picture. Increasingly, we are learning that epigenetic changes, that is, changes in chromatin structure, are critically important in regulation cellular gene expression. Recently, several labs have published manuscripts identifying RNA interference as being crucial for the establishment of such epigenetic changes in species as diverse as Drosphilia, plants, and the fission yeast S. pombe. This knowledge presented a fantastic opportunity not only to study epigenetic changes, but to actually selectively create epigenetic changes by creating germline transgenic mice in which a target gene has been silenced by RNAi. After the demonstration that RNAi in mammalian cells can be mediated by vectors encoding short, hairpin RNAs (shRNAs), we sought to develop a system by which to create tranagenic mice using this technology. we demonstrate that a stable, heritable RNAi trigger in the form of a short hairpin was successfully passed through the mouse germline. As well as demonstrating a technique that can be applied to any gene of interest, we have created gene knock- down mouse models for the Neil-l DNA glycosylase involved in DNA repair pathways, and for p53. These observations open the way to the use of RNAi as a complement to standard knock-out methodologies and provides a means to rapidly assess the consequences of suppressing a gene of interest in a living animal. The vision driving the creation of this technology was one of eventual RNAi-based therapeutics. One could particularly imagine silencing oncogenes in cancer cells to attenuate their tumorgenic tendencies.
DTIC
Genome; Genetic Engineering; Epidemiology; Cancer; Oncogenes

20030111894 Texas Univ., Houston, TX, USA

Reduction of Radiation- or Chemotherapy-Induced Toxicity by Specific Expression of Anti-Apoptotic Molecules in Normal Cells

Ueno, Naoto T.; Jun. 2003; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0304

Report No.(s): AD-A417850; No Copyright; Avail: CASI; A03, Hardcopy

Adjuvant radiation and chemotherapy confer a survival benefit in breast cancer, but both treatments can damage normal tissues in ways that can adversely affect quality of life (e.g., by skin desquamation, mucositis, pulmonary fibrosis, cardiomyopathy, peripheral neuropathy). These effects on normal tissues are generally due to apoptosis (programmed death) of normal cells. We hypothesize that ectopic overexpression of the anti-apoptotic molecule Bcl-2 will inhibit the radiation-induced apoptosis of normal cells and thus reduce the toxicity of these treatments. We found that overexpressing Bcl-2 in murine fibroblast NIH3T3 cells resulted in resistance to radiation. Heterogeneous plasmid that expresses Bcl-2 cDNA in front of a minimal promoter regulated by multiple wild-type p53 DNA-binding sites protects specifically cells with wild-type p53 but not p53-mutated or p53-deleted cancer cells from genotoxic damage (e.g., radiation) by tipregulated expression of p53 and Bcl-2. Progress is described the results of specific aim I and 2 that allows to develop preclinical animal model in specific aim 3.

DTIC

Apoptosis; Cells (Biology); Chemotherapy; Toxicity; Radiation; Gene Expression

20030111897 Memphis Univ., Memphis, TN

Computational Modeling of the Prostate-Expressed Lysophosphatidic Acid Receptor Edg-7

Sardar, Vineet M.; Parrill, Abby L.; Apr. 2003; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0248

Report No.(s): AD-A417853; No Copyright; Avail: CASI; A03, Hardcopy

Recently it was shown that the lysophosphatidic acid (LPA) receptor LPA3/ EDG7 is expressed in human prostate cancer cell lines namely LNCap and Du-145. Based on these findings and evidence that LPA is a very potent mitogen, the overall goal of this proposed research is to rationally design LPA3/EDG7 selective ligands. We have identified the probable binding position of two LPA1/ EDG2 and LPA3/EDG7 selective inhibitors namely DGPP (8:0) and FAP (12:0). The binding position and the critical amino acids involved in interacting with these inhibitors relative to the endogenous ligand LPA (18:1) is discussed.

DTIC

Prostate Gland; Pathology; Endothelium; Cancer; Receptors (Physiology); Acids

20030111898 Pittsburgh Univ., Pittsburgh, PA

Determination of a Unique Pattern of Gene Expression in Node Positive Breast Cancer Using Serial Analysis of Gene Expression (SAGE)

Brufsky, Adam M.; Jun. 2002; 9 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0608

Report No.(s): AD-A417855; No Copyright; Avail: CASI; A02, Hardcopy

Individual breast cancer cells in a growing primary tumor are genetically unstable and undergo somatic mutation at an accelerated rate. Primary breast tumors are therefore composed of genetically heterogeneous clones of cells. Individual clones of cells, through activation and expression of normally suppressed genes, likely acquire the capacity for lymphogenous and hematogenous spread at a very early stage of primary tumor development. These clones likely represent only a small fraction of the total tumor volume. We hypothesize that a pattern of genetic expression (a 'signature') for lymphogenous spread exists in a small fraction of cells of a primary breast cancer. In addition, we hypothesize that this signature will be constant between primary tumors from different women. This genetic signature should be detectable by sensitive genetic differential display methods, and can be exploited to determine the lymph node status of a primary breast cancer. A corollary to this hypothesis is that a lymph node involved by metastatic breast cancer should represent an in vivo amplification of clones of cells of a primary breast cancer. The lymph node should have a pattern of genetic expression differing from the primary tumor. In addition, the lymph node genetic expression signature should contain genes associated with increased aggressiveness.

DTIC

Cancer; Gene Expression; Mammary Glands; Cells (Biology); Lymphatic System

20030111899 Central Inst. for the Deaf, Saint Louis, MO, USA
Physiological Maturation of Regenerating Hair Cells
Baird, Richard A.; [2003]; 6 pp.; In English
Contract(s)/Grant(s): NAG2-1343; No Copyright; Avail: CASI; A02, Hardcopy

The bullfrog saccule, a sensor of gravity and substrate-borne vibration, is a model system for hair cell transduction. Saccular hair cells also increase in number throughout adult life and rapidly recover after hair cell damage, making this organ an ideal system for studying hair cell development, repair, and regeneration. We have used of hair cell and supporting cell immunocytochemical markers to identify damaged hair cells and hair cell precursors in organotypic cultures of the bullfrog saccule. We then used an innovative combination of confocal, electron, and time-lapse microscopy to study the fate of damaged hair cells and the origin of new hair cells after gentamicin ototoxicity in normal and mitotically blocked saccular cultures. These studies have shown that gentamicin ototoxicity produces both lethal and sublethal hair cell damage. They have also shown that hair cell recovery in this organ takes place by both the repair of sublethally damaged hair cells and by the replacement of lost hair cells by mitotic regeneration. In parallel studies, we have used biophysical and molecular biological techniques to study the differentiation and innervation of developing, repairing, and regenerating hair cells. More specifically, we have used RT-PCR to obtain the bullfrog homologues of L-type voltage- gated calcium (L-VGCC) and large-conductance Ca(2+)-activated potassium (BK) channel genes. We have then obtained probes for these genes and, using in situ hybridization, begun to examine their expression in the bullfrog saccule and amphibian papilla. We have also used fluorescent-labeled channel toxins and channel toxin derivatives to determine the time of appearance of L-type voltage-gated calcium (L-VGCC) and Ca(2+)-activated potassium (BK) channels and to study dynamic changes in the number, distribution, and co-localization of these proteins in developing, repairing, and regenerating hair cells. Using time-lapse microscopy, we are also studying the dynamic relationship between ion channel clustering and synaptic formation in hair cells and afferent neurons. In future studies, we will determine when hair cell precursors acquire electrical tuning, and, using whole-cell patch-clamp techniques, identify and characterize their L-VGCC and BK currents. We will also use biophysical techniques to determine the number of L-VGCC and BK channels and the size and gating kinetics of their underlying L-VGCC and BK conductances, correlating these variables with the amplitude and frequency of membrane oscillations produced by intracellular current steps. We expect these studies to determine how hair cells regulate ion channel expression to achieve specific physiological responses.
Derived from text
Cells (Biology); Damage; Genetics; Physiology

20030111902
EGF Regulation of Nuclear Co-Activator AIB1 Function in Breast Cancer
Oh, Annabell S.; Riegal, Anna; Apr. 2002; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0394
Report No.(s): AD-A417856; No Copyright; Avail: CASI; A03, Hardcopy

Various growth factor receptor pathways promote human breast tumorigenesis of hormone-independent tumors. The nuclear receptor coactivator AIBi (amplified in breast cancer 1) can be phosphorylated and regulated by growth factor- induced signaling pathways such as MAP kinase and IkB kinase. Our lab has found a splice variant of AIBl, called delta exon3 AIBl, which has a higher co-activating ability than the full-length protein. This study determined the ability of delta exon3 splice variant compared with AIBi in potentiating growth factor signaling and to determine the mechanism of this potentiation using a growth factor responsive promoter.
DTIC
Cancer; Hormones; Mammary Glands; Tumors; Gene Expression

20030111941 Louisville Univ. Foundation, Inc., KY, USA
Development of an Oral Barley Beta-Glucan Adjuvant That Augments the Tumoricidal Activity of Antibodies or Vaccines Used for the Immunotherapy of Breast Cancer
Ross, Gordon D.; Jul. 2003; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0445
Report No.(s): AD-A417775; No Copyright; Avail: CASI; A03, Hardcopy

These Data provided strong evidence for the efficacy of an oral beta-glucan adjuvant for use in combination with anti-tumor antibodies such as Herceptin, Rituxan, and Erbitux. The tumor regression activity of these three antibodies was significantly increased by the simultaneous administration of oral beta-glucan. The data showing that antibodies must activate

complement and deposit IC3b on tumors means that antibodies that do not to activate complement would not benefit from oral beta-glucan.
DTIC
Cancer; Mammary Glands; Tumors

20030111943
Cellular Mechanisms Regulating Urokinase-Type Plasminogen Activator in Hormone Refractory Prostate Cancer: A Novel Therapeutic Target
Gallick, Gary E.; Jul. 2003; 64 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0524
Report No.(s): AD-A417778; No Copyright; Avail: CASI; A04, Hardcopy

'Cellular Mechanisms Regulating Urokinase-Type Plasminogen Activator in Hormone Refractory Prostate Cancer: A Novel Therapeutic Target' has as its primary goals inhibiting the expression of two pathways critical to prostate cancer progression, one mediated by the tyrosine kinase receptor c- Met, and the second mediated by urokinase plasminogen activator (uPA), and determining the effects on tumor progression and metastasis. The purpose of the research is to provide a novel therapeutic basis for the development of prostate tumor metastases through inhibition of these growth regulatory pathways. Inhibition of the c-Met pathway through the use of an adenovirus expressing a specific ribozyme inhibits migration and invasion of prostate tumor cells in vitro and completely inhibits the growth and lymph node metastasis of prostate tumor cells in an orthotopic mouse model system (Kim et al., in Press). Direct inhibition of uPAR (urokinase plasminogen activator receptor), achieved by the competitive inhibitor for uPA binding, A6, also reduced invasive potential of prostate tumor cells in vitro, and greatly prolonged the survival of mice bearing prostate tumors (%survival' being defined as time to first signs of morbidity) Boyd et al., 2003). Thus, in the past year, we have nearly finished the first two tasks of the Award, with data demonstrating the c-Met and uPAR are both involved in tumor progression through cell migration and invasion and that both c-Met and UPAR are targets for therapeutic intervention. We plan to determine the effects of combining inhibitors of these two molecules and examine human tumors (task 3) in the final year of the work.
DTIC
Cancer; Cells (Biology); Prostate Gland

20030111946 Johns Hopkins Univ., Baltimore, MD
Modulation of Breast Tumor Cell Response to Retinoids by Histone Deacetylase Inhibitors
Sacchi, Nicoletta; Apr. 2003; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0432
Report No.(s): AD-A417781; No Copyright; Avail: CASI; A03, Hardcopy

Retinoic acid (RA) resistance is a major hurdle of retinoid-differentiation therapy. One form of RA-resistance in breast cancer can be traced to loss of expression of the tumor suppressor RAR beta, due to epigenetic changes including DNA methylation and histone deacetylation in one of the RAR beta promoters. Epigenetic changes are reversible. By using histone deacetylase inhibitors (HDACT), including phenyl butyrate (PB) and Trichostatin A (TSA), we were able to revert epigenetic changes at RAR beta, restore RA sensitivity and induce endogenous RAR beta expression in RA-resistant breast cancer cells both in vivo and in vitro (Sirchia et al., Cancer Research, 62, 2455-2461, 2002). Our next goal is to evaluate whether we can improve reactivation of endogenous RAB beta. In the course of our preliminary studies we realized that the RA- resistant phenotype is associated with RAR beta promoter not only with a) heterogeneous DNA methylation/histone hypocetylation patterns but also b) different types and degree of histone modifications, including methylation at lysine 4 and 9 on Histone 3, acetylation at histone 3 and histone 4, and phosphorylation at serine 3 on Histone 3. It remains to be established whether these modifications can influence the efficiency of endogenous reactivation of RAR beta.
DTIC
Cancer; Butyric Acid; Phosphorylation

20030111950 Buck Inst. for Age Research, Novato, CA, USA
Comprehensive Development Program of Hunter-Killer Peptides for Prostate Cancer
Ellerby, Howard M.; May 2003; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0029
Report No.(s): AD-A417782; No Copyright; Avail: CASI; A04, Hardcopy

13. ABSTRACT (Maximum 200 Words) Prostate cancer is now the most common cancer among men in the USA.

Angiogenesis is required for prostate tumor survival, growth, and metastasis. We proposed to design novel Hunter-Killer Peptides (HKPs), each representing a chimeric peptide of an angiogenesis-targeting peptide and a mitochondrial membrane-disrupting peptide. While non-toxic in the circulation, the HKPs will be preferentially toxic to mitochondria once internalized into angiogenic cells, via the targeting domain.
DTIC
Peptides; Cancer; Membranes; Metastasis

20030111951 Pennsylvania Univ., Philadelphia, PA
A Novel Strategy for Controlling the Metastic Phenotype: Targeting the SNAG Repression Domain in the SNAIL Zinc-Finger Protein
Rauscher III, Frank J.; Apr. 2003; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0631
Report No.(s): AD-A417783; No Copyright; Avail: CASI; A03, Hardcopy

Considerable progress has been made toward tasks aimed at reconstitution, mapping and determining the specificity of the SNAIL- SNAG domain/SNAP interaction in vitro and in vivo. We have obtained epitope-tagged full length CDNA clones of the SNAG domain zinc finger protein, SNAIL, and the SNAPs, Ajuba and LIMDI and verified stable protein expression in mammalian cells. We have demonstrated that Ajuba can interact with SNAIL by co-immunoprecipitation and have shown that wild type but not SNAG-domain-deleted SNAIL can augment SNAIL-mediated repression of transiently transfected E-Cadherin promoter Luciferase reporter plasmids. Immunocytochemical analysis has shown that in the absence of cotransfected SNAG domain proteins, both Ajuba and LlMDl exhibit predominantly cytoplasmic subcellular localization: however, Ajuba deleted for nuclear exclusion signals localizes in both the cytoplasm and nucleus. We have generated a panel of HEK293 stable cell lines expressing Ajuba and the LIMDl and examined differences in the biochemical complexes associated with Ajuba and LIMDl in cytoplasmic compared to nuclear fractions. We have generated and characterized extremely useful polyclonal antibodies capable of detecting and discriminating between Ajuba and LIMD1. Our current efforts are aimed at definition of potential dominant negative SNAG/SNAP interaction surfaces towards our goal of reactivating E-Cadherin to control the metastatic phenotype.
DTIC
Metastasis; Biochemistry; Enzymes

20030111953 Albany Medical Coll., NY
Inducible Anti-Angiogenic Gene Therapy
Higgins, Paul J.; May 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0270
Report No.(s): AD-A417784; No Copyright; Avail: CASI; A02, Hardcopy

Clinical studies have indicated that high breast tumor levels of plasminogen activator inhibitor-1 (PAI-1) are associated with an increased risk for metastasis, decreased patient survival, a well developed angiogenic response, and overall poor prognosis. Since PAI-1 is required for tumor- dependent angiogenesis and inhibits capillary regression, a targeted molecular genetic approach was devised to ablate PAI- 1 synthesis in endothelial cells using antisense PAI-1 expression constructs. Work in year 2001 established that constructs prepared in the Rc/CMV and retroviral pLNCX2 vectors, in fact, significantly attenuated PAI-1 synthesis in mouse (MS1) and rat (T2) endothelial cells confirming proof of principal for the original hypothesis. of a total of 11 different clones isolated following transfection of the PAI-1 antisense Rc/ CMVIAP plasmid, 4 MS1- and 2 T2-derived lines were essentially PAI-1-null. A host mouse breeding colony was also established in order to maintain, at relatively low cost, a sufficient number of mice to meet the goals of this program.
DTIC
Gene Therapy; Mammary Glands; Genetics

20030111955 California Univ., Los Angeles, CA
Modulation of VEGF Bioavailability in Breast Tumors by Direct MMP Cleavage
Lee, Sunyoung; Iruela-Arispe, Luisa; May 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0328
Report No.(s): AD-A417785; No Copyright; Avail: CASI; A02, Hardcopy

Vascular endothelial growth factor(VEGF) is one of the most relevant mediators of capillary recruitment and stimulator of tumor-angiogenesis. Substantial evidence implicates VEGF in the vascularization of tumors, including those related to the

mammary gland. Once synthesized and secreted by the normal mammary gland, VEGF is frequently bound to extracellular matrix molecules, remaining inaccessible to its receptors present on endothelial cells. Subsequent release of VEGF from extracellular sources is thought to require break- down of matrix proteins by matrix metalloproteinases(MMPs). However, its exact regulation is unknown. We previously found that MMP-3 cleaves VEGF165(^22kDa) directly, releasing two major VEGF165 cleavage products, ^16kDa and ^6kDa. Here we report that, by western analysis with epitope-specific antibodies, Edman sequencing and MALDI/MS analysis for both fragments to determine the cleavage sites in VEGF, MMP-3 cleaves VEGF165, releasing the ^16kDa fragment that is functionally active as it phosphorylates VEGFR-2 in porcine aortic endothelial cells at a level comparable by conditioned media from uncleaved VEGF165-expressing cells. The data imply that VEGF may be processed extracellulary releasing bioactive fragments and that this proteolysis might offer an important mode for regulation on VEGF bioavailability.
DTIC
Cleavage; Cancer; Mammary Glands

20030111957 Yale Univ., New Haven, CT
Novel Regulation by Glucocorticoids of C-FMS Proto-Oncogene RNA Protein Binding and Breast Cancer Invasion
Chambers, Setsuko K.; May 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0633
Report No.(s): AD-A417824; No Copyright; Avail: CASI; A02, Hardcopy

We propose to explore the role of c-fms RNA protein binding as well as the mechanism by which the c-fms proto-oncogene contributes to aggressive invasive behavior of breast cancer. We have found by Northwestern analysis that there are several proteins which bind to the 3, untranslated region of c-fms RNA. Protein purification has yielded several proteins, some of which are abundant enough for sequencing analysis. The final fraction was confirmed to be active in 3UTR c-fms RNA gel shift assays. Further, we have successfully utilized microarray analysis to identify 5 genes which are consistently differentially overexpressed by dexamethasone in BT20 breast cancer cells. One such gene, which was confirmed to be sensitive to dexamethasone by Western Blot, is sgk, a serine threonine kinase. The sgk protein is phosphorylated by PI3-kinase. We have demonstrated that inhibition of PI3-kinase results in a significant decrease in dexamethasone and CSF-1 (growth factor ligand for c-fms) induced adhesiveness of BT20 cells to extracellular matrix, This suggests that sgk may be a downstream mediator of the c-fms related invasive phenotype. Sgk has not been previously been identified as a gene involved in c-fms related aggressive behavior, thus may represent a potential new target for therapeutic intervention.
DTIC
Cancer; Glucocorticoids; Mammary Glands; Oncogenes; Proteins; Ribonucleic Acids

20030111958 Fox Chase Cancer Center, Philadelphia, PA, USA
Dietary Patterns and Prostate Cancer in the NHEFS Cohort
Tseng, Marilyn; Jun. 2003; 42 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0057
Report No.(s): AD-A417826; No Copyright; Avail: CASI; A03, Hardcopy

Ecologic studies implicate a ‘western’ diet in prostate cancer, but whether dietary patterns measured in individuals are associated with risk has not been studied previously. We used prospective data from the NHANES I Epidemiologic Follow-up Study, with 136 cases among 3,779 men followed 1982-4 to 1992. Using principal components analysis, three patterns were identified: vegetable-fruit, red meat- starch, and southern. In proportional hazards models, southern pattern intake showed a risk reduction (3rd vs. 1st tertile RR 0.6, 95% CI 0.4-1.1) that approached statistical significance, was observed in black and non-black men, and was not attributable to intake of any individual foods or nutrients. A southern pattern may reflect a history of living in the South and serve as a marker of sunlight exposure and protection through 1,25-hydroxyvitamin D production. Other findings in the same sample also suggest the importance of a vitamin D- related pathway: Dairy intake (RR 2.2, 95% CI 1.3-4.0), lowfat milk (RR 1.6, 95% CI 1.2-2.1), and calcium (RR 2.4, 95% CI 1.5- 3.9) were associated with risk, while vitamin D intake was inversely associated (RR 0.5, 95% CI 0.3-1.0). High calcium intake may suppress 1,25-hydroxyvitamin D production, increasing prostate cancer risk. However, mechanisms linking dairy/calcium to prostate cancer should be clarified and confirmed.
DTIC
Cancer; Diets; Males; Prostate Gland; Epidemiology

20030111959 Virginia Univ., Charlottesville, VA

Membrane Estrogen Receptor Alpha Targeting and Its Association With SHC in Regulating Breast Cancer Cell Proliferation

Song, Robert X-D.; Jun. 2003; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0610

Report No.(s): AD-A417786; No Copyright; Avail: CASI; A02, Hardcopy

17beta-estradiol (E2) induces rapid, non-genomic effect in MCF-7 breast cancer cells, including rapid activation of MAPK, phosphorylation of adapter protein Shc, increase of the interaction between Shc and estrogen receptor (ERalpha). More strikingly E2 also induced a rapid membrane association of ERalpha: (1) Further studying the structure and function of ERalpha, we demonstrated that only membrane- associated ERalpha, but not cytosol and nuclear ones, mediates E2 effect on MAPK activation. (2) To study the mechanism of ERalpha membrane association, we further investigated the role of Shc in estrogen action. Here we demonstrated that in MCF-7 cells, Shc acts as a chaperon linking ERalpha to the cell membrane by binding to a transmembrane receptor IGF-1R. Further study is under the way to investigate the molecular mechanism among these protein complex formation and their biological effects in estrogen non-genomic action.

DTIC

Cells (Biology); Regeneration (Physiology); Estrogens; Cancer; Biological Effects

20030111962

Matriptase Activation in Breast Cancer Progression

Lin, Chen-Yong; Jun. 2003; 11 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0391

Report No.(s): AD-A417787; No Copyright; Avail: CASI; A03, Hardcopy

In the current research plan, we proposed to study the mechanism for activation of matriptase, a membrane-bound serine protease. In non-transformed mammary epithelial cells, matriptase activation can be induced by sphingosine 1- phosphate, a blood-borne bioactive phospholipid. In addition to S1P, as an exogenous inducer, both catalytic and non- catalytic domains of matriptase could also participate in the activation of the protease. In the past one-year, we have systemically constructed matriptase mutants, and used these mutants to study the structural requirements for matriptase activation. Our data reveal that matriptase activation requires its own catalytic activity, proteolytic processing at Gly-149 in the SEA domain of the protease, glycosylation of the first CUB domain and the serine protease domain, and intact low-density lipoprotein (LDL) receptor. Its cognate inhibitor, hepatocyte growth factor activator inhibitor-1 (HAI- 1), may also participate in the activation of matriptase. These results suggest that besides matriptase catalytic activity, matriptase activation requires posttranslational modification of the protease, intact non-catalytic domain, and its cognate inhibitor.

DTIC

Cancer; Lipoproteins; Phosphates

20030111966 Baylor Coll. of Medicine, Houston, TX

The Role of the Telomere End Protection Complex in Telomere Maintenance

Cervantes, Rachel B.; Jun. 2003; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0276

Report No.(s): AD-A417832; No Copyright; Avail: CASI; A02, Hardcopy

Telomeres are the protective ends of chromosomes that are necessary for maintaining the viability of a cell and the integrity of its genome. One essential function of telomeres is to protect the chromosome end from being degraded by nucleases that are normally present in any cell. Unprotected chromosome ends could fuse to each other leading to loss of genetic material, genomic instability, and subsequent carcinogenesis. The focus of my research is to understand the mechanism of chromosome end protection in the well-studied model organism, S. cerevisiae, and then extend the knowledge we gain in yeast to humans by identifying human homologues of the essential proteins involved in end protection. Using molecular and phylogenetic approaches, I have successfully identified yeast homologues of three proteins known to be involved in end protection - Cdc13, Stnl and Tenl. With these homologues in hand, I have initiated searches for human homologues of Stnl and Tenl. Using a combination of bioinformatics and yeast genetics, I have potentially identified a site of interaction between Cdc13 and Stnl that is essential for mediating end protection. These findings have further elucidated the mechanism of end protection and have allowed us to start looking for similar proteins and parallel mechanisms in humans.

DTIC

Chromosomes; Genome; Cells (Biology); Organisms

20030111967 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD

Determining Optimal Microwave Antigen Retrieval Conditions for Microtubule-Associated Protein 2 Immunohistochemistry in the Guinea Pig Brain

Pleva, Christina M.; Hamilton, Tracey A.; Petrali, John P.; Kan, Robert K.; Dec. 2002; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-TC1

Report No.(s): AD-A417833; USAMRICD-TR-02-06; No Copyright; Avail: CASI; A03, Hardcopy

The present study examined the efficacy of microwave pretreatment on microtubule-associated protein 2 (MAP-2) immunoreactivity in paraffin-embedded sections of formalin-fixed guinea pig brains using different MAP-2 monoclonal antibodies. Brain sections were boiled in sodium citrate, citric acid, Tris hydrochloride, and EDTA solutions with pH values of 2, 4, 6, and 8 in a microwave prior to MAP-2 immunohistochemical staining. Specific MAP-2 immunoreactivity was observed in brain regions when NeoMarkers MAP-2 antibody (clone AP-18) was used in conjunction with citric acid buffer of pH 6.0 as an antigen retrieval solution. No immunoreactivity of MAP-2 was observed in negative control sections. The results suggest that a lO-min boiling in citric acid solution at pH 6.0 is the optimal microwave-assisted AR method for immunolabeling MAP-2 in formalin-fixed, paraffin- processed guinea pig brain samples using NeoMarkers MAP-2 monoclonal antibody (AP-18). This undoubtedly will have important applications in our efforts to conduct retrospective studies on archival guinea pig brain paraffin blocks, ultimately relaxing the use of additional animals to evaluate changes in MAP-2 expression between chemical warfare nerve agent-treated and control samples.

DTIC

Antigens; Brain; Guinea Pigs; Proteins; Immunology; Histochemical Analysis; Microwaves

20030111968 Baylor Coll. of Medicine, Houston, TX

The Role of Estrogen Receptor alpha K303R Mutation in Breast Cancer Metastasis

Cui, Yukun; Fuqua, Suzanne A.; Jun. 2003; 20 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0278

Report No.(s): AD-A417835; No Copyright; Avail: CASI; A03, Hardcopy

The activity of estrogen receptor a is activated by both ligand binding and various modifications including phosphorylation and acetylation. Recently we have isolated a somatic ERalpha mutation which occurs in the major p300 acetylation site of ERalpha(Lys 303 to Arg, K303R)in human breast hyperplasias. This mutant is significantly correlated with both breast tumorigenesis and development. We report here that a component of the nucleosome remodeling and histone deacetylase complexes (NuRD), called metastasis-associated protein 1-like 1 (MTA1-L1),is an ERalpha binding protein both in vivo and in vitro. Also, we found that this interaction is ligand independent and requires the N-terminal region of MTA1-L1 and multiple domains of ER, Furthermore, we show that MTA1- L1 downregulates wild-type ERalpha, but not the K303R ERalpha mutation activities in transient transactivation assays. Taken together, our results suggest that the alterated ERalpha-containing NuRD function due to the K303R mutation could be a possible mechanism for this hypersensitive phenomenon.

DTIC

Cancer; Estrogens; Mammary Glands; Metastasis; Receptors (Physiology); Mutations

20030111969 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD

Clinical Drug Treatment of Edemagenic Gas-Induced Lung Injury

Sciuto, Alfred M.; Hurt, Holcombe H.; Feb. 2003; 30 pp.; In English

Contract(s)/Grant(s): Proj-TC1

Report No.(s): AD-A417836; USAMRICD-TR-03-01; No Copyright; Avail: CASI; A03, Hardcopy

Studies were performed to address treatment against phosgene gas. Efficacy was judged by examining post- treatment (PTx) effects on pulmonary edema (PE) i. e. lung weight gain (LWG), survival rates (SR), odds ratios (OR), and glutathione (GSH) redox state, and lipid peroxidation (LP). N- acetylcysteine (NAC), ibuprofen (IBU), aminophylline (AMIN), and isoproterenol (ISO) were studied in the isolated perfused rabbit lung model (lPRLM) and mouse model. Intratracheal (IT) NAC delivered 1 h after phosgene exposure lowered pulmonary artery pressure (Ppa), LWG, leukotrienes (LTs), LP, and oxidized GSH. Using the lPRLM, AMIN after phosgene exposure significantly reduced LP and LTs, and LWG. Ptx with ISO in the IPRLM by combined intravascular (IV) or intratracheal (IT) route 1 h after phosgene lowered Ppa, tracheal pressure, LWG, and LTs. In mice IBU was administered i.p. 20 min after phosgene at 0, 3, 9, or 15 mg/mouse. At 5 h, a second IBU injection was given. The OR was 5 for the 9/4.5 IBU group at 12 h and 13 for the 15/7.5 mg IBU. IBU enhanced mouse SR

by reducing PE, LP, and GSH depletion. Treatment of phosgene injury involves early intervention that reduces LP, maintains GSH, and prevents the release of LTs responsible for PE.
DTIC
Edema; Injuries; Lungs; Gases; Drugs; Clinical Medicine

20030111980 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD
Control of Nerve Agent-Induced Seizures is Critical for Neuroprotection and Survival
Shih, Tsung-Ming A.; Duniho, Steven M.; McDonough, John H.; Aug. 2002; 28 pp.; In English
Contract(s)/Grant(s): Proj-TC1
Report No.(s): AD-A417799; USAMRICD-TR-02-04; No Copyright; Avail: CASI; A03, Hardcopy

The effectiveness of some anticholinergics (atropine, biperiden or trihexyphenidyl) and beazodiazepines (diazepam or midazolam) as an anticonvulsant treatment against seizures induced by six nerve agents (tabun, sarin, soman, cyclosarin, VR and VX) was studied in a guinea pig model that closely approximates the use of pretreatment and therapy drugs as medical countermeasures for nerve agent exposure. The time to seizure onset, the time to seizure termination, and 24-h lethality were recorded. The anticonvulsant ED5O of each drug for termination of seizures induced by each agent was calculated and compared. Brain tissue from animals that survived 24 h was examined for pathology. Results suggest that all nerve agents produce EEG seizures via a common mechanism and can be controlled by anticholinergic or beazodiazepine anticonvulsant treatment. While control of seizures was known to protect against brain pathology, the relationship between seizure control and the acute lethal effects of these agents appears to have been previously under-appreciated. Effective anticonvulsant treatment of a nerve agent casualty is, therefore, critical to immediate and long-term recovery.
DTIC
Nerves; Anticonvulsants; Anticholinergics; Electroencephalography

20030111983 Boston Univ., Boston, MA
Design and Construction of Genetic Applets
Collins, James J.; May 2003; 5 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0554
Report No.(s): AD-A417910; No Copyright; Avail: CASI; A01, Hardcopy

In this project, we took a forward engineering approach to understanding and controlling gene expression. Specifically, we developed a theory of gene networks that will execute a prescribed series of cellular functions. By designing the gene networks ourselves, we can allow only simple interactions and thus avoid the enormous complexity that biology has developed over years of evolution. This project involved both theoretical and experimental work.
DTIC
Gene Expression; Cytology; Genetic Engineering

20030111985 University of South Florida, Tampa, FL
Robust Detection of Masses in Digitized Mammograms
Li, Lihua; Jun. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0245
Report No.(s): AD-A417801; No Copyright; Avail: CASI; A02, Hardcopy

This project is to develop a robust computer aided diagnosis (CAD) system for mass detection with high sensitivity and specificity in digitized mammograms. The research scope in past year is to evaluate the detection performance and robustness of CAD system. Several major progresses have been made including (1). In addition to the training database, two independent testing databases were generated for evaluation. (2). Two testings and comparisons were made between the algorithms before and after the modifications using the methods developed in this project research in past two years: one on performance testing, another on robustness testing. A set of FROC curves was generated. It is demonstrated that the CAD system developed in this project consistently outperformed the CAD method we developed before both in detection performance and generalizability.
DTIC
Computer Aided Design; Computer Techniques; Cancer; Mammary Glands

20030111989 Nebraska Univ., Lincoln, NE
Process Research and Development of Antibodies as Countermeasures for C. botulinum
Meagher, Michael M.; Mar. 2003; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0659
Report No.(s): AD-A417916; No Copyright; Avail: CASI; A03, Hardcopy

This report describes the ongoing project to fill out shell space on the third floor and basement of Othmer Hall, the new home for the University of Nebraska-Lincoln Biological Process Development Facility. At the detailed design is completed and construction is nearly half completed with the expected completion date being December 2003. The third floor will house all of the process research capabilities, i.e. molecular biology, fermentation, cell culture, analytical methods, quality control, purification development and media prep. This report also describes research on the expression of antibodies in Chinese Hamster Ovary (CHO) cells against serotype A botulinum neurotoxin. We have been able to clone and successful express the full intact 8-25 antibody provided by Dr. Jim Marks of UCSF at 30 mgIL in 250 mL spinner shake flasks. This product has been purified and sent to Dr. Leonard Smith of USAMRllD for evaluation. Results are pending.
DTIC
Clostridium Botulinum; Antibodies

20030112003 Vanderbilt Univ., Nashville, TN, USA
P38 Mitogen-Activated Protein Kinase in Metastasis Associated With Transforming Growth Factor Beta
Bakin, Andrei V.; Jun. 2003; 36 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0602
Report No.(s): AD-A417915; No Copyright; Avail: CASI; A03, Hardcopy

Metastatic breast cancer cells express high levels of the transforming growth factor!beta (TGFbeta). Although TGFbeta is a potent tumor suppressor, it can promote formation of highly metastatic tumors by stimulating an epithelial to mesenchymal transition (EMT), cell migration, and changes in tumor microenvironment. Our initial observation indicated that p38 mitogen activated protein kinase (p38Mapk) is required for these TGFbeta responses in epithelial cells. Metastatic breast cancer cells express high levels of active p38Mapk and this contributes to tumor invasiveness. Thus, p38Mapk is a potential target for selective therapeutic intervention.
DTIC
Metastasis; Cancer; Mammary Glands; Proteins

20030112027 Baylor Coll. of Medicine, Houston, TX
Can Gene Expression Pattern Analysis Predict Recurrence in Node-Negative Breast Cancer
Immaneni, Anand; O'Connell, Peter; Jun. 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0283
Report No.(s): AD-A417924; No Copyright; Avail: CASI; A02, Hardcopy

Although a majority of women with node-negative breast cancers have a good prognosis, 30% experience recurrence and death from metastatic disease. As result, systemic therapies are routinely administered to nearly all of these node-negative patients. Markers that better predict recurrence risk would more effectively target adjuvant therapies to the patients most likely to benefit from them. Our goal is to identify the genetic markers that 1) are differentially expressed in good versus bad outcome node- negative primary breast cancers, 2) help dichotomize node- negative patients into low and high-risk categories so that adjuvant treatment could be more effectively utilized, 3) identify genetic pathways associated with the metastatic phenotype. cDNA micro-arrays were used to analyze 30 untreated primary node-negative breast tumors from patients who were either completely cured by surgery alone (good outcome) and those who experienced metastatic recurrences (Bad outcome). At the p =0.05 level of significance, 137 genes involved in cell cycle, apoptosis samples DNA repair, cell adhesion, cytoskeleton and signal transduction were found to be differentially expressed between the good versus bad outcome tumors by Wilcoxon tests. Tree-view analyses generated dendrograms showing that the two categories of tumors mostly, but not completely, formed outcome- related clusters. We are currently validating the array data using semi-quantitative RT- PCR. Preliminary assays showed that the tested genes are indeed differentially expressed in the tumor samples. More candidate genes are currently being assayed. We have just started immunohistochemistry analysis on tissue arrays of archival specimens to assess the prognostic significance of some of these interesting candidate metastasis markers for which antibodies are commercially available.
DTIC
Gene Expression; Mammary Glands; Cancer

20030112030 Baylor Coll. of Medicine, Houston, TX
Involvement of Steroid Receptor Coactivators/Ubiquitin Pathway Enzymes in Mammary Gland Tumorigenesis
Gao, Xiuhua; Nawaz, Zafar; Jun. 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0281
Report No.(s): AD-A417925; No Copyright; Avail: CASI; A03, Hardcopy

Steroid hormones, estrogen and progesterone, and their intracellular receptors play an important role in the development and progression of breast cancer. Coactivator proteins modulate the biological activity of these hormone receptors. We have cloned an E3 ubiquitin- protein ligase enzyme, E6-associated protein (E6-AP) as coactivators of steroid hormone receptors. The purpose of this research is to explore the possibility that the altered expression of E6-AP may contribute to the development of breast cancer. We have examined this possibility by studying the expression patterns of E6-AP and estrogen receptor-alpha (ERa) in various human breast cancer cell lines and breast tumor biopsy samples. Additionally, we have correlated the expression profile of E6- AP with that of ER in breast tumor biopsies. To date, we have examined 13 samples by immunhistochemistry, and 19 samples by Immunofluorescence. We found an inverse correlation between the expression of E6-AP and the expression of ER in these tumors. Furthermore, E6-AP is down regulated in invasive breast tumors compared with their adjacent normal tissues. These data suggest a possible role of E6-AP in mammary gland development and tumorigenesis. Presently, we are studying the expression profile of E6-AP and ER in different stage tumors. Our next goal of this project is to create novel in vitro models in stable cell lines, which will overexpress E6-AP.
DTIC
Enzymes; Physiology; Mammary Glands; Estrogens; Cancer; Activity (Biology); Cells (Biology)

20030112031 Duke Univ., Durham, NC
Modular Machine Learning Methods for Computer- Aided Diagnosis of Breast Cancer
Jesneck, Jonathan L.; Lo, Joseph; May 2003; 47 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0373
Report No.(s): AD-A417928; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study was four fold: 1) Identify subsets of the training data of breast cancer features using both a priori information and unsupervised learning methods. 2) Build local models for breast cancer prediction for each subset of the training data using supervised learning methods. Evaluate the performance of the local models on the training data relative to a single, global, supervised learning model and to current clinical practice. 3) Combine the local models to form a global, modular model and evaluate the performance of the modular model on the evaluation data set relative to a single, global, supervised learning model and to current clinical practice. 4) Develop an ensemble classifier combining three sources of data (image processing, radiologist - extracted mammographic findings, and patient history) for the task of computer-aided diagnosis of breast microcalcification clusters. We developed the world's largest database of over 4400 cases containing radiologist- extracted mammographic findings, patient age, and biopsy outcome, and we used this data -to develop modular, global CAD models using different machine learning algorithms applied to the entire database.
DTIC
Clinical Medicine; Cancer; Mammary Glands; Machine Learning; Applications Programs (Computers); Computer Aided Design

20030112038 Columbia Univ., New York, NY
Potentiation of T Lymphocyte Responses by Modulating NF - Kappa Beta Activity in Dendritic Cells
Beg, Amer A.; Jun. 2003; 37 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0355
Report No.(s): AD-A417929; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this investigation is to determine whether modulation of NF-KB activity by genetic engineering of DCs can affect DC longevity and T cell stimulatory functions. The specific aims are: 1) To determine the effect of expression of constitutively-active IKKBeta IkE kinase) on nuclear NF-kB levels in DCs, and on the longevity of DCs. 2) To determine the effect of IKKbeta expression on in vitro and in vivo T cell priming by DCs. Results from these studies may thus lead the way for development of approaches for enhancing DC survival and function, with the goal of generating potent anti-tumor immunity.
DTIC
Lymphocytes; Cells (Biology); Dendritic Crystals; Tumors

20030112044
Overcoming Resistance of Prostate Cancer to TRAIL- Mediated Apoptosis
Kraft, Andrew S.; Jun. 2003; 63 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0045
Report No.(s): AD-A417935; No Copyright; Avail: CASI; A04, Hardcopy

TRAIL-TNF-related apoptosis inducing ligand) is a protein that induces apoptotic cell death in cancerous but not normal tissues. TRAIL has the potential to be a novel prostate cancer treatment. However, we have found that the majority of prostate cancer cell lines are insensitive to this agent. The goal of this proposal is decipher the nature of this resistance and develop biochemical tools to enhance the sensitivity of prostate cancer to TRAIL killing. Scope This proposal examines normal prostate epithelia, prostate cancer cell lines, and animal tumors for sensitivity to TRAIL.
DTIC
Cancer; Prostate Gland

20030112045
Mechanisms and Regulation of Gene Expression by Androgen Receptor in Prostate Cancer
Wang, Zhengxin; Jul. 2003; 61 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0097
Report No.(s): AD-A417936; No Copyright; Avail: CASI; A04, Hardcopy

Our general objective is to use completely defined cell-free transcription systems both to identify novel AR- associated cofactors and to investigate the mechanism of action of AR and both novel and previously identified candidate coactivators. In an attempt to isolate cofactors capable of influencing AR transcriptional activity, we used an immunoprecipitation method and identified a 44-kDa protein, designated as p44, as a new AR-interacting protein. P44 interacts with AR in the nucleus and with an androgen- regulated homeobox protein (NKx3. 1) in the cytoplasm of LNCaP cells. Transient transfection assay revealed that p44 enhances AR-, glucocorticoid receptor-, and progesterone receptor- dependent transcription but not estrogen receptor- or thyroid hormone receptor-dependent transcription. P44 was recruited onto the promoter of the prostate-specific antigen gene in the presence of the androgen in LNCaP cells. P44 exists as a multiprotein complex in the nucleus of HeLa cells. This complex, but not p44 alone, enhances AR-driven transcription in vitro in a cell-free transcriptional system and contains the protein arginine methyltransferase 5 (PRMT5), which acts synergistically with p44 to enhance AR-driven gene expression in a methyltransferase-independent manner. Our data suggest that a novel mechanism by which the protein arginine methyltransferase is involved in the control of AR-driven transcription. P44 expression is dramatically enhanced in prostate cancer tissue when compared with adjacent benign prostate tissue.
DTIC
Genes; Hormone Metabolisms; In Vitro Methods and Tests

20030112272 California Univ., Irvine, CA
Monitoring the Response of Chemotherapy on Breast Cancer Tumors by Photon Migration Spectroscopy
Hsiang, David J.; Jun. 2003; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0324
Report No.(s): AD-A418087; No Copyright; Avail: CASI; A03, Hardcopy

Optimal management of patients with locally advanced breast cancer (LABC) remains a complex therapeutic problem. LABC represents 5-20% of all newly diagnosed breast cancers in the USA with a higher incidence in medically underserved areas. Over the years, treatment for LABC has been evolving from radical mastectomy to the use of neoadjuvant chemotherapy followed with mastectomy or breast conservation therapy. The optimal intensity and duration of neoadjuvant chemotherapy for LABC still remains controversial due to the difficulty of evaluating response to therapy. Presently, response to treatment is measured by physical exam, mammography and or ultrasound. Several studies have showed significant discrepancies between the clinical assessment of response to neoadjuvant chemotherapy and the pathologic assessment of response found in post therapy surgical specimens. The goal of this project is to use Photon Migration Spectroscopy (PMS) as a new modality to monitor the response of breast tumor to neoadjuvant chemotherapy. PMS has shown excellent sensitivity to crucial early functional changes in breast tissue subjected to neoadjuvant chemotherapy which can be pivotal to the choice of chemotherapy agents and final survival outcome.
DTIC
Cancer; Mammary Glands; Migration; Photons; Spectroscopy; Tumors; Chemotherapy

20030112279
Characterization of the PKB/AKT Pathway in the Role of Tumorigenesis and Transformation of MCF10A Human Mammary Epithelial Cells
Ackler, Scott L.; Jul. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0258
Report No.(s): AD-A418085; No Copyright; Avail: CASI; A03, Hardcopy

The Akt homology domain (AM) of Akt has been identified as a potential dimerization site within the kinase, and potentially could serve as a selective inhibitor of these kinases. We fused the AM domains of Akt1 (AH1) and Akt2 (AH2) to EGFP and performed expression studies with these constructs. Overexpression of both in PTEN deficient U87 cells sensitized these cells to apoptosis from camptothecin treatment, while neither was able to do this in PTEN+ MCF-7 cells. AH2 was able to block overexpressed Aktl and endogenous Akts inhibition of AFX as measured by an AFX reporter assay, but not when Akt2 was overexpressed. AFX disinhibition in U87 and MCF-7 cells patterned their effects in the cytotoxicity assay. Finally, we were able to demonstrate that AH2 bound to Akt1 and Akt2, but AH1 only bound to Akt1 using co-immunoprecipitation assays; both bound to PDK1. Binding of AH domains to Akt decreased phosphorylation within the activation loop of Akts. We hypothesize that the AH2 domain binds to the AM domain within Akts, and this blocks access either to 3'OH-phosphoinositides or PDK1, and thereby inhibits Akt activation. We further hypothesize that PTEN deficient cells are more susceptible to Akt inhibition PTEN expressing cells.
DTIC
Homology; Mammary Glands; Tumors; Epithelium; Cells (Biology); Biosynthesis

20030112283 Weizmann Inst. of Science, Rehovot
Preparative Production of Acetylcholinesterase and Paraoxonase in Prokaryotic and Eucaryotic Expression Systems
Sussman, Joel L.; Jul. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0675
Report No.(s): AD-A418089; No Copyright; Avail: CASI; A03, Hardcopy
The acute toxicity of organophosphate (OP) compounds in mammals in general, and in humans in particular, is generally ascribed to their irreversible inhibition of acetyicholinesterase (AChE), the enzyme that terminates the action of acetylcholine (ACh) at cholinergic synapses by its rapid hydrolysis (1). Current medical protection against OPs involves anticholinergic drugs to counteract the accumulation of ACh (2), and quaternary oximes to reactivate OP-inhibited AChE (3). Since some OP compounds, such as soman, inhibit AChE and then rapidly 'age' (4), carbamate pretreatment was developed (5). Although both oximes and carbamylation regimens are partially effective, they have substantial side effects, and do not provide complete protection (6). This led to an interest in non-pharmacological approaches to protection, such as administration of enzyme scavengers (7), or OP hydrolases (8). The feasibility of using bioscavengers, such as AChE or BChE, has been demonstrated in rodents as well as in non-human primates (7). Animal trials have shown that injection of purified human serum paraoxonase (PON1) can protect against OP toxicity (9), and PONi knockout mice display heightened sensitivity to chlorpyrifos oxon relative to wild-type mice (9, 10). The hydrolytic capacity of PON1 might render it even more effective relative to the stoichiometric capacity of AChE and BChE. Since wild-type PON does not display high turnover in hydrolysing nerve agents (11), site-directed mutagenesis might also be used to enhance its catalytic activity (12).
DTIC
Acetyl Compounds; Anticholinergics; Eukaryotes; Organic Phosphorus Compounds; Prokaryotes; Gene Expression

20030112287 Columbia Univ., New York, NY
Aging Families and Breast Cancer: Multigenerational Issues
Raveis, Victoria H.; Jul. 2003; 94 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0215
Report No.(s): AD-A418090; No Copyright; Avail: CASI; A05, Hardcopy
With the continuing shift of cancer care to community-based care the necessity to develop programs that will enable the family to meet patients' needs for support and assistance is of paramount importance. Overall goal of this exploratory investigation is to obtain information the will: identify adult daughter caregivers in need of psychosocial support interventions to enable them to meet their mothers' needs for illness-related emotional support and assistance; reduce daughter' emotional stresses associated with this support role, and, enable the daughters to continue their caregiving role. To accomplish these objectives we are collecting data from a sample of older women receiving treatment for breast cancer and their adult caregiving daughters. The patients and their daughters each complete a questionnaire and the daughters complete a focused interview. Activities for Year 3 have focused on ongoing sample accrual and data collection, analysis of data, and dissemination of project findings through conference presentations, invited lectures and publications. Study data supports the conclusion that cancer is a disease that impacts or affects the family unit, not just he patient. Programs and services are needed that target the family and support not only the patient but the special needs of family members. While family members may be regarded as part of the care team, they are also affected by the cancer experience. It needs to be more commonly acknowledged/recognized that they hold a dual status.
DTIC
Cancer; Mammary Glands; Aging (Biology); Sociology

20030112290 Illinois Univ., Chicago, IL

Novel Approach for Evaluating and Treating Advanced Breast Cancer Patients Whose Tumors Overexpress HER-2/neu

Blend, Michael J.; May 2003; 33 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0271

Report No.(s): AD-A418094; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this research is to develop stable radioimmunoconjugates (RICs) of an anti-HER 2/neu antibodies (MoAbs) for imaging and therapy in an animal model bearing human breast tumors. Pharmacy-grade Herceptin and an anti- HER2/neu antibody were conjugated with a DTPA linker. InCl(3)111 and YCl(3)90 were labeled to MoAb-CHX-A'-DTPA according to the procedure of Clarke et al. (Cancer Res 60: 4804, 2000). Binding capacity of RICs was tested with human cancer cell lines MCF-7, HCC-1954, BT-474 and SKBR-3.

DTIC

Cancer; Mammary Glands; Patients; Pharmacology; Gene Expression; Radioimmunoassay

20030112298 Pennsylvania Univ., Philadelphia, PA

Molecular Determinants of tGolgin-1 Function

Yoshino, Atsuko; Marks, Michael; Lemmon, Mark; Jul. 2003; 75 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0365

Report No.(s): AD-A418143; No Copyright; Avail: CASI; A04, Hardcopy

TGolgin-1 is a large, predominantly coiled coil peripheral membrane protein that associates with the trans Golgi network (TGN) by virtue of a C-terminal GRIP domain. We showed that overexpression of isolated GRIP domains from tGolgin-1 or related proteins results in disruption of the TGN by inhibiting recycling from endosomes, suggesting that tGolgin-l and other GRIP domain proteins function in this pathway. This is important because signalling molecules required for initiating transformation and for metastasis rely on sorting and processing in the TGN. In collaboration with Dr. Chris Burd, we showed that GRIP domain localization to the TGN in yeast is regulated by a small GTPase cascade, in which the Arf-like protein Ar13 recruits the Arf-like protein Ar11, and activated Ar11 in turn binds directly to and recruits GRIP domains. Orthologues of these proteins function similarly in mammalian cells. Using RNAi to ablate expression of tGolgin-1 from mammalian cells, we have shown that tGolgin-1 also participates in the association of the Golgi complex to the dynein/dynactin complex. This has important implications for a role of tGolgin-l in cell motility and polarization required for tumor development, metastasis, and immunity. We are now probing for the mechanism of this function of tGolgin-1.

DTIC

Cells (Biology); Membranes; Proteins; Molecules; Mammary Glands

20030112305 Michigan Univ., Ann Arbor, MI

Automated Method for Analysis of Mammographic Breast Density - A Technique for Breast Cancer Risk Estimation

Chan, Heang P.; Jul. 2003; 54 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0326

Report No.(s): AD-A418148; No Copyright; Avail: CASI; A04, Hardcopy

The goal of this proposed project is to develop an automated technique to assist radiologists in estimating mammographic breast density. During this project year, we have completed the analysis of the correlation between the percent mammographic dense area and the percent volumetric fibroglandular tissue measured on MR images. The performance of the automated segmentation program on the Set of mammograms used in this study was verified with an experienced radiologist's manual segmentation. The percent mammographic dense area and percent volumetric fibroglandular tissue is highly correlated with correlation coefficients of 0.91 and 0.89, respectively, for CC and MLO views. The high correlation indicates the validity of using mammographic density as a surrogate for monitoring breast density changes. The computerized image analysis tool can provide a consistent and reproducible estimation of percent dense area on routine clinical mammograms, thereby contributing to the understanding of the relationship of mammographic density to breast cancer risk, detection, and prognosis, and the prevention and treatment of breast cancer. We have also begun the development of an automated density segmentation method for direct digital mammograms (DMs). We performed a study to compare breast density estimated from digitized screen-film mammograms (SEMs) with that estimated from DMs. Our results indicate that breast density on DMs generally appears to be lower than that on SFMs because of the harder beam quality used and image processing applied to the DMs. The lower density may improve the mammographic sensitivity for lesion detection in dense breasts. However, for patients with SFMs and DMs taken over time, comparison of serial mammograms for breast density changes will be problematic. We are designing

automated segmentation techniques for DM1. We will modify the program and evaluate its performance on DMs in the coming year.
DTIC
Cancer; Mammary Glands; Automatic Control; Risk

20030112371
Regulation of Drug Sensitivity by Functional Status of P53 in Human Prostate Cancer
Hait, William N.; Yang, Jin-Ming; Jul. 2003; 22 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0081
Report No.(s): AD-A418093; No Copyright; Avail: CASI; A03, Hardcopy

Effective treatment of prostate cancer requires a better understanding of drug resistance mechanism and better therapeutic strategy. We previously found that flutamide, and anti-androgen commonly used in the treatment of prostate cancer, was a substrate of MRPl, a transmembrane phosphoprotein. During this grant period we further characterized the properties of flutamide transport by MRPl. We demonstrated that transport of flutamide and hydroxyflutamide by MRPl was ATP-dependent, further strengthening the conclusion that flutamide and its active metabolite hydroxyflutamide were transported by MRPl. In addition, our preliminary data showed that nilutamide, a flutamide derivative that is currently used as second line hormone therapy for prostate cancer, was not a substrate of MRPl, suggesting that nilutamide may still be used in the treatment of prostate cancer with the overexpression of MRPl. Using the ELISA assay established in our laboratory, we screened a set of structurally related compounds for their activity of stabilizing p53. Among the compounds tested, we found that promazine, chlorpromazine and trans-flupenthixol were able to stabilize p53. In our LVCaP cell model that harbors a temperature-sensitive p53 mutant, the compounds that possess p53-stabilizing effect appear to be effective in sensitizing drug resistant cells to chemotherapeutic drugs.
DTIC
Cancer; Chemotherapy; Drugs; Prostate Gland; Sensitivity

20030112372
The Role of Stat3 Activation in Androgen Receptor Signaling and Prostate Cancer
Gao, Allen; Jul. 2003; 40 pp.; In English
Contract(s)/Grant(s): DAMD-17-01-1-0089
Report No.(s): AD-A418095; No Copyright; Avail: CASI; A03, Hardcopy

Most prostate cancer patients respond initially to androgen ablation and antiandrogen therapy. However, virtually all patients will relapse due to acquisition of the growth of the androgen-independent tumor cells. The molecular mechanism characterizing prostate cancer progression from androgen- dependence to androgen-independence is incompletely understood. We propose that Signal Transducers and Activators of Transcription 3 (Stat3) both regulates he expression of Stat3 target genes, and interacts with AR in prostate cancer cells. The experiments proposed in this application are based upon the hypothesis that Stat3 activation alters androgen receptor signaling pathways, that in turn results in the loss of growth control in prostate cancer cells. We propose to determine the consequence of Stat3 activation in prostate cancer cell growth and to determine the molecular basis of Stat3 interactions with androgen receptor signaling.
DTIC
Cancer; Cells (Biology); Patients; Prostate Gland

20030112375 Fox Chase Cancer Center, Philadelphia, PA, USA
Antibody - Pretargeted Cytokine Therapy of Cancer
Weiner, Louis M.; Jun. 2003; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD7-99-1-9183
Report No.(s): AD-A418149; No Copyright; Avail: CASI; A03, Hardcopy

We hypothesized that the selective accumulation of systemically administered cytokines at tumor sites can alter tumor microenvironments to favor the induction of anti-tumor immune responses. We further hypothesized that this can be accomplished by pre-targeting tumors with antibody-streptavidin immunoconjugates and then administering biotinylated cytokines. The purpose of this research program was to identify antibody-pretargeted cytokine therapy strategies that lead to tumor-selective cytokine accumulation, the development of host inflammatory cell infiltrates in tumor, and the induction of tumor-specific immunity. The ultimate goal of this research was to identify candidate strategies for clinical development, alone or in combination with tumor vaccines. In the first year of this award we made significant progress toward achieving these

goals. Interleukin-2 (IL-2) was biotinylated, and its biological properties were thoroughly characterized. We obtained a streptavidin- conjugated monoclonal antibody that recognized the Ep-CAM tumor antigen that is frequently overexpressed in breast cancer specimens. Animal experiments to characterize the biodistribution properties of the antibody - streptavidin conjugate and of the conjugate admixed with biotinylated IL-2 were performed in year 2. Because biodistribution results did not suggest that the previously used streptavidin-biotin system would yield therapeutic results we redirected efforts in the final year on developing new systems employing bispecific minibodies that contain anti-tumor binding domains and domains that bind to a metal chelate that can serve as a universal acceptor for metal-conjugated cytokines.
DTIC
Antibodies; Therapy; Tumors; Cancer; Mammary Glands; Immunology

20030112376 Hadassah Medical Organization, Jerusalem, Israel
Involvement of Heparanase in Breast Carcinoma Progression
Vlodavsky, Israel; Friedmann, Yael; Peretz, Tamar; Jun. 2003; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0278
Report No.(s): AD-A418151; No Copyright; Avail: CASI; A03, Hardcopy

Primary tumors produced by MCF-7 breast carcinoma cells over-expressing the mostly intracellular human enzyme, exhibited a 3-4 fold accelerated growth compared with tumors produced by mock-transfected cells. A more pronounced increase in tumor size and vascularity was observed with MCF-7 cells over-expressing a secreted form of heparanase, indicating that cellular localization of heparanase plays an important role in breast tumor progression. Translocation, secretion and processing of heparanase were stimulated in response to estrogen. Estrogen also stimulated heparanase promoter activity and gene expression in MCF-7 cells. This effect was abolished by the pure antiestrogen ICI 182,780, but not tamoxifen. Our data suggest a mechanism through which estrogen, independent of its proliferative effect, may induce heparanase overexpression and thereby promote tumor-stromal interactions, critical for breast carcinoma progression. The involvement of heparanase in morphogenesis and neoplastic alterations was demonstrated in transgenic mice over- expressing the heparanase enzyme. Mammary glands of these mice exhibited precocious branching and widening of ducts, as well as early signs of hyperplasia and basement membrane disruption. Progress was made in characterization and purification of a proteolytic activity expressed by MDA-435 breast carcinoma cells and involved in processing and activation of latent heparanase. Our results indicate that heterodimer formation between the 8 kDa and 50 kDa heparanase subunits is necessary for heparanase enzymatic activity. Heparanase offers an attractive drug target. Lead heparanase-inhibiting species of laminaran sulfate and chemically modified glycol-split derivatives of heparin were prepared, characterized and found to efficiently inhibit experimental metastasis.
DTIC
Cancer; Heparins; Mammary Glands; Tumors

20030112390 Maryland Univ., Baltimore, MD
Genetic Alteration of Metabolism and Tumorigenicity of Prostate Cancer Cells
Feng, Pei; Jun. 2003; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0072
Report No.(s): AD-A417940; No Copyright; Avail: CASI; A04, Hardcopy

In the prostate, overwhelming evidence now exists that zinc and citrate metabolism are important factors in the pathogenesis and progression of prostate cancer (Pca). This proposal is aiming to establish that the pro static tumor cells obtained from PC-3 and LNCaP-derived tumors are citrate oxidizing cells; and to demonstrate that the genetic alteration of zinc accumulation and expression of m-aconitase will alter citrate oxidation and will correspondingly alter the tumorigenic capabilities of LNCaP and PC-3 cells. The second year study was focused on: 1) to study the zinc effect on the prostate tumorigenicity in vivo; 2) to establish and characterize ZIP1 over-expressed PC-3 cells; 3) To determine the tumorigenic capacity of ZIP1 over-expressed PC-3 cells; 4) To establish ZIP1 over-expressed LNCaP cells using stable transfection technique. At the present time the progress of this study is very promising, and we anticipate continuation of significant outcomes from this project. With this grant support, two abstracts were published and presented in international and local meetings, one paper was published and two manuscripts have been submitted.
DTIC
Prostate Gland; Cancer; Cells (Biology); Genetics

20030112393 Wyoming Univ., Laramie, WY
Protein Based Nanomaterials Symposium Support
Lewis, Randolph V.; Jan. 2003; 4 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0036
Report No.(s): AD-A417941; AFRL-SR-AR-TR-03-0444; No Copyright; Avail: CASI; A01, Hardcopy

Biomaterials or bio-based materials, particularly those based on proteins, have become increasingly important as models for future materials development. Despite the interest and excitement in this field there have been very few meetings organized around this topic. There are meetings based a single protein family such as collagen or silk but very few with a broader scope. This symposium is designed to provide an overview of a number of current proteins being explored as protein based materials. The focus is on the basic research being done to understand these proteins and how they can become the basis for materials. We included researchers from both university and company laboratories to insure a broad overview. A book will be published from the proceedings of the symposium.
DTIC
Organic Materials; Proteins; Collagens

20030112394 Kentucky Univ., Lexington, KY, USA
Transcription-Coupled Repair and Breast Cancer
Mellon, Isabel; Jun. 2002; 60 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8201
Report No.(s): AD-A417977; No Copyright; Avail: CASI; A04, Hardcopy

The overall goals of the project were to investigate the consequences of mutations in BRCA1 and BRCA2 in transcription-coupled repair (TCR) of oxidative damage and ultraviolet light induced damage in mouse and human systems. Since others have focused on mouse cell lines, we have focused on human cell lines. We examined the removal of UV light induced cyclobutane pyrimidine dimers (CPDs) from each strand of the DHFR gene in a BRCA1 mutant human cell line HCC1937. We find no evidence for a defect in TCR. We find no evidence for a defect in TCR in a BRCA2 deficient human cell line, Capan-1. Hence, defects in BRCA1 and BRCA2 do not appear to influence transcription-coupled repair of UV damage. The nucleotide excision repair pathway removes UV light-induced damage and bulky adducts formed in DNA by certain carcinogens.
DTIC
Mammary Glands; Cancer; Mutations; Damage; Defects

20030112396 California Univ., Davis, CA
Aberrant Chromatin Modification as a Mechanism of Prostate Cancer
Chen, Hongwu; Jun. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0033
Report No.(s): AD-A417978; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study was to test me hypothesis that aberrant chromatin modification plays a critical role in prostate cancer (CaP) progression. Scope of this study: We proposed to analyze histone acetylation and phosphorylation patterns on androgen receptor (AR) target genes such as PSA in malignant prostate cancer cells. Comparison of me patterns of histone modifications between different CaP cells will allow us to identify me chromatin modifications mat are altered during CaP progression and me responsible enzymatic activities. Major findings during the first two years: We began our study by examining histone modification such as acetylation on AR target gene PSA in the androgen dependent LNCaP cells and have made the following findings with the details incorporated in the attached paper published recently in PNAS and described below: A) Using chromatin immunoprecipitation (ChIP) assay as a measurement, we found that DHT induced marked histone hyperacetylation at both the promoter and me enhancer of PSA gene, while anti- androgens such as casodex induced histone hypoacetylation primarily at the enhancer elements. B) We also found mat DHT induced the recruitment/occupancy of nuclear receptor coactivators including members of the p160/SRC-1 family and CBP/p300, while casodex the recruitment/ occupancy of histone deacetylases such as HDAC1 and HDAC2. These proteins are components of the nuclear receptor corepressor complexes. The p160 coactivators such as ACTR and SRC-1 and CBP/p300 proteins are demonstrated to possess histone acetylase (HAT) activities. C) We demonstrated mat elevation of ACTR protein level in the LNCaP cells not only increased DHT induction of PSA gene expression, but also induced androgen-independent PSA expression, suggesting the involvement of HAT protein ACTR in AR-mediated control of gene expression.
DTIC
Phosphorylation; Cancer; Prostate Gland; Chromates; Enzyme Activity

20030112397 Minnesota Univ., Minneapolis, MN, USA
Employment and Breastfeeding Status
Miller, Lori J.; Hunter, Anna N.; Weber, Erica R.; May 2003; 64 pp.; In English
Report No.(s): AD-A417943; AFIT-CI-02-1297; No Copyright; Avail: CASI; A04, Hardcopy

The relationship between breastfeeding continuation at 12 weeks postpartum among employed women and job characteristics to include maternity leave status, job flexibility, and type of occupation; social variables to include relationship status and social support; and demographic variables to include education, race, and family income were determined. A comparative and descriptive design was used. Data were collected from secondary analysis of the Maternal Health pilot study. A convenience sample of 45 breastfeeding, employed women, living in a seven county area around Minneapolis and St. Paul, Minnesota, completed measures of their breastfeeding status, maternity leave status, job flexibility, occupation, relationship status, social support, education, race, and family income before discharge from the hospital after birth and at 12 weeks postpartum. Longer breastfeeding among employed women was significantly associated with having an education beyond high school, having a clerical or professional occupation, and having a longer maternity leave. After refining research techniques with the pilot study and secondary data, a more definitive study with a more generalizeable sample may be conducted.
DTIC
Schools; Hospitals; Education

20030112398 Texas Univ., Dallas, TX, USA
Prediction of Breast Cancer Risk by Aberrant Methylation in Mammary Duct Lavage
Virmani, Arvind K.; Jul. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0421
Report No.(s): AD-A417945; No Copyright; Avail: CASI; A02, Hardcopy

Women found to have atypical hyperplasia on a breast biopsy are at significantly increased risk for breast cancer. Nipple duct lavage (NDL) is being promoted by some as a new screening test for atypical hyperplasia, but cytological interpretation is a subjective art and experience indicates that the underlying conditions represented by cytological atypia on NDL can range from intraductal papilloma to ductal carcinoma in situ (DCIS). Laboratory studies indicate that methylation of tumor suppressor genes is an early event in breast carcinogenesis and often represents a cell's attempt to defeat cell cycle control. We have shown previously that methylation of RASSFlA of APC in benign breast epithelium correlates with calculated breast cancer risk and the finding of Cyclin D2 methylation is specific for malignant transformation. We are applying these objective methylation tests to cells obtained by NDL from women with breast cancer, women at increased risk of breast cancer, and women at low or average risk of breast cancer. Successful completion of the project will provide new tools for the objective evaluation of breast epithelial cells obtained by NDL in order to accurately risk stratify women and to enhance the early detection of DCIS.
DTIC
Epithelium; Mammary Glands; Methylation; Cancer

20030112400
A Novel Prostate Epithelium-Specific Transcription Factor in Prostate Cancer
Liberman, Towie A.; Jun. 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0023
Report No.(s): AD-A417956; No Copyright; Avail: CASI; A02, Hardcopy

Our goal is to understand the role of a novel epithelium-specific Ets transcription factor, PDEF, in prostate cancer% Our progress over the last year has provided significant further evidence that PDBF is an important player in prostate and breast cancer. We were able to characterize the mouse PDEF gene and promoter and to generate knockout constructs for PDEF. We, furthermore, demonstrated that PDEF is a target for kinases in the MAP kinase pathway. We also identified a variety of target genes for PDBF related to adhesion, migration and cell cycle using transcriptional profiling, real time PCR and SIRNA interference which will further help us to understand the biological function of PDEF. Our results as well as the critical roles of other Ets factors in cellular differentiation and tumorigenesis strongly suggest that PDBF is an important regulator of prostate gland development and plays a role in prostate and breast cancer progression or development. The new data have further strengthened our belief that PDEF is a prime target for drug development.
DTIC
Prostate Gland; Mammary Glands; Cancer; Epithelium

20030112401 Nevada Univ., Las Vegas, NV
Heat Shock Protein 27 Inhibits Apoptosis by Binding Cytochrome c
Carper, Stephen W.; Jun. 2003; 131 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0571
Report No.(s): AD-A417947; No Copyright; Avail: CASI; A07, Hardcopy

The purpose of this research project is to investigate the interaction between heat shock protein 27 (hsp27) and cytochrome c in the inhibition of apoptosis. The scope of the study was to include: measuring the binding of hsp27 to cytochrome c in vivo, determining why hsp27 binds to cytochrome c and determining the fate of the hsp27:cytochrome c complex. Major findings include cellular survival curves to cytochrome C, ATP, FAD and NAD. All electron carriers were cytotoxic to human breast cancer cell lines, with FAD being the most cytotoxic. This finding could have applications in the treatment of breast cancer. Molecular chaperone assays with hsp27 and alphaglucosidase and citrate synthase indicate that hsp27 binds to cytochrome c in a non-specific manner.
DTIC
Proteins; Cancer

20030112402 Scripps Research Inst., La Jolla, CA
Adenoviral Gene Therapy Vectors Targeted to Prostate Cancer
VonSeggern, Daniel J.; Jun. 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0098
Report No.(s): AD-A417951; No Copyright; Avail: CASI; A02, Hardcopy

The overall goal of this project is the development of conditionally-replicating adenoviruses ('CRA') that will selectively infect, replicate in, and kill prostate tumor cells, with the spread of progeny virus to further tumor cells. While CRA have been described before, all have been based on the tropism of the commonly used adenovirus type 5 (Ad5), which 1) does not efficiently infect many tumor cells, and 2) infects a wide variety of normal cells. By improving infection of the tumor cells and the selectivity of conditionally replicating viruses, we hope to improve the therapeutic window associated with replicating Ad treatment. There are three Aims (Tasks) in the project: 1) to evaluate existing Ad serotypes for their possible utility, 2) to use phage display technology to isolate peptides that selectively bind to prostate tumor cells, and 3) to combine the best targeting strategy produced in the first two aims with prostate tumor-selective Ad replication. We have made substantial progress in both of these aims and have identified two very promising fiber proteins for further use. Based on these findings, we feel that we are on track to meet the overall goal of constructing and evaluating a retargeted conditionally replicating virus.
DTIC
Cancer; Prostate Gland

20030112403 Colorado Univ., Aurora, CO, USA
Exploiting Polytene Chromosomes to Identify Transcription CoFactors and Complexes Recruited to an Estrogen Responsive Promoter in Vivo
Nordeen, Steven; Jun. 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0506
Report No.(s): AD-A417949; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this work was to develop a novel system to study recruitment of factors, especially those involved in chromatin modification and remodeling, to an estrogen-responsive promoter. Transgenic fruitflies were created that conditionally express estrogen receptors and that contain a reporter whose expression is dependent on the estrogen receptor. Six doubly transgenic lines were developed. These transgenic flies express the estrogen receptor in response to heat shock and the reporter (green fluorescent protein) in response to estrogens. For five of six lines, estrogen-dependent expression of the reporter in salivary glands has been confirmed. Whole mounts of glands from control and estrogen-fed larvae were done and estrogen receptor visualized by immunofluorescence. Results suggest that much of the estrogen receptor m both control and hormone-treated larvae, while nuclear, is not bound to DNA. Chromosomal squashes of polytene chromosomes reveal that the chromatin- bound estrogen receptor is bound to euchromatic DNA and excluded from heterochromatic DNA. Surprisingly, estrogen made no difference in the apparent binding of receptor to DNA. These results suggest that estrogen receptors are bound to active regions of chromatin even in the absence of hormone. This may facilitate the search for high affinity binding sites when hormone is present.
DTIC
Chromosomes; Estrogens; Fluorescence; Hormones

20030112405 Cold Spring Harbor Lab., New York, NY, USA
Scanning the Human Genome for Novel Therapeutic Targets for Breast Cancer
Hannon, Gregory J.; Apr. 2003; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0346
Report No.(s): AD-A417950; No Copyright; Avail: CASI; A03, Hardcopy

The broad goal of this project is to develop genome-wide RNAI approaches in mammals and to apply these to the discovery of new therapeutic targets for cancer. Specifically, we will generate a library of short hairpin RNA expression constructs (shRNA) that ultimately correspond to every gene in the human genome. These will be made available as a public resource and used internally to screen for genes that are essential to the survival of breast cancer cells but which are dispensable for the survival of normal cells. A subset of these might prove suitable as therapeutic targets for breast cancer therapy. During the first year of funding, two things have become clear. First, although they were not in place at the time of submitting this application, we have largely developed the technologies necessary to pursue the above goal. Second, funding in the Innovator award falls far short of that necessary to achieve the goal. Relevant to the last point, we have been able to leverage the Innovator award with several other funding sources to create a program, which is capable of meeting the proposed goal.
DTIC
Cancer; Ribonucleic Acids; Genes

20030112406 Jackson (Henry M.) Foundation, Rockville, MD
Control of Mammary Differentiation by Ras- Dependent Signal Transduction Pathways
Cutler, Mary L.; May 2003; 35 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0264
Report No.(s): AD-A417953; No Copyright; Avail: CASI; A03, Hardcopy

Mammary epithelial cells undergo periodic cycles of growth, differentiation and apoptosis during pregnancy and lactation. These processes are initiated by a complex series of signals that include mammotrophic hormones and locally- derived growth factors. This study is aimed at determining the mechanism by which an important mitogenic signal transduction pathway, which is frequently activated in breast carcinoma, inhibits mammary differentiation and apoptosis. We have demonstrated that the Ras pathway is activated by EGF stimulation of HC11 mammary epithelial cells. This occurs in part via the increase in GTP-bound Ras in the cells. EGF stimulation results in activation of Erk and Akt signal transduction pathways and prevents lactogenic differentiation. Inhibition of either Ras (via DNRas expression) or Erk (via PD98059) or Akt (via wortmannin) can counter the effects of EGF on differentiation. The mechanism of disruption of differentiation appears to involve interference with the growth arrest that occurs prior to the induction of differentiation; the mechanism for growth arrest may require the down regulation of Mek1 expression. The expression of dominant negative Ras in HC11 cells blocked signal transduction to the Ras-Raf-Mek-Erk signal transduction pathway but not signal transduction via the PI-3-kinase pathway. Expression studies of HC11 cells undergoing lactogenic differentiation using DNA microarrays demonstrated that there is a shift in gene expression that affects genes related to milk production as well as development and growth control.
DTIC
Cancer; Mammary Glands; Lactates; Hormones

20030112418 California Univ., Berkeley, CA, USA
Early Gravitropic Events in Roots of Arabidopsis: Ca(2+)H(+) Fluxes in the Columella Cells
Feldman, Lewis; [2003]; 3 pp.; In English
Contract(s)/Grant(s): NAG2-1351; No Copyright; Avail: CASI; A01, Hardcopy

Despite the wealth of information derived from physiological approaches, molecular mechanisms for sensing and responding to gravity in plants remain largely uncharacterized. Roots of higher plants offer many advantages for studying the sensing and responding phases. In roots, gravisensing occurs in specialized cells, the columella cells in which earlier studies have indicated an involvement of the cytoskeleton, Ca(2+), H(+) and auxin in processing the gravity signal. The overall goal of this project was to characterize gravity-stimulated Ca(2+) and H(+) fluxes in the columella cells of a model plant Arabidopsis thaliana and to define their regulation. For this work we used intact Arabidopsis roots.
Author
Gravitropism; Plant Roots; Hydrogen Ions; Calcium; Cells (Biology)

20030112425 Burnham Inst., La Jolla, CA
Targeting of an Anti-Metastatic and Anti- Angiogenic Compound to Breast Tumors
Akerman, Maria; Jun. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0308
Report No.(s): AD-A417959; No Copyright; Avail: CASI; A02, Hardcopy

Our laboratory is studying anastellin, a fragment of fibronectin that inhibits angiogenesis, tumor growth and metastasis in vivo. By fusing anastellin with peptides that home to specific vascular sites in angiogenic vasculature, I am testing whether the concentration of anastellin at the angiogenic endothelium can be increased, and whether that would improve the anti-angiogenic activity of anastellin. I have found that targeting anastellin to angiogenic blood vessel endothelium in vivo does not improve the efficacy of anastellin. However, in contrast, targeting anastellin to lymphangiogenic vessels has a significant inhibiting effect on the development of lymphatic vasculature. These findings are interesting, because eliminating tumor lymphatics is a key step in inhibiting tumor metastasis.
DTIC
Metastasis; Mammary Glands; Endothelium; Peptides

20030112427
Gamma Synuclein Promotes a Metastatic Phenotype in Breast Cancer and Ovarian Tumor Cells by Modulating the Rho Signal Transduction Pathway
Godwin, Andrew K.; May 2003; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0522
Report No.(s): AD-A417957; No Copyright; Avail: CASI; A03, Hardcopy

Synucleins(a, b, g, synoretin) are a family of small, highly conserved proteins expressed predominantly in neurons. While a-synuclein is implicated in neurodegenerative diseases, g-synuclein is expressed in the majority (>85%) of late-stage breast and ovarian carcinomas and is not expressed in normal mammary and ovarian epithelium. In spite of their significance, the normal and pathological roles of synucleins are not fully understood. To address the biological function of g-synuclein and its role in the malignancy of breast and ovarian cancer, we ectopically overexpressed g-synuclein in several cancer cell lines. Recently we found that g-synuclein is associated with two major mitogen-activated kinases (MAPK), i.e., extracellular signal-regulated protein kinases (ERK 1/2) and c-Jun N-terminal kinase 1 (JNKl). Over-expression of g- synuclein lead to constitutive activation of ERKl/2, and down- regulation of JNKl in response to stress (UV, sodium arsenate, and heat shock). In this study, we further characterized the effects of g-synuclein on paclitaxel, a commonly used chemotherapeutic drug, and nitric oxide induced apotosis. We found that g-synuclein over%expressing cells were more resistant (4- to 5-fold) to paclitaxel or nitric oxided as compared to the parental cells. This resistance to paclitaxel could be partially restored when ERK activity was inhibited using U0126, a MEKl/2 inhibitor. In addition, activation of the mitochodrial apoptotic pathway (JNK and/or caspase 3 activation) by paclitaxel and nitric oxide was blocked by ectopic expression of g-synuclein. Collectively, these data indicate that g-synuclein may be involved in the pathogenesis of breast and ovarian cancer by promoting tumor cell survival under adverse conditions and by providing resistance to certain anti-cancer drugs. Because of its high frequency of expression in late-stage breast and ovarian cancers, g- synuclein may be a promising target for therapy.
DTIC
Metastasis; Cells (Biology); Chemotherapy; Pathogenesis; Epithelium

20030112429 Schepens Eye Research Inst., Boston, MA, USA
Low Vision Research at the Schepens Eye Research Institute
D'Amore, Patricia A.; Jul. 2003; 55 pp.; In English
Contract(s)/Grant(s): DAMD17-01-2-0032
Report No.(s): AD-A417960; No Copyright; Avail: CASI; A04, Hardcopy

This research proposal, Low Vision at the Schepens Eye Research Institute, is a collaborative effort on the part of four Investigators at the Institute whose goal is to advance the studies on low vision. Project 1 focuses on the promotion of corneal transplant longevity using targeted delivery of anti-apoptotic genes and has successfully delivered the desirable genes into corneal explants. Project 2 involves studies on biodegradable polymers and CNS stem cells, and has been able to incorporate CNTF and GDNF in slow release biopolymers which they have tested in mouse models. Project 3 encompasses research on photoprotection by macular pigment and tests the hypothesis that macular pigment protects the retina from damage leading to degradation of macular function. Project 4 is a continuation of the remote diagnosis of retinal damage; the initial instrument design for the testing of human subjects is completed. Project 5 is also a continuation of the identification of factors that can

predict dry eye complications of LASIK surgery. Patient enrollment is proceeding well and early analyses are complete.
DTIC
Vision; Eye (Anatomy); Apoptosis; Diagnosis

20030112453 Thomas Jefferson Univ., Philadelphia, PA
A Novel Method for Determining Calcification Composition
Maidment, Andrew D.; Jun. 2003; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0465
Report No.(s): AD-A417963; No Copyright; Avail: CASI; A03, Hardcopy

Calcifications can be divided into two broad categories. Type I are composed of weddellite, while type II calcifications all have some phosphorus content, most typically calcium hydroxyapatite. Type II calcifications are known to be associated with carcinoma, while it is generally accepted that the exclusive finding of type I calcifications is indicative of benign lesions. We are attempting to develop a technique that will determine the composition of calcifications prior to biopsy, thereby allowing one to avoid biopsy on Type I calcifications. We believe that coherent scatter imaging (which is similar to x-ray diffraction imaging) may best determine the chemical composition of calcifications. To date in this grant, we have designed a dedicated detector and are in the process of optimizing image acquisition. We have characterized the detector, in part, and have characterized specific raw materials to determine a basis set for compositional analysis. We intend to validate this design using a clinical trial of surgical biopsy specimens prior to histology.
DTIC
Mammary Glands; Cancer

20030112458 Baylor Coll. of Medicine, Houston, TX
Inhibition of Estrogen Receptor Coactivator Expression by Antisense Oligodeoxynucleotides and Effect on Breast Cancer Cell Proliferation and Gene Expression
Smith, Carolyn L.; May 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0477
Report No.(s): AD-A417966; No Copyright; Avail: CASI; A03, Hardcopy

Coactivators are nuclear proteins that interact with steroid receptors, such as estrogen receptor-alpha (ERalpha), and are required for the ability of receptors to stimulate the expression of target genes. Antiestrogen ligand are commonly utilized in the treatment of breast cancer to negatively regulate the activity of steroid receptors. However, tumors often can develop resistance to antiestrogen therapy. Therefore, as an alternative approach to inhibiting ERalpha function in breast cancer cells, we have developed antisense oligonucleotides against three of the major ERalpha coactivator proteins. These oligonucleotides decrease the expression of coactivator mRNA and protein, and in so doing, decrease the ability of ERalpha to stimulate gene expression. These oligonucleotides also decrease the proliferation of MCF- 7 breast cancer cells in response to estrogen treatment. Taken together, antisense oligonucleotide technology has the potential to regulate ERalpha action at a level that circumvents ligand control, and therefore represents a novel mechanism by which to inhibit breast cancer gene expression and proliferation, and potentially to regulate the growth of breast cancer.
DTIC
Estrogens; Mammary Glands; Cancer

20030112498 Department of Energy, USA
Strengthening Public-Domain Mechanisms in the Federal Government: A Perspective From Biological and Environmental Research
Patrinos, Ari; Drell, Daniel; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 161-164; In English; See also 20030112480; Copyright; Avail: Other Sources

The Office of Biological and Environmental Research at the DOE, is the steward of about half a billion dollars. The responsibility of this office is to oversee and manage its spending for the greatest good to the U.S. science effort in service to DOE missions and, by extension, our citizenry. Our office supports research in various scientific areas, among them environmental sciences, global climate research, medical technologies and imaging, and genomics including the Human Genome Project that we started in 1986. Among other things, we work very hard to adhere to practices and policies that promote openness of data access because we believe that experience has demonstrated that, paraphrasing Ivan Boesky, openness is good, openness works, and this maximizes the benefits to us all. But we have to recognize and adapt to new

realities. Some conclusions for consideration by the National Academies as they explore the role of scientific and technical data and information in the public domain, are given.
Derived from text
Governments; Research and Development; Biotechnology; Environment Effects

20030112509 Scripps Research Inst., La Jolla, CA
Novel Combination Therapy for Prostate Carcinoma
Xiang, Rong; Feb. 2003; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0137
Report No.(s): AD-A417972; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis driving this project was validated since an oral DNA vaccine encoding murine VEGF-R2 (FLK-1) induced suppression of angiogenesis and ablation of tumor growth by triggering a specific CTL response specifically killing proliferating endothelial cells - overexpressing FLK-1 in the tumor vasculature. Targeting of genetically stable endothelial cells rather than mutating, heterogeneous tumor cells was achieved in murine models of melanoma, colon and lung carcinoma without impairment in fertility, hematopoiesis and neuromuscular performance and with only a slight decrease in wound healing.
DTIC
Prostate Gland; Cancer

20030112510 North Carolina Univ., Chapel Hill, NC, USA
Flt-1 (VEGFR-1) as an Angiogenic Inhibitor: Implications for a Novel Breast Cancer Therapy
Kearney, Joseph B.; Bautch, Victoria L.; Jun. 2003; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0379
Report No.(s): AD-A417967; No Copyright; Avail: CASI; A03, Hardcopy

Breast cancer progression is dependent on the ability of breast tumors to recruit new blood vessels by angiogenesis. At the level of cell biology, angiogenesis is the migration and proliferation of endothelial cells to form vascular sprouts. These hallmarks of angiogenic endothelial cell biology are conserved between cancer angiogenesis and embryonic angiogenesis. Thus, understanding the molecular cues that regulate the migration and proliferation of endothelial cells during embryonic vascular development has the potential to elucidate novel breast cancer therapies. This proposal involves the analysis of the fit-1 gene, a presumptive negative regulator of vascular outgrowth during embryonic development. To date, we have shown that fit-1 functions to limit endothelial cell numbers during embryonic vascular development by negatively regulating endothelial cell proliferation both in vivo and in vitro. Furthermore, we have demonstrated that the vascular overgrowth phenotype of fit-1 null mutant embryonic stem cell cultures can be partially rescued by co-culturing fit-J null mutant ES cells with wild type ES cells and by treatment of fit-I null mutant ES cultures with a soluble version of the fit-l receptor. These data indicate that fit-l regulates embryonic angiogenesis and suggest a potential therapeutic role for fit-l in regulating the pathological angiogenesis that is essential for breast cancer progression.
DTIC
Mammary Glands; Cancer

20030112511 Texas Technological Univ., Lubbock, TX, USA
Analysis of Breast Cell-Lineage Response Differences to Taxol Using a Novel Co-Culture
Gollahon, Lauren S.; Apr. 2003; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0581
Report No.(s): AD-A417968; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this study is to investigate interactions occurring between normal breast cells and tumor cells grown together in a novel co-culture system. This is accomplished through the use of GFP technology. The scope of the work to date includes establishing optimal growth densities; generating hTERT cell lines to insure the availability of 'normal' cells for continued analysis; and optimizing the conditions for valid efflux and transport experiments. Major findings: Preliminary results suggest that c-myc may be implicated in the ability for the tumor cells to resist Taxol insult through upregulation of the GLUT-1 transport mechanism. In addition, ER negative cells do not appear to be as influenced by the normal cells in co-culture growth experiments. Task associated progress report: We have determined growth curves and patterns for concurrent cell cultures of control epithelial, stromal and tumor cells (Task 1-3) and determined ratios of mammary epithelial, stromal and tumor cell types in co-culture (Tasks 1-3). Concurrently, my Co-PI has established the parameters for valid uptake

and efflux transport experiments for normal mammary cells and tumor cells. In order to obtain valid efflux and transport mechanism results for our system, previous methods described in the literature had to be modified.
DTIC
Mammary Glands; Cancer

20030112513 Georgetown Univ., Washington, DC, USA
Targeting of Prostate Cancer With Hyaluronan Binding Proteins
Zhang, Lurong; Jun. 2003; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0081
Report No.(s): AD-A417981; No Copyright; Avail: CASI; A03, Hardcopy

To test our hypothesis that the hyaluronan (HA) binding proteins (HABP) from cartilage is a new category of anti-tumor agents, we have proposed three aims: (1) To examine the effect of HABP on the tumor growth of prostate cancer cell lines; (2) To examine the effect of link protein and aggrecan on the tumor growth of prostate cancer; (3) To examine the possible anti-angiogenesis effect of HABPs. In past year, we have successfully finished the following works: (1) cloned 1, 065 bp of cDNA cording for full length of human cartilage link protein; (2) inserted this cDNA into pcDNA3 expression vector; (3) stablely transfected into tumor cell lines; (4) examined the inhibitory effect of link protein on growth of endothelial cells; (5) demonstrated that the link protein could inhibit the tumor growth in vivo. The significance of these studies are (1) it determines that the link protein is an anti-tumor element in cartilage; (2) the cDNA cloned in this study may be used for gene therapy.
DTIC
Prostate Gland; Cancer

20030112540 Burnham Inst., La Jolla, CA
Characterization of Receptors for Peptides Homing to the Vasculature of the Breast Carcinomas by Display Cloning
Zhang, Lianglin; Jun. 2003; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0309
Report No.(s): AD-A418117; No Copyright; Avail: CASI; A02, Hardcopy

Using in vivo screening of phage-displayed peptide libraries, a pentapeptide, CREKA, which homes to vasculature of breast tumor in mice was identified. The CREKA-displaying phage homes to breast tumors in mice with a 100-fold selectivity over non-recombinant phage. The homing of the CREKA phage was inhibited by its cognate synthetic peptide. The CREKA-displaying phage and fluorescein-labeled CREKA peptide were taken up by tumor tissue, but not by control tissues, and they co-localized with septa of connective tissue in tumors. Using the CREKA peptide in expression cloning with a phage-displayed CDNA library yielded a phage that specifically bound to the peptide. The cDNA coded for a fragment of the collagen Iv alpha 2 chain with typical Gly-X-Y repeats. CREKA phage bound avidly to immobilized collagen. Heat denaturation of the triple helical structure of collagen enhanced CREKA binding to collagen. These results indicate that the CREKA peptide homes to tumors because it binds to non- triple-helical collagen in angiogenic blood vessels. The investigation of drug-CREKA conjugate for the prevention and treatrnent of breast tumor in mice has been undergoing.
DTIC
Cancer; Mammary Glands; Tumors; Peptides

20030112541 Indiana Univ., Indianapolis, IN, USA
Role of DNA-Dependent Protein Kinase in Breast Cancer Development: Progression
Lee, Suk-Hee; Jul. 2003; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0295
Report No.(s): AD-A418119; No Copyright; Avail: CASI; A04, Hardcopy

DNA-dependent protein kinase (DNA-PK) is a nuclear serine/threonine protein kinase involved in various DNA metabolism and damage signaling pathways. DNA damage activates DNA-PK, which in turn phosphorylates a number of key proteins involved in replication, repair, and transcription. Accordingly, DNA-PK has long been suspected as a factor involved in sensing and transmitting DNA damage signals to the downstream target, which eventually contributes to the genomic stability and prevention of cancer. The overall goal of this proposal is to explore the role of DNA-PK in the development and progression of breast cancer. Since DNA-PK is a DNA repair factor as well as involved in damage signaling pathway, levels of DNA-PK activity among breast cancer would contribute to their drug resistance and also provide the basis for selection of patients for treatment with chemotherapy drugs.
DTIC
Cancer; Mammary Glands; Chemotherapy; Amino Acids

20030112550 Yale Univ., New Haven, CT
Beta IV Spectrin in Normal and Cancer Breast Cells
De Camilli, Pietro; Sep. 2002; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0670
Report No.(s): AD-A418127; No Copyright; Avail: CASI; A03, Hardcopy

Long-term goal of this application was to elucidate pathogenetic mechanisms in human autoimmune paraneoplastic neurological conditions. These syndromes result from the ectopic expression in cancer cells of neuronal antigens followed by the onset of an autoimmune response directed at the cancer tissue. A side effect of this response is an autoimmune impairment of nervous system function. We have identified novel autoantigens of autoimmune paraneoplastic conditions, primarily autoantigens expressed in breast cancer. Recently, we have identified a woman with lower motor neuron syndrome, breast cancer and anti-Beta IV spectrin autoantibodies. The specific goal of this project was to conduct studies on the properties of Beta IV spectrin and to determine whether anti-Beta IV spectrin antibodies are a frequent occurrence in cancer. If this was the case, such antibodies could be used as diagnostic tools and Beta IV spectrin could represent a target for cancer immunotherapy. We have made progress towards the elucidation of Beta IV spectrin function and expression profile. A Beta IV mutant mouse was generated and found to have significant neurological defects, consistent with a critical role of this protein in axonal physiology. However, so far we have failed to obtain evidence for the occurrence of widespread anti-Beta IV spectrin autoimmunity in cancer patients.
DTIC
Cells (Biology); Cancer; Neurophysiology

20030112551 Burnham Inst., La Jolla, CA
Cloning and Characteristics of Active Egr-1 Target Genes by In Vivo Crosslinking
DE Belle, Ian; May 2003; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9092
Report No.(s): AD-A417973; No Copyright; Avail: CASI; A03, Hardcopy

This project is designed toward the identification of a comprehensive set of target genes for the transcription factor Egr1. Since breast cancer cells often do not express Egr1 while normal breast epithelial cells do, it is important to define Egr1 target genes with the hope that critical patterns of Egr1 regulated gene expression active only in normal cells will be revealed. I have chosen to approach this project using an in vivo crosslinking and chromatin immunoprecipitation (ChIp), protocol. Using this approach I have successfully cloned a newly identified Egr1 target gene called TOE1. This gene is currently being characterized, but has the property of an inhibitor of cellular growth when overexpressed. Furthermore, TOE1 may act through interaction and modification of the activity of p53. I have furthered the search for Egr1 target genes using the ChIP approach by adapting an array hybridization protocol using custom generated mammalian gene promoter arrays using a high throughput approach.
DTIC
Mammary Glands; Cancer

20030112554 Chicago Univ., Chicago, IL
Design of Substrates to Study the Interactions of Tumor Cells and Fibroblasts
Mrksich, Milan; Aug. 2001; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-97-1-7253
Report No.(s): AD-A417979; No Copyright; Avail: CASI; A02, Hardcopy

This program was concerned with developing methods that can pattern the attachment of multiple cell types to a common substrate with absolute control over the position, size, shape and identity of each adherent cell. These methods were developed for use in patterning carcinoma cells and stromal fibroblasts in distinct, non-overlapping patterns for mechanistic studies of the inducible expression of stromelysin. Work in the first two years of this program developed the basis for an electroactive surface that could turn on the immobilization of ligands and hence the attachment of cells. Progress in the third period applied the dynamic substrate to pattern the attachment of two different cell types into a coculture array. This important milestone establishes a method to pattern two (or more) cell types to a substrate with arbitrary control over the geometric patterns of each cell type. Work in the fourth, and final, period has developed an electroactive substrate that can electrically release immobilized ligands. These active substrates will permit control over the time in which one patterned cell type is exposed to a second patterned cell type, and hence provide an important methodology for investigating heterotypic cell-cell interactions in cellular culture systems.
DTIC
Cells (Biology); Fibroblasts; Substrates; Tumors

20030112557 Northwestern Univ., Evanston, IL
Suppression Role of Androgen-Response Gene Calreticulin in Prostate Cancer
Wang, Zhou; Jun. 2003; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0088
Report No.(s): AD-A417980; No Copyright; Avail: CASI; A03, Hardcopy

Androgens are intimately associated with prostate cancer progression. We have previously identified more than 24 androgen-response genes. One of the genes encodes calreticulin, a highly conserved protein with demonstrated functions in intracellular Ca(++) homeostasis, cell adhesion, chaperoning, and gene expression. Our studies have indicated that calreticulin overexpression is suppressive to anchorage- independent growth and metastasis of prostate cancer cells and calreticulin expression is down-regulated in human prostate tumor specimens. Thus, down-regulation of calreticulin in clinical prostate cancer specimens is likely to be an important step in prostate cancer progression. Our observations argue that part of androgen-induced gene expression program, such as calreticulin, is inactivated in the progression of prostate cancer, which represents a new concept in prostate cancer biology. Our results also provided strong basis for further exploring the mechanism by which calreticulin suppresses prostate tumor metastasis. In addition, we have generated several mutants for calreticulin, which will allow us to determine which of the three domains, N, P, or C, is responsible for the suppression of prostate tumor metastasis.
DTIC
Genes; Physiological Responses; Prostate Gland; Cancer

20030112559 New Mexico State Univ., Las Cruces, NM
Miniaturized DNA Biosensor for Decentralized Breast-Cancer Screening
Wang, Joseph; Jun. 2003; 25 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0366
Report No.(s): AD-A418130; No Copyright; Avail: CASI; A03, Hardcopy

The use of DNA testing as an important component of breast cancer diagnosis has been increasing rapidly over the past decade. The goal of this project is to develop and characterize an electrochemical biosensing microsystem for the rapid point-of-care genetic screening of breast-cancer. During the third year of this project we introduced new electrical routes for further improving the performance of DNA biosensors for genetic screening of breast-cancer. Particular attention has been given to simultaneous measurements of several breast- cancer related sequences and to the signal amplification in connection to several nanoparticle tracers and highly sensitive stripping voltammetric detection of the metal tag. Additional developmental work, aimed at transforming these powerful nanoparticle-based bioassays to a miniaturized flow system, is in progress towards the realization of wide-scale decentralized screening for breast cancer.
DTIC
Deoxyribonucleic Acid; Mammary Glands; Cancer; Bioinstrumentation

20030112561 Johns Hopkins Univ., Baltimore, MD
Early Detection of Breast Cancer by Molecular Analysis of Ductal Lavage Fluid
Sukumar, Saraswati; Jun. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0286
Report No.(s): AD-A418025; No Copyright; Avail: CASI; A03, Hardcopy

Reliable intermediate biological markers for breast cancer risk, that can be easily detected in both pre- and post-menopausal women, do not exist at the present time. For more than 20 years, the ability to access breast ductal fluid through the nipple has prompted initiatives to develop a PAP-like test for breast cancer. Yields were variable, not every woman yielded fluid, and there was no assurance of obtaining samples from the entire length of the ducts. In this proposal, we will use a 1) a facile ductal lavage (DL) technique using cannulating catheters which flushes each duct to yield thousands of ductal cells. 2) a panel of markers consisting of three genes, Cyclin D2, Twist and retinoic acid receptor beta 2 (RAR beta 2), which are aberrantly hypermethylated in breast cancer cells. We will standardize the techniques using fluid from cancer patients, and then evaluate the frequency of cells positive by MSP assays in ductal lavage obtained from women with a high risk of developing breast cancer, such as patients with lobular carcinoma, patients with cancer in one breast, and those with mammographically suspicious lesions. Thus, we aim to develop a PAP test for the breast.
DTIC
Cancer; Mammary Glands; Biomarkers; Molecular Biology

20030112564 California Univ., Los Angeles, CA
Membrane Estrogen and HER-2 Receptors in Human Breast Cancer
Pietras, Richard J.; Marquez, Diana; Chen, Hsiao-Wang; Jul. 2003; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0177
Report No.(s): AD-A418059; No Copyright; Avail: CASI; A03, Hardcopy

Patients with breast cancers that express estrogen receptor (ER) commonly receive anti-estrogen therapy. The efficacy of this treatment depends on tight regulation of breast growth by estrogen. However, as breast cancers progress, they often become resistant to estrogens, and most patients no longer respond to anti-estrogen therapy. New anti-estrogen treatment options are needed, and alternative therapies may result from findings showing that some ER molecules occur in plasma membranes of breast cancer cells and interact with transmembrane HER-2 growth factor receptors. Expression of HER- 2 receptors occurs in many breast cancers, and the protein kinase activity of HER-2 may modulate the ligand-independent activation of ER. Active cross-communication between ER and HER-2 receptors occurs in breast tumors, leading to the promotion of cancer growth. Thus, this axis may offer a new target for therapeutic intervention. The authors have partially purified a membrane-associated form of ER in breast cancer cells and has evidence that it promotes tumor growth. Using this novel signaling pathway as a target, the authors are assessing new treatments to prevent cancer progression in models of human breast cancer. Since HER-2 overexpression in breast cancer is associated with the failure of anti-estrogen therapy, understanding the basis of interactions between ER and HER-2 receptors may help to improve patient management and survival.
DTIC
Cancer; Mammary Glands

20030112566 City Univ. of New York, NY
Time-Resolved Spectral Optical Breast Tomography
Xu, Min; Lax, Melvin; Jun. 2003; 76 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0516
Report No.(s): AD-A418030; No Copyright; Avail: CASI; A05, Hardcopy

The research carried out during the current reporting period involved: (a) extending the cumulant solution of radiative transfer to planar geometries and comparing with Monte Carlo simulations; (b)developing and enhancing the 3D tomographic image reconstruction algorithm by using the cumulant transport model; (c) developing the criterion of the optimal regularization for image reconstruction dependent on the noise presented in measurements; and (d) deriving the nonlinear correction factor for optical imaging due to multiple passages of an absorption inhomogeneity by a photon and providing a measure of the efficacy of linear inversion schemes. The cumulant transport model was found to provide a more accurate model than the conventional diffusion model for image reconstruction in turbid media such as human breasts. The proper modeling of the noise and the appropriate regularization improves the quality of image reconstruction. The nonlinear effect of the multiple passages of an absorption site by a photon on optical imaging only becomes appreciable when the size of the inhomogeneity reaches about ten times of the transport mean free path or larger in human tissues. The theoretical formalism and computer algorithm for 3D tomographic image reconstruction shows with simulated data the potential to provide fast 3D images of the scattering and absorption objects at various depths in turbid media.
DTIC
Mammary Glands; Cancer; Spectra; Computer Aided Tomography

20030112567 Washington Univ., Seattle, WA
Medical Ultrasound Technology Research and Development at the University of Washington Center for Industrial and Medical Ultrasound
Crum, Lawrence A.; Oct. 2, 2003; 18 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0982
Report No.(s): AD-A418031; No Copyright; Avail: CASI; A03, Hardcopy

This grant provided support to expand the scientific program and infrastructure at the University of Washington's Center for Industrial and Medical Ultrasound (CIMU). The many disparate facilities and technical capabilities available to CIMU staff and students were integrated and enhanced to provide a world-class, advanced research center for bioengineering development and graduate education in high-intensity, focused ultrasound (HIFU). This included leveraging of overall research in understanding of acoustic hemostasis and improvement of research tools. Significant progress was made in developing a highly automated transducer characterization capability. Features include acoustic field mapping by scanned hydrophones, acoustic power efficiency measurement, electric and acoustic impedance measurement, medical ultrasound imaging and RF

data collection, optical methods of acoustic field mapping (Schlieren apparatus), and for each system a convenient software interface and user manual. Specialized fixtures and instruments were developed to measure HIFU dose response in vitro, an essential component of developing reliable and realistic computer models for HIFU simulation and treatment planning. Single-element HIFU transducers were refined with liquid, gel, and solid coupling media and other improvements to be more powerful, convenient, and robust. These technological enhancements have enabled the development of HIFU arrays and image-guided ultrasound systems for greater flexibility and control in clinical treatment protocol. Lastly, significant bioacoustic model development was undertaken for use in practical engineering design as well as for fundamental research of the mechanisms of ultrasound therapy.
DTIC
Ultrasonics; Medical Equipment; Biotechnology; Research and Development; Bioacoustics

20030112569 Mount Sinai Hospital, Toronto, Ontario, Canada
Characterization of a Proposed Novel BRCA2 Interaction
Huggins, Christopher J.; May 2003; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0497
Report No.(s): AD-A417974; No Copyright; Avail: CASI; A02, Hardcopy

Mutations in the tumor suppressor breast cancer susceptibility gene 2 (BRCA2), identified in 1994 using linkage analysis and cloned in 1995, are associated with 30- 40% of all familial breast cancer cases and, to a lesser extent, with ovarian and pancreatic cancer. In addition, mutations in BRCA2 are strongly linked to hereditary breast cancer in males. Most research has focused on BRCA2 and its involvement in DNA repair due to cellular sensitivity to DNA damaging agents in BRCA2-null mice. Less studied are other possible functions that BRCA2 may perform. Using BRCA2 in a yeast two hybrid assay we identified tristetraprolin (TTP) as a potential interacting protein. TTP was previously shown to be involved in the degradation of TNF-alpha mRNA. This was underscored by TTP-null mice displaying high levels of TNF- alpha and the manifestation of autoimmune-like complications as a result of these elevated levels. We have mapped the area of interaction on BRCA2 using an interaction mating analysis to a stretch of -80 amino acids. We have also demonstrated an in vivo interaction in transfected 293 cells between BRCA2 and TTP. Future studies will attempt to ascertain whether this interaction exerts an influence on the levels of TNF-alpha mRNA.
DTIC
Mammary Glands; Cancer

20030112572 Fox Chase Cancer Center, Philadelphia, PA, USA
Pharmacogenetic Factors Contributing to Variation in Response to Tamoxifen and Raloxifene
Raftogianis, Rebecca B.; Jul. 2003; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0248
Report No.(s): AD-A417991; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of these studies is to elucidate the pharmacogenetic factors that contribute to variation in human response to tamoxifen (TAM) and raloxifene (RAL). We had previously identified and partially characterized common genetic polymorphisms in two human drug-metabolizing genes, SULT1A1 and UGT1A6. We hypothesized that these polymorphisms contributed to variation in TAM or RAL metabolism. These studies were divided into three aims with the purpose of 1) biochemically characterizing the contribution of these enzymes to the metabolism of TAM and RAL; 2) developing cell model systems to study allele-specific differences in cellular response to these molecules and; 3) perform a clinical pharmacogenetic study to evaluate the association of common genetic polymorphisms in drug metabolizing genes with variable clinical response to TAM. Thus far we have determined that SULT1A1 and UGT1A6 contribute to the inactivation of 4-hydroxytamoxifen (OHT), the active metabolite of TAM, and that a separate enzyme, UGT1A9 catalyzed the glucuronidation of RAL. We have determined genotype/phenotype correlation for UGT1A6 alleles in a bank of human liver tissue and have generated HEK 293 cell lines that stably express each of the four UGT1A6 allozymes. The UGT1A6*2 allozyme, when expressed homozygously, is associated with high UGT1A6 activity. We established MCF-7 breast cancer cell lines stably expressing the wild type and variant SULT1A1 alleles and have measured allele-specific differences in the response of these cells to estrogens and OHT. These studies suggest that pharmacogenetic factors might contribute to variable cellular response to antiestrogenes.
DTIC
Mammary Glands; Cancer; Drugs

20030112576 Texas Univ., San Antonio, TX, USA
Interactions Among Brca1, Brca2, and Components of the Recombination Machinery
Sung, Patrick M.; Jun. 2003; 55 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8247
Report No.(s): AD-A417993; No Copyright; Avail: CASI; A04, Hardcopy

Homologous recombination (HR) is an important tool for the repair of chromosomes damaged by various mutagenic chemicals including alkylating agents and DNA cross-linking agents, and by ionizing radiation that causes DNA double strand breaks. The dozen or so of genes and proteins that function in concert to mediate homologous recombination are collectively known as the RAD52 epistasis group. In mammals, the breast tumor suppressors BRCA1 and BRCA2 regulate the efficiency of the HR machinery. Specifically, BRCAl binds the Rad50/Mrel1/Nbsl complex and BRCA2 interacts with the Rad51 protein.
DTIC
Mammary Glands; Cancer

20030112577 Strang Cancer Prevention Center, New York, NY, USA
Characterization and Use of Temperature-Sensitive Mutations of BRCA1 for the Study of BRCA1 Function
Billack, Blass; Monteiro, Alvaro; Jul. 2003; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0403
Report No.(s): AD-A418024; No Copyright; Avail: CASI; A03, Hardcopy

Recent evidence suggests that the breast and ovarian cancer susceptibility gene product BRCAl is involved in at least two fundamental cellular processes: transcriptional regulation and DNA repair. The precise mechanism of action of BRCAl in either of these processes is still unknown. We have identified a naturally-occurring allele of BRCAl which codes for a single amino acid substitution from arginine to tryptophan at residue 1699 (R1699W). This mutation occurs in a region at the N-terminal BRCT domain that is highly conserved among BRCAl homologs. When the C-terminus of the mutant protein (aa 1560-1863) was fused to a heterologous GAL4 DNA-binding domain and expressed in yeast or mammalian cells, it was able to activate transcription of a reporter gene to levels observed for wild type BRCAl at the permissive temperature (30C) but exhibited significantly less transcription activity at the restrictive temperature (37C or 39C). The transcription activity of the mutant protein appears to undergo complex regulation, as temperature-sensitive transcription activation was found to be cell type specific and not dependent on the tissue of origin. Stable cell lines expressing the mutant protein had similar capacity for DNA- damage repair of double strand breaks induced by ionizing radiation at all temperatures examined, suggesting that the activity of the mutant protein in DNA-damage repair is not temperature sensitive. Our results demonstrate that the transcriptional activity of the R1699W) mutant can be modulated as a function of temperature and provide a novel experimental approach which can be utilized to dissect the molecular mechanism(s) of BRCAl in processes related to transcription.
DTIC
Mutations; Transcription (Genetics); Cells (Biology); Oncogenes; Temperature Dependence

20030112582 Mount Sinai Hospital, Toronto, Ontario, Canada
Investigation of Lobular Carcinoma In Situ, Using Molecular Genetic Techniques, for the Involvement of Novel Genes
Mastracci, Teresa L.; Andrulis, Irene L.; Jun. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0498
Report No.(s): AD-A418032; No Copyright; Avail: CASI; A02, Hardcopy

Atypical lobular hyperplasia (ALH) and lobular carcinoma in situ (LCIS), i. e. lobular neoplasia, are lesions of significance in terms of implication of risk to the patient in the development of invasive carcinorna. A strong correlation between the lobular histological type and inactivation of E-cadherin, a protein involved in cell adhesion, has been reported. As well, mutations in the E- cadherin gene have been reported in invasive lobular carcinoma (ILC) and LCIS with adjacent ILC. The purpose of our study is to investigate lobular neoplastic lesions, lacking any adjacent invasive carcinoma, for alterations in and expression of known and novel genes/proteins with the goal of characterizing a molecular genetic profile for lobular neoplasia. We have accrued 23 cases of which there are 14 ALH lesions and 14 LCIS lesions. All cases able to be evaluated are negative for E-cadherin and beta-catenin protein expression by immunohistochemistry. The mutation analysis has been completed for thirteen lesions and to date alterations in the E-cadherin gene have only been characterized in LCIS. All ALH lesions screened to date show inactivation of E-cadherin but harbor no alterations. Studies are in progress to evaluate loss of heterozygosity at chromosome 16q, E-cadherin promoter methylation, and pl2O-catenin - protein expression. The

completion of these analyses will provide insight into the molecular genetic profile for lobular neoplasia.
DTIC
Genetics; Cancer; Histology; Immunology

20030112583 University of South Florida, Tampa, FL
The Role of AKT2 in Human Breast Cancer
Yuan, Zeng-Qiang; Cheng, Jin Q.; Jun. 2003; 29 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0397
Report No.(s): AD-A417995; No Copyright; Avail: CASI; A03, Hardcopy

Accumulated evidences showed that Akt is a major cell survival pathway and plays an important role in malignant transformation and chemoresistance. However, the underlying mechanisms have not been well documented. We demonstrated that Akt protects stress-induced programmed cell death by inhibition of stress kinase JNK/p38 through activation of NFkB pathway. Further, we have shown that human cancer cells expressing constitutively active AKT2 resist to cisplatin through inhibition of cisplatin-induced ASK1 (apoptosis signal- regulating kinase 1) activation. AKT2 phosphorylation of ASK1 led to abrogation of cisplatin-induced JNK/p38 activation and Ba(x) conformational changes. MST1, one member of STE20 like kinase, has been shown to induce apoptosis through its cleavage, activation and nuclear translocation. We have recently observed that AKT2 inhibits MST1-induced apoptosis by phosphorylatiion of MST1 at Thr-120.
DTIC
Apoptosis; Cancer; Mammary Glands

20030112587 Texas Univ., Dallas, TX, USA
Isolation of Factors That Disrupt Critical Protein/Protein Interactions Within the Telomerase Holoenzyme for Use in Breast Cancer Therapies
White, Michael A.; Jun. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0441
Report No.(s): AD-A418028; No Copyright; Avail: CASI; A02, Hardcopy

Telomerase activity is required to maintain telomere integrity on chromosomes of proliferating cells and thus is critically involved in regulating cellular replicative lifespan. Telomerase is repressed in most adult somatic cells, and activation of telomerase activity is an early event associated with tumor progression. Expression of telomerase is sufficient to greatly prolong proliferative lifespan of human cells in culture. Because telomerase activity is not required to maintain viability of post-mitotic somatic cells, but is required to maintain the proliferative capacity of tumor cells, telomerase is an ideal target for anti-cancer therapies. Here we have produced mammalian expression vectors containing Pollll- driven short-hairpin sIRNA precursors targeting hTERT mRNA. We show that these vectors dramatically repress telomerase activity when delivered to telomerase positive immortal human tumor cells, resulting in dramatic telomere shortening and a limited replicative life-span in culture.
DTIC
Cancer; Mammary Glands; Proteins; Therapy

20030112588 Illinois Univ., Chicago, IL
Breast Tumor Kinase Signaling in Breast Cancer
Tyner, Angela L.; Jun. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0273
Report No.(s): AD-A417996; No Copyright; Avail: CASI; A03, Hardcopy

We previously demonstrated that the breast tumor kinase Brk can phosphorylate and inhibit the RNA-binding protein Sam68, which plays important roles in RNA metabolism associated with growth. Two novel Sam68-like mammalian proteins SLMl and SLM2 were identified, and cotransfection of NMuMG cells with different Brk expression constructs and either GFP-SLM1 or GFP-SLM2 revealed a direct correlation between Brk activity and the level of SLM1 and SLM2 phosphorylation. Mutation of the terminal tyrosine in Brk (Brk Y-F) increased the level of SLM protein phosphorylation. Localization of tyrosine phosphorylated proteins was examined in NMuMG cells cotransfected with Brk constructs and GFP-tagged substrates. Interestingly phosphotyrosine immunoreactivity was restricted to the nucleus and co- localized with the GFP-tagged nuclear substrates only when Brk Y-F was expressed. Expression of wild type Brk resulted in phosphorylation

of cytoplasmic and nuclear proteins. This suggests a role for the carboxy terminal tyrosine in localization of Brk.
DTIC
Cancer; Mammary Glands; Tumors

20030112590 Baylor Coll. of Medicine, Houston, TX
Genetic and Functional Studies of Genes That Regulate DNA-Damage-Induced Cell Death
Songyang, Zhou; May 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0145
Report No.(s): AD-A417994; No Copyright; Avail: CASI; A02, Hardcopy

Studies have shown that apoptosis and survival pathways in response to DNA damage play a critical role in breast cancer development and progression. 90% of breast cancer cases are sporadic where mutations of BRCA1/2 have not been detected. Other breast cancer genes must exist. Our group has approached the issue in two ways, a genomic and a proteomic approach. We have established and utilized a novel retrovirus-based genetic screen system to search for genes that would confer resistance to DNA damage induced apoptosis. Multiple clones have been isolated from this genetic screen. Among the genes identified are both novel and known proteins that may be important in DNA-damage responses. To further elucidate the pathways mediated by BARD 1, we looked for factors interacting with BARD1 using mass spec sequencing. Several factors have emerged from this study and are being examined. The information obtained from our studies should prove useful for developing new and effective screening strategies, drug targets, and treatment for breast cancer.
DTIC
Mammary Glands; Cancer

20030112623 Mount Sinai Hospital, Toronto, Ontario, Canada
Microarray Technology to Study the Role of Genetic Polymorphisms in Breast Cancer Risk
Ozcelik, Hilmi; Jul. 2003; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0353
Report No.(s): AD-A418133; No Copyright; Avail: CASI; A03, Hardcopy

Several studies have suggested an association between low penetrant alleles and breast cancer risk. Although the contribution of low penetrant alleles to the individual risk is relatively small, they can contribute to a large proportion of breast cancer cases in the population. In this study we took the candidate gene approach to study the association of 21 different genetic polymorphisms with breast cancer risk in a population-based sample using a high- throughput genotyping technology. To date, we have established and validated the genotyping methods. We have completed genotyping 398 cases and 372 population controls for 21 SNPs from several cancer-related molecular pathways. Initial statistical analysis of the cases and controls has shown that XPD cod751 polymorphism is significantly associated with breast cancer risk. Further analysis of the cases has shown that SNPs of ER, XPD, COMT and p27 genes were significantly associated with breast cancer risk in breast cancer cases with at least a first-degree relative of breast cancer. Statistical analysis to investigate the gene-gene and gene-environmental interactions of the SNPs is currently ongoing. This project has the potential to identify breast cancer susceptibility variants in the context of interaction with other genetic or epidemiological risk factors.
DTIC
Genetics; Polymorphism; Mammary Glands; Cancer

20030112624 Hadassah Medical Organization, Jerusalem, Israel
Protease Activated Receptors in the Malignant Invasion Process
Bar-Shavit, Rachel; Vziely, Beatrice; Jun. 2003; 162 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0277
Report No.(s): AD-A418137; No Copyright; Avail: CASI; A08, Hardcopy

Protease-Activated Receptors (PARs) are G-coupled seven transmembrane domain proteins consisting of 4 family members and activated via proteolytic cleavage. In addition to their traditional role in hemostasis, thrombosis and vascular biology, PAR1, thrombin receptor, the first prototype of the family emerges with surprisingly novel functions in tumor biology. We have assigned a central role for PAR1 in breast carcinoma invasion, metastasis and angiogenesis. The notion that hPar1 is one of a series of genes that are part of an invasive program stems from our studies showing that hPar1 is exclusively expressed along the time limited placenta physiological invasion process to the uterus decidua during implantation, completely shuts off thereafter. The use of breast carcinoma clones overexposing different forms of hPar1 (e.g., lull length, a truncated version and antisense hPar1) as also tetracycline inducible hPar1! system have enabled the elucidation of a specific

'invadopodia' signaling pathway and the relative contribution of hPar1 during breast carcinoma progression and angiogenesis. In parallel, we have established an original line of mice over-expressing MMTV LTR - driven hpar-1 targeted to the mammary glands. The glands exhibited grossly hyperplastic features as compared with the non transgenic littermates. This phenotype is precociously reminiscent of the effect of several oncogene overexpression in the mouse breast. We propose now a novel pathway of wnt activation as a consequence of hPar1 overexpression in the mammary glands. Our approach involving the combined analyses of tissue specific hPar1 transgenes, biopsy specimens and established cell lines are combined to assist evaluating the involvement of hPar1 in breast carcinoma invasion, metastasis and angiogenesis.
DTIC
Cancer; Genes; Hemostatics; Metastasis

20030112626 Colorado Univ., Denver, CO, USA
The Physiology of Growth Hormone-Releasing Hormone (GHRH) in Breast Cancer
Zeitler, Philip S.; Jun. 2003; 34 pp.; In English
Contract(s)/Grant(s): DAMD17-00-01-0212
Report No.(s): AD-A418139; No Copyright; Avail: CASI; A03, Hardcopy

We hypothesize that GHRH functions as an autocrine/paracrine growth factor in neoplastic breast tissue. To address this hypothesis, we have undertaken a comprehensive examination of the physiology of GHRH in immortalized breast cancer cell lines. We report here the results of the project. The data summarized here indicate that endogenous GHRH acts as a growth factor through activation of MAPK/ERK (in a ras and raf dependent fashion). In addition, the data suggest an anti- apoptotic action of GHRH through suppression of p38 activation of a caspase cascade and consequent inhibition of Bc1-2 cleavage. Activation of an independent Jnk pathway may antagonize the effects of GHRH on the p38 pathway. The data also indicate a possible reciprocal autocrine/ paracrine role for GHRH and somatostatin in the regulation of breast tumor cell growth. Finally, the data support a role for tightly regulated GHRH secretion as an important component in the promotion of breast tumor cell growth. The emerging picture of the pathway by which GHRH promotes growth and inhibits apoptosis in breast cancer cell lines furthers our understanding of the previously demonstrated actions of GHRH antagonists to inhibit breast cancer growth in vitro and in vivo. More importantly, this understanding begins to suggest ways in which GHRH antagonists might fit into therapeutic regimens, as pro-apoptotic agents in their own right or as adjuvant agents supporting the action of traditional anti- neoplastics.
DTIC
Hormones; Growth; Cells (Biology); Cancer

20030112628 Arizona Univ., Tucson, AZ
Analysis of Rad9 Functions; Roles in the Checkpoint Response, DNA Damage Processing, and Prevention of Genomic Instability
Nyberg, Kara A.; Weinert, Ted A.; Jun. 2003; 27 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0127
Report No.(s): AD-A418042; No Copyright; Avail: CASI; A03, Hardcopy

The Saccharomyces cerevisiae Rad9 checkpoint protein contains only one set of known domains - the BRCT domains. Originally identified in the C-terminus of the human breast cancer susceptibility gene BRCAl, these domains occur frequently in proteins involved in recognizing and/or repairing DNA damage. To better understand the role of the two C-terminal BRCT domains in Rad9, various deletion constructs were created and either overexpressed or endogenously expressed in rad9 strains. These strains were assayed for their ability to repair different forms of DNA damage and for their ability to arrest in response to such damage. Other indicators, such as downstream phosphorylation of Rad53, were also analyzed as signs of activation of the rad9 deletion constructs. Our results show that the BRCT domains are essential for Rad9's checkpoint functions. These domains act to increase the local concentration of Rad9 both by stabilizing the protein and by dimerizing the protein.
DTIC
Deoxyribonucleic Acid; Genome; Oncogenes; Proteins; Saccharomyces

20030112630 Washington Univ., Saint Louis, MO
Optical Imaging of Mammaglobin Expression of Breast Cancer
Achilefu, Samuel; May 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0613
Report No.(s): AD-A418018; No Copyright; Avail: CASI; A03, Hardcopy

Mammaglobin (MMG) is a breast-specific glycoprotein that is over-expressed in 80% of all primary and metastatic breast cancer. Despite its uniqueness as a breast- specific cancer marker, the utility of MMG in breast cancer imaging has not been explored. Consequently, the goal of this project is to evaluate the potential of imaging the expression of MMG in established human breast cancer models. TO accomplish this goal, we labeled polyclonal and monoclonal anti-MMG antibodies with a near infrared fluorescent probe for optical imaging and 64Cu-DOTA for positron emission tomography (mPET). Preliminary results indicate that the mPET imaging with 64Cu-DOTA-anti MMG monoclonal antibodies showed predominant liver uptake in mice. In contrast, the fluorescent- labeled derivative of polyclonal MMG antibody primarily accumulated in the tumor, kidneys and liver. We have also developed a tumor model with increased expression of MMG. Our preliminary results appear to support the hypothesis that targeting the expression of MMG will enhance the localization of breast cancer tumors.
DTIC
Cancer; Mammary Glands; Images; Optical Equipment

20030112632 Congressional Budget Office, Washington, DC, USA
A CBO Study: Growth in Medical Spending by the Department of Defense
Percy, Allison; Papenfuss, Sam; Topoleski, Julie H.; Sep. 2003; 43 pp.; In English
Report No.(s): AD-A417997; No Copyright; Avail: CASI; A03, Hardcopy

The Department of Defense (DoD) faces a growing burden in providing peacetime health care for military personnel, retirees, and their dependents and survivors-who all together number over 8 million. Adjusted for the overall rate of inflation in the U.S. economy, the department's annual spending on medical care almost doubled from 1988 to 2003, rising from $14.6 billion to $27.2 billion. Furthermore, because DoD cut the size of the active-duty force by 38 percent over that same period, medical spending per active- duty service member nearly tripled, rising from $6,600 to $19, 600.' Medical spending rose from one-quarter to more than one- half of the level of cash compensation (defined as basic pay, the housing allowance, and the subsistence allowance), and it is likely to continue to increase.
DTIC
Management; Defense Program; Cost Analysis; Health

20030112633 Health Research, Inc., Rensselaer, NY, USA
Antibody Probes to Estrogen Receptor-Alpha Transcript-Specific Upstream Peptides: Alternate ER-Alpha Promoter Use and Breast Cancer Etiology/Outcome
Pentecost, Brian T.; May 2003; 74 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0261
Report No.(s): AD-A418096; No Copyright; Avail: CASI; A04, Hardcopy

Positive Estrogen Receptor alpha (ER) status correlates with a reduced incidence of breast cancer recurrence in the first years after resection of tumors, and predicts a favorable response to adjuvant anti-estrogens. ER- protein in breast tumors increases with patient age. The project develops novel antibody reagents to probe the expression of ER from alternate promoters taking advantage of short peptides encoded in regions of the ER mRNAs that are promoter specific and not shared. We hope that the short transcript specific peptides will act as Biomarkers' of promoter use. In the second year we have developed a new set of polyclonal antisera to one of the short upstream peptides and these are to be tested in immunohistochemical assays for ability to assess promoter use. A set back has been our failure to develop successful monoclonal antibodies, though the primed mice had good immune responses.
DTIC
Cancer; Mammary Glands

20030112635 Beth Israel Deaconess Medical Center, Boston, MA, USA
Integrin-Mediated Stimulation of HIF-1x and Angiogenesis in Breast Cancer
Mercurio, Arthur M.; Jun. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0154
Report No.(s): AD-A418002; No Copyright; Avail: CASI; A02, Hardcopy

Understanding the mechanisms involved in the progression from carcinoma in situ to metastatic disease is one of the most important problems in breast cancer research. To this end, studies by our group and others have implicated a critical role for the alpha6 integrins in breast cancer progression. For this reason, it is essential to elucidate the mechanisms by which these integrins contribute to breast cancer progression. This IDEA Award is based on the hypothesis that the alpha6 integrins regulate expression of VEGF, a growth factor that is essential for tumor survival and angiogenesis. In Year 2 of this Award,

we have made considerable progress in validating this hypothesis and we have established that the alpha6betal integrin is necessary for the activation of HiF-lalpha, a transcription factor that regulates VEGF expression in breast carcinoma cells.
DTIC
Cancer; Mammary Glands; Metastasis

20030112636 Texas Univ., San Antonio, TX, USA
Molecular Characteristics of Multicorn, A New Large Proteolytic Assembly and Potential Anti-Cancer Drug Target, in Human Breast Cancer Cells
Gaczynska, Maria E.; May 2003; 22 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0410
Report No.(s): AD-A418003; No Copyright; Avail: CASI; A03, Hardcopy

We have discovered a new giant proteolytic complex distinct from the proteasome and ubiquitous among Eukaryotes. The enzyme named multicom apparently takes part in the cell cycle regulation and is involved in partial overcoming the physiological effects of proteasome inhibitors. As the most significant accomplishment, we wish to report here the development and successful testing of AAF-CMAC, an in vivo fluorescent probe of peptidolytic activity of multicom.
DTIC
Mammary Glands; Cancer

20030112637 Jackson (Henry M.) Foundation, Rockville, MD
Preconceptional Paternal Exposure to Embedded Depleted Uranium Fragments: Transmission of Genetic Damage to Offspring
Miller, Alexandra C.; Mar. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0185
Report No.(s): AD-A418020; No Copyright; Avail: CASI; A02, Hardcopy

The Persian Gulf War resulted in friendly fire casualties among U.S. personnel injured by fragments of depleted uranium (DU) munitions. The demonstrated effectiveness of such weapons makes it likely that they may be used against U.S. forces in future conflicts. Uncertainty about how aggressively to remove fragments of the radioactive, chemically toxic DU has stimulated research into the long-term health consequences of embedded DU fragments. There has been no previous research to determine whether long-term exposure to embedded DU can affect the health of offspring of personnel wounded by DU. This study investigates whether male mice carrying embedded fragments of DU transmit genetic damage to their offspring. We hypothesize that long-term chronic exposure to embedded DU results in paternal transmission of genetic damage to unexposed F1 generation offspring, characterized by increased frequency of in vivo mutations in tissues. During this the first year of this project, we have successfully obtained our institutional animal care approvals, standardized pellet implantation surgical protocols in the mouse, established agreements for use of the proprietary 'Big Blue' mouse, contracted for DU and HMTA pellet procurements, begun implantation of DU and HMTA pellets in the mice, and initiated breeding of implanted mice.
DTIC
Genetics; Damage; Uranium; Depletion; Neurotropism

20030112638 Texas Univ., Galveston, TX, USA
Molecular Pathogenesis of Rickettsioses and Development of Novel Anti-Rickettsial Treatment by Combinatorial Peptide-Based Libraries
Walker, David H.; Feb. 2003; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0198
Report No.(s): AD-A418019; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study is to utilize adaptein libraries coded within pantropic retroviral vectors that confer protection against rickettsial pathogens and to study the molecular pathogenesis of rickettsioses. The following specific aims were proposed: 1) To establish heterogeneous cell populations, with each cell expressing a unique member of a complex combinatorial peptide-based (e.g. adaptein) library and challenge with R. prowazekii, R. rickettsii, and O. tsutsugamushi; 2) To determine the role of NF-kB, cytokines (TNFalpha, IFN-gamma, RANTES), ROS and NO in intracellular killing of rickettsia-infected monolayers containing adapteins; and 3) To characterize signal transduction pathways modulating the cytoskeletal events responsible for the increased vascular permeability. During the first year of this project we were able to construct two dozen libraries encoding combinatorial 6-mer, 12-mer, and 18-mer peptides. We successfully produced these

libraries in bacterial cells and transfected two different cell lines with recombinant retroviruses containing the libraries with high efficiency for rickettsial challenges. We have also developed in vitro models of endothelial barrier using rat derived microvascular endothelial cells. Measurements of endothelial permeability using FITC-dextrans in transwell settings and using ECIS have been performed. Elevation of intracellular calcium in infected cell monolayers and activation of calmodulin have also been demonstrated.
DTIC
Cells (Biology); Cytology; Pathogenesis; Molecular Biology

20030112639 Thomas Jefferson Univ., Philadelphia, PA
Estimation of Tumor Angiogenesis With Constrast Enhanced Subharmonic Ultrasound Imaging
Forsberg, Fleming; Jul. 2003; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0464
Report No.(s): AD-A418021; No Copyright; Avail: CASI; A03, Hardcopy

New contrast-specific imaging modalities such as harmonic imaging (HI) may improve the accuracy of breast ultrasound. Unfortunately, HI suffers form reduced blood-to- tissue contrast resulting form second harmonic generation and accumulation in tissue. As an alternative we propose using subharmonic imaging (SHI) by transmitting at the double the resonance frequency (2f sub o) and receiving at the subharmonic (f sub o). SHI has the potential to detect slow, small volume blood flow associated with tumor neovascularity, making early detection and identification of tumors very likely. Hence, the current project proposes to increase the ability of breast ultrasound to differentiate between denign and malignant lesions by combining injection of an ultrasound contrast agent with SHI. To date, in vitro experiments comparing SHI to flow rates have been completed showing good correlation with contrast uptake slopes. Animal experiments with rabbits were abandoned due to problems associated with the perfusion measurements. A new protocol using dogs was approved by the TJU IACUC. Two new interations of SHI software have been developed for a new scanning platform (the Logiq 9) and initial testing has commenced (in a canine model). A probe (the 7L) was selected for human studies.
DTIC
Cancer; Mammary Glands; Tumors; Ultrasonics; Imaging Techniques

20030112643 Arizona Univ., Tucson, AZ
Effect of Tumor-Derived TGF-Beta on the Efficacy of Dendritic Cell Vaccines
Kobie, James J.; Akporiaye, Emmanuel T.; Jul. 2003; 29 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0128
Report No.(s): AD-A418005; No Copyright; Avail: CASI; A03, Hardcopy

As antigen presenting cells capable of inducing strong cytotoxic T lymphocyte (CTL) responses to specific antigens, dendritic cells (DCs) have become prime candidates for use in cancer immunotherapy. It has been shown that treatment of DCs with tumor cell supermatants results in reduced expression of MHC class II and reduced ability to induce a CTb response. These findings have led to the suggestion that tumors secrete soluble factors that inhibit the antigen presenting functions of DCs. In the clinical setting, immunization with DOs is well tolerated, but is unable to produce significant clinical responses. Taken together, these findings suggest that the tumors secrete immunosuppressive factors that interfere with the efficacy of DC immunotherapy. One such factor is transforming growth factor-% (TGF-P). TGF-% is a known suppressor of T cell function and recently has been implicated in decreasing the function of antigen presenting cells.
DTIC
Mammary Glands; Cancer

20030112646 Pennsylvania Univ., Philadelphia, PA
Rapid Visual Assays of Oncogenic Aberrant ErbB Receptor activation Using Fluorescence Microscopy
Berger, Mitchell B.; Lemmon, Mark A.; Jul. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0363
Report No.(s): AD-A418007; No Copyright; Avail: CASI; A03, Hardcopy

The growth of cells in the body is closely regulated by peptide growth factors, which are detected by the cells via cell-surface receptors. Many human cancers of the breast, brain, etc., can develop if these receptors behave as if they sense the presence of growth factors when they should not. One particular family of receptors that has been heavily implicated in the development of human cancers is the erbB receptor tyrosine kinase family, which includes both the EGF- Receptor and erbB2/HER-2/neu - both of which are major targets for chemotherapeutic agents either in clinical use or in clinical trials. The

physiologic outcome of both normal and oncogenic erbB receptor activation depends on the ability of these receptors to form both homo- and heteromeric complexes, but the exact mechanism underlying the formation of these complexes is not well understood. We are attempting to use a variety of cell biological, biochemical and biophysical approaches to elucidate the nature of homo- versus heteromeric complexes in the erbB receptor family.
DTIC
Microscopy; Cancer

20030112648 California Univ., Irvine, CA
Electrical Impedance Tomography of Breast Cancer
Muftuller, L. T.; Jun. 2003; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0326
Report No.(s): AD-A418049; No Copyright; Avail: CASI; A03, Hardcopy

In screening of breast cancer, once abnormalities or lesions are discovered by the X-ray mammogram, generally, other imaging techniques are needed as an adjunct to diagnose the lesion as benign or malignant ft has been shown that cancer cells exhibit altered local electrical impedance. However, existing technology to measure the electrical impedance of the breast relies on a device that has poor spatial resolution. We proposed to map the impedance distribution in the tissue with high spatial resolution, by using it in conjunction with MRI to improve diagnostic accuracy of screening. During the first phase of this project, we developed necessary MRI pulse sequences, the software to analyze acquired images to extract impedance information and hardware components to inject electrical current synchronized with the MRI scanner. Several different pulse sequences were tested to determine their sensitivity and specificity. A spin- echo based sequence with alternating current injection at ^200Hz was found to be the most efficient among the tested. Various gel phantoms are prepared mimicking the electrical impedance variations in tissues. With these phantoms, spatial resolution and sensitivity of the method to various current amplitudes and impedance perturbations are measured. The method is also tested on a single animal with a malignant tumor. Results demonstrate that the proposed method clearly distinguishes objects separated by 1-2mm providing a good resolution and it can be used with safe current amplitudes (down to 0.5-ImA). Moreover, the method was able to distinguish 50% impedance variations. Therefore, these results support our hypothesis that MRI-impedance imaging can be used to distinguish benign and malignant tissues. In the second phase of the project, we will perform experiments on tumor induced rats.
DTIC
Cancer; Mammary Glands; Tomography; Electrical Impedance

20030112651 Rochester Univ., NY, USA
New PTEN Signal Pathway in Breast Cancer
Chang, Chawnshang; Jun. 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0383
Report No.(s): AD-A418006; No Copyright; Avail: CASI; A02, Hardcopy

Breast cancer is the second deadliest cancer in US women, with estimated 182,800 new cases yearly. PTEN has been characterized as a tumor suppressor gene and found deleted or mutated in many human tumors, including breast, and functions to negatively regulate cell growth, migration, etc, through down-regulation of downstream mediators, such as Akt, etc. Germline PTEN mutations are associated with Cowden syndrome, characterized by increased risk of developing breast cancer. PTEN expression has a positive ER and PR status in primary breast cancers. Whereas, approximately 65% of tumors tested are positive for ER and PR and 75%-80% positive for AR. Androgen, through AR, inhibits mammary carcinoma growth in animal models and is used clinically to influence breast cancer progression. AR germline mutations can cause partial androgen insensitivity. Combined with BRCA1 germline mutations associated with earlier age onset breast cancer, AR functional changes are implicated in breast cancer, suggesting PTEN and AR play roles in breast cancer progression. However, detailed correlations remain unknown. We propose the PTEN pathway, by AR interaction, results in AR-mediated cell growth modulation, and provides a new molecular mechanism of PTEN-mediated AR suppression signaling pathways. Our studies may provide new gene therapies/drug designs for breast cancer patients.
DTIC
Mammary Glands; Cancer

20030112656 Texas Univ., Houston, TX, USA
Tumor-Host Interactions in Breast Cancer Bone Metastasis
Price, Janet E.; Jun. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0455
Report No.(s): AD-A418048; No Copyright; Avail: CASI; A03, Hardcopy

The proposal will test the hypothesis that bone represents a unique microenvironment favoring the survival and growth of metastatic breast cancer cells. Further, that cells in breast cancer bone metastases are specialized populations of cancer cells, endowed with properties that promote their growth in bone. The presence of breast cancer cells can disrupt the normal balance of bone turnover and promote osteoclast activity. Understanding the biology of breast cancer bone metastases and the contribution of cancer cell- derived factors, such as platelet derived growth factor (PDGF), will lead to new approaches for control or prevention of this significant clinical problem. Expression analyses will be performed using cDNA arrays, testing samples from breast cancer cell lines growing in different conditions - in vitro and in vivo (direct injection into bone or mammary fatpad, and/or metastases from different organs in mice). The arrays to be used will identify cytokines and receptors, and genes involved in specific pathways (cell cycle regulation, cell death, metastasis and invasion, signal transduction, angiogenesis). One of the factors known to promote bone resorption is PDGF, and the consequences of the release of PDGF by metastatic breast cancer cells will be determined in in vitro experiments with immortalized osteoblasts.
DTIC
Cancer; Mammary Glands; Bone Demineralization; Tumors; Metastasis

20030112657 Texas Univ., Austin, TX, USA
Confocal Microscopy for Real Time Detection of Oral Cavity Neoplasia
Clark, Anne L.; Gillenwater, A.; Collier, T.; Alizadeh-Naderi, R.; El-Naggar, A. K.; Jan. 2003; 38 pp.; In English
Report No.(s): AD-A418050; AFIT-CI02-1298; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this study was to characterize features of normal and neoplastic oral mucosa using reflectance confocal microscopy. Oral cavity biopsies were acquired from 17 patients at the Head and Neck Clinic of the University of Texas M. D. Anderson Cancer Center who were undergoing surgery for squamous cell carcinoma (SCC) within the oral cavity. Reflectance confocal images were obtained at multiple image plane depths from biopsies within 6 hours of excision. Following imaging biopsies were fixed in 10% formalin and submitted for routine histologic examination. Reflectance confocal images were compared to histologic images from the same sample to determine which tissue features contribute to image contrast and can be potentially imaged using in vivo confocal microscopy. Confocal images were successfully acquired from 15 biopsy pairs from 17 patients. Depth-related changes in cell diameter and nuclear density were observed at multiple anatomic sites within the oral cavity. In SCCs, densely packed, pleomorphic tumor nuclei could be visualized with distinct differences in nuclear density and morphology distinguishable between confocal images of neoplastic and non-neoplastic oral cavity. Other features of non-cancerous and cancerous oral tissue that could be identified in the confocal images included areas of inflammation, fibrosis, muscle fibers and salivary glands. The results support the potential for this tool to play a significant role in the clinical evaluation of oral lesions, real-time identification of tumor margins, and monitoring of response to therapeutic treatment. (2 tables, 9 figures, 34 refs.)
DTIC
In Vivo Methods and Tests; Diagnosis; Mouth; Images; Laser Spectroscopy

20030112658 Kentucky Univ., Lexington, KY, USA
A Five-Country Comparison of Anxiety Early After Acute Myocardial Infarction
De Jong, Marla J.; Chung, Misook L.; Roser, Lynn P.; Jensen, Lynne A.; Kelso, Lynn A.; Jan. 2003; 21 pp.; In English
Report No.(s): AD-A418051; AFIT-CI02-1299; No Copyright; Avail: CASI; A03, Hardcopy

Anxiety is common after acute myocardial infarction (AMI) and has the potential to negatively affect physical and psychosocial recovery. There have been no cross- cultural comparisons of anxiety among AMI patients. The objectives of this study were to evaluate whether anxiety after AMI differs across five diverse countries and to determine whether an interaction between country, sociodemographic variables, and clinical variables contributes to variations in reporting anxiety. A total of 912 individuals with confirmed AMI were enrolled in this prospective, comparative, cross-cultural study. Anxiety was assessed within 72 hours of hospital admission using the Brief Symptom Inventory. The mean level of anxiety in the entire sample was 0.62 +/- 0.76, which is 44% higher than the normal mean level. Anxiety levels were not significantly different among the countries studied with the exception that patients in England reported lower levels of anxiety than those in the USA (P=.03) . However, this difference disappeared after controlling for sociodemographic variables on which the countries differed. The results show that patients from each country studied experienced high anxiety after AMI. Even though various cultures were

represented in this study, culture itself did not account for variations in anxiety after AMI. It appears that anxiety after AMI is a universal phenomenon. Given the potentially negative impact of anxiety on mortality and quality of life after AMI, clinicians and researchers should continue to explore interventions to treat anxiety and minimize its untoward effects. (2 tables, 1 figure, 24 refs.)
DTIC
Sociology; Anxiety; Myocardial Infarction; Culture (Social Sciences)

20030112660 Baylor Coll. of Medicine, Houston, TX
Sprouty-1, An Inhibitor of Prostate Cancer Signal Transduction
Ittmann, Michael; Jul. 2003; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0021
Report No.(s): AD-A418011; No Copyright; Avail: CASI; A03, Hardcopy

There is abundant evidence that increased expression of growth factors and increased activity growth factor receptors, particularly those of the fibroblast growth factor (FGF) and epidermal growth factor (EGF) families, play an important role in human prostate cancer. The sprouty gene was originally identified as a negative regulator of FGF and EGF receptor signaling in Drosophila. We have found that sprouty-1 is the major human sprouty homologue expressed in human prostate and it is significantly downregulated in approximately 70% of extensive, clinically localized prostate cancers. Our studies have indicated that this is due, at least in part, to altered transcriptional regulation of the sprouty- 1 gene in prostate cancer cells. Loss of this negative regulator of growth factor signaling may enhance tumor aggressiveness and be correlated with clinical, pathological and biological parameters of aggressive clinical behavior in human prostate cancer. We have now shown that expression of sprouty-1 in human prostate cancer cells, either by stable transfection or by expression via replication deficient adenovirus, markedly inhibits proliferation of prostate cancer cell lines. Studies to evaluate the prognostic significance of loss of sprouty-1 expression are currently underway.
DTIC
Cancer; Genetics

20030112663 Johns Hopkins Univ., Baltimore, MD
Imaging the Vascular and Metabolic Impact of Claudin-7, a Tight Junction Protein, in Transgenic Human Breast Cancer Models
Sukumar, Saraswati; Jun. 2003; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0285
Report No.(s): AD-A418014; No Copyright; Avail: CASI; A04, Hardcopy

Through the application of SAGE and array technologies, our laboratory has identified genes, such as Claudin-7, that are lost in metastatic breast cancer cells. We plan to apply magnetic resonance imaging and spectroscopy to determine the impact of Claudin-7 on breast cancer cell invasion and metabolism. Breast cancer cells engineered to stably overexpress Claudin-7 will be generated. MR microscopy methods will be used to quantify invasion of cells into Matrigel and localized 1H MRS and 31P MRS will be used to study the physiology and metabolism of cells during invasion. Alterations in tight junction characteristics will be analyzed to study correlation to the acquired phenotypes. To characterize vasculature in terms of vascular volume and permeability using high resolution MRI, tumor metabolic characteristics, namely, lactate levels, intra- and extra- cellular pH, and phospholipid metabolism will be obtained by multi-nuclear (1H and 31P) spectroscopic imaging of solid tumors. These aims will be performed using the following human breast cancer cell lines: non-metastatic cell lines MCF-7 and SKBR3, and the metastatic cell line, MDA-MB-435.
DTIC
Proteins; Metabolism; Cancer; Mammary Glands

20030112664 Burnham Inst., La Jolla, CA
Cripto: A Target for Breast Cancer Treatment
Adamson, Eileen D.; Jun. 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0165
Report No.(s): AD-A418017; No Copyright; Avail: CASI; A02, Hardcopy

Cripto is a growth factor that is important in breast cancer, leading to increases in cell proliferation and to increased survival of cells. Specific receptors for this factor have not been defined for breast cells but there is evidence from published work that Cripto acts as a co-factor for the Nodal factor, previously thought to be present and active only in early embryonic

development. This work will define the importance of this route of Cripto signaling in breast cells compared with the other known route involving Ras and the MAPK/Erk pathway. A number of possible ways that Cripto could effect a proliferative signal to breast cells has been described by the PI in a review article previously reported and published in J Cell Physiol. 190, 267-278. The experimental studies for exploring the mechanism of activation of breast cancer cells by Cripto is described for the first year of the experimental work, with the aim of making peptides that block Cripto and its tumorigenic effects.
DTIC
Regeneration (Physiology); Cells (Biology); Cancer

20030112665 Purdue Univ., West Lafayette, IN, USA
Functional Analysis of the ErbB4 Receptor Tyrosine Kinase
Riese, David J.; Jul. 2003; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0416
Report No.(s): AD-A418035; No Copyright; Avail: CASI; A03, Hardcopy

ErbB4 is a member of the signaling network composed of the EGF (epidermal growth factor) family of peptide hormones and the ErbB family of receptor tyrosine kinases. We have hypothesized that ErbB4 is a mammary-specific tumor suppressor. Indeed, we have preliminary data that indicates that overexpression of ErbB4 causes the EGF family hormones EGF and Neuregulin to inhibit DNA synthesis of a human mammary tumor cell line. Furthermore, we have constructed three constitutively active, ligand-independent ErbB4 mutants. We have published data indicating that these mutants do not malignantly transform the growth of cultured rodent fibroblasts. These data indicate that ErbB4 is not an oncogene. Moreover, we have preliminary data indicating that one of the three constitutively active ErbB4 mutants inhibits proliferation of several human mammary cell lines. Analyses of additional ErbB4 mutants suggest that this growth inhibition is dependent on ErbB4 kinase activity and on phosphorylation of tyrosine 1056 in the carboxyl-terminal region of the ErbB4 cytoplasmic domain.
DTIC
Cells (Biology); Hormones; Mammary Glands; Peptides; Tyrosine; Oncogenes; Functional Analysis

20030112668 Texas Univ., Austin, TX, USA
Detection and Diagnosis of Oral Neoplasia with an Optical Coherence Microscope
Clark, Anne L.; Gillenwater, A.; Alizadeh-Naderi, R.; El-Naggar, A. K.; Richards-Kortum, Rebecca; Jan. 2003; 37 pp.; In English
Report No.(s): AD-A418053; CI02-1295; No Copyright; Avail: CASI; A03, Hardcopy

Optical coherence microscopy (0CM) is a new optical imaging technology that can provide detailed images of tissue architecture and cellular morphology of living tissue. The technique combines the sub-cellular resolution of high numerical aperture (NA) confocal microscopy with the increased sensitivity and penetration depth of optical coherence tomography (OCT) to acquire detail similar to that available in histologic tissue evaluation, except that images can be achieved non-invasively and without the need for fixation and histochemical staining. 0CM images have been acquired from biological structures with a resolution of 2 microns with a 200-500 micron field of view at a penetration depth of 600 microns in plant specimens and in vitro human colon tissue. Thus, 0CM provides the potential to image epithelial tissue with the subcellular resolution needed to assess the pathologic state of tissue. The goal of this study was to characterize the features of normal and neoplastic oral mucosa using 0CM and to compare these to the image features available with confocal microscopy. The authors report the results of a pilot study using both a confocal microscopy and an 0CM system to image pairs of clinically normal and abnormal biopsies obtained from 12 patients. The findings show that, like confocal microscopy, 0CM can image oral mucosa with a resolution comparable to histology without the need for tissue fixation, sectioning, or staining. In addition to subcellular resolution, the 0CM demonstrated consistently deeper penetration depths than achieved by the confocal arm of the system. Analysis of epithelial scattering coefficients clearly discerns a difference between the hyperkeratotic layers and the non-keratinized epithelium below and an increase in scattering associated with premalignancy. (2 tables, 7 figures, 41 refs.)
DTIC
Epithelium; Cancer

20030112670 Stanford Univ., Stanford, CA
Development of a Novel Test System for Screening for Antagonists of ErbB5 Receptors in Breast Cancer
Blau, Helen M.; Jun. 2003; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0442
Report No.(s): AD-A418054; No Copyright; Avail: CASI; A03, Hardcopy

The focus of this project was to design a system for screening chemical compounds that would inhibit the dimerization of the EGFR family members ErbB2 and ErbB3 using beta-galactosidase complementation. We attempted to apply the beta-galactosidase complementation system to both ErbB2, 3 homo and heterodimerization, as well as the interaction of these receptors with downstream signaling molecules such as Grb2. We were unsuccessful in these endeavors owing largely to the unpredictability of the protein-protein interactions under investigation. A second goal of the proposed work was to design a mammalian two-hybrid system to identify proteins that interact with the cytoplasmic domain of ErbB2. Initial experiments with the beta-galactosidase system showed that the fluorescent substrate was not sensitive enough for this type of application. To circumvent these issues we designed a new complementation system based on beta-lactamase. This system is advantageous because a robust cell-permeable fluorescent substrate has recently been developed. Using the beta- lactamase system we showed that it meets several criteria which enable its use screening retroviral cDNA libraries such as: the ability to detect moderate affinity interactions (Fos- Jun), identify single retroviral integrations, and we were successful in performing a mock library experiment at dilutions up to 1:30,000.
DTIC
Cancer; Cytoplasm

20030112677 Georgetown Univ., Washington, DC, USA
Gene Therapy for Prostate Cancer Radiosensitization Using Mutant Poly (ADP-Ribose) Polymerase
Soldatenkov, Viatcheslav; Jul. 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0019
Report No.(s): AD-A418061; No Copyright; Avail: CASI; A03, Hardcopy

During the first three years of funding the authors developed recombinant plasmids expressing the DNA- binding domain of poly(ADP-ribose) polymerase (PARP-DBD) under the control of the 5'-flanking sequences of the human prostate- specific antigen (PSA) gene, and demonstrated that PARP-DBD sensitized prostate cancer cells to DNA-damaging agents in vitro. The present study is designed to assess the efficiency of this strategy in vivo. Towards this end, they developed a cationic liposome-mediated gene delivery of the PARP-DBD expressing plasmid in tumor xenografts of PSA-producing and androgen-sensitive prostate cancer cells (22Rv1 cell line). Tumor-bearing mice were treated intratumorally with liposome-complexed plasmid for PARP-DBD (LE-PARP-DBD), ionizing radiation (IR), or a combination of LE-PARP-DBD and IR. The results showed that administration of LE-PARP-DBD resulted in the expression of dominant-negative mutant of PARP in 22Rv1 tumor xenografts and enhanced radiation-induced inhibition of tumor growth in vivo. These data indicate that expression of the PARP-DBD in PSA-producing prostate cancer cells show potential to radiosensitize prostate tumor cells in vivo. (5 figures, 4 refs.)
DTIC
In Vitro Methods and Tests; Chemotherapy; Gene Therapy; Cancer; Prostate Gland

20030112680 Meharry Medical Coll., Nashville, TN
Gene-Gene and Gene-Environment Interactions in the Etiology of Breast Cancer
Adegoke, Olufemi J.; Jun. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0482
Report No.(s): AD-A418062; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this CDA is to evaluate the gene- gene and gene-environment interactions in the etiology of breast cancer in two ongoing case-control studies, the Shanghai Breast Cancer Study (SBCS) and the Nashville Breast Health Study (NBHS), and in one proposed case-control study, the Breast Cancer in West Africa Study (BCWAS). The work in the first year has resulted in a study from the SBHS entitled 'Genetic polymorphisms in uridine diphospho- glucuronosyltransferase 1A1 (UGT1A1) and risk of breast cancer, ' presented at the American Association for Cancer Research molecular epidemiology meeting in Waikoloa, Hawaii, January 2003. The awardee participated in the conduct of the NBHS and in the development of a full-study funding proposal resubmitted to the National Cancer Institute in March 2003. Funding to conduct the pilot project of the BCWAS for 2 years starting in May 2003 was obtained from the Meharry Medical College and Vanderbilt-Ingram Cancer Center. Results from the investigation of the association of UGT1A1 *28 polymorphism and the risk of breast cancer in Chinese women participating in the SBHS did not indicate a significant role for this polymorphism in the risk of breast cancer. However, in the analysis of hormone levels and UGT1A1 genotype among postmenopausal controls, the authors observed progressively lower blood levels of estrone (E1) and estrone sulfate (E1-S), and higher levels of testosterone and sex-hormone binding globulins (SHBG) with increasing presence of *28 allele compared to the wild *1/*1 genotype. The results suggest that genetic polymorphism in the UGT1A1 gene is related to the blood levels of SHBG and estrogens and may thus be related to the risk of postmenopausal breast cancer in Chinese women. Efforts are underway to

conduct similar analyses for the Caucasian and African-American populations in the NBHS and the African population in the BCWAS when these studies have recruited enough participants. (8 refs.)
DTIC
Interactions; Polymorphism; Genetics; Etiology; Epidemiology

20030112685 North Carolina Univ., Chapel Hill, NC, USA
Cloning of Novel Oncogenes Involved in Human Breast Cancer
Der, Channing J.; Dec. 2002; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-97-1-7050
Report No.(s): AD-A418063; No Copyright; Avail: CASI; A02, Hardcopy

While the aberrant overexpression of HER family receptors is known to be involved in breast cancer, the complex nature of the genetic events that trigger the development of breast cancer remain to be identified. The authors have developed, refined, and applied a retrovirus- based gene transfer assay to identify activated oncogenes in breast cancer. Progress during the past year has involved the following: (1) the use of breast carcinoma cell lines for generation of retrovirus expression libraries; (2) development of better functional screens for activated oncogenes, and (3) evaluation of protocols to improve the rescue of cDNAs from the transformed cell populations. The authors have generated several retrovirus-based cDNA expression libraries that represent genes expressed in noninvasive (MCF-7 and T47D) and invasive (MDA-MB4682 and BT549) human breast cancer cell lines. These libraries were introduced into Rat-1 rodent fibroblasts and RIE-1 rat intestinal epithelial cells, after which transforming activity was assayed. Two isolates from the analyses encode the Rat-1 serine/threonine kinase and the fibroblast growth factor receptor 2 (FGFR2). In the final year of support, the authors characterized the transforming activity of FGFR2 and evaluated possible signaling mechanisms by which it causes transformation. The results show that pharmacologic inhibitors of MEK1/2 potently block FGFR2 transforming activity. (4 figures, 7 refs.)
DTIC
Genetic Engineering; Actuators; Cloning (Biology); Fibroblasts

20030112688 Pennsylvania Univ., Philadelphia, PA
Structure and Function of the AIB1 (Amplified in Breast Cancer-1) Protein
Marmorstein, Ronen; Jul. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0461
Report No.(s): AD-A418064; No Copyright; Avail: CASI; A02, Hardcopy

The overexpression or amplification of the AIB1 gene is observed in the majority of primary breast tumors, and is also correlated with a large percentage of hereditary and sporadic ovarian carcinomas. The AIB1 protein is a member of the steroid receptor coactivator family of transcriptional regulatory proteins that contain a conserved C-terminal histone acetyltransferase domain, and an N-terminal bHLH-PAS domain. The authors hypothesize that the HAT and BHLH-PAS domains of AIB1 play critical roles in mediating elevated transcriptional activation levels in AIB1-mediated cancers. The goal of this proposal is to determine the three- dimensional structure of the HAT and bHLH-PAS domains of AIB1 to facilitate the structure-based design of small molecule inhibitors to specifically target AIB1 for therapeutic application. To date, the authors have prepared several HAT and bHLH-PAS-containing AIB1 recombinants. Each of the HAT- containing domains, either alone or as GST fusion proteins, are unstable, suggesting that the HAT domain is not correctly folded and may require association with another protein factor for AIB1-mediated HAT activity. They have overexpressed and purified to homogeneity several N-terminal bHLH-PAS-containing domains that migrate as apparent monomers on gel filtration chromatography. Crystallization efforts to these bHLH-PAS- containing AIB1 domains are underway to facilitate an X-ray crystal structure determination.
DTIC
Crystal Structure; Proteins; Physiology; Cancer; Mammary Glands; Tumors

20030112689 Beth Israel Deaconess Medical Center, Boston, MA, USA
Laminin-10 and Its Receptors in Breast Carcinoma: Cooperation of Alpha6Beta4 and Alpha3Beta1 Integrin Laminin Receptors in Breast Carcinoma
Awwad, Rana A.; Jun. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0155
Report No.(s): AD-A418060; No Copyright; Avail: CASI; A03, Hardcopy

Insulin receptor substrate 1 and 2 are downstream signaling molecules for growth factors and adhesion receptors that are implicated in breast cancer. In this report, the author dissects the individual roles of IRS-1 and IRS-2 in the promotion and

progression of breast carcinoma. The results show that IRS-1 and IRS-2 play distinct roles in the malignant progression of breast carcinoma. IRS-1 and IRS-2 are both required for cell proliferation, with IRS-2 being a better mediator of cell proliferation. The results also show that IRS-2, but not IRS-1, is required for cell survival in the absence of exogenous growth factors and in invasion. In fact, IRS-1 function might reduce the efficacy of IRS-2 in these processes. Altogether, the findings suggest that IRS-1 is involved in the early stages of breast cancer establishment and that IRS-2 is required for its maintenance and progression to malignancy.
DTIC
Cells (Biology); Insulin; Cancer; Mammary Glands

20030112692 Brigham and Women's Hospital, Boston, MA
A Novel Pathway to Down-Regulate ErbB Signaling in Mammary Epithelial Cells
Duan, Lei; Band, Hamid; Jan. 2003; 98 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9086
Report No.(s): AD-A418069; No Copyright; Avail: CASI; A05, Hardcopy

Activation of tyrosine kinases plays a key role in cell proliferation, and ErbB receptor tyrosine kinases are specifically implicated in breast cancer. Biochemical studies have recently identified the proto-oncogene product Cbl as a negative regulator of EGF receptor and ErbB2. The Cbl- dependent negative regulation of ErbB receptors was associated with their ubiquitin modification and down-regulation from the cell surface. Based on these observations, this proposal is investigating the role of Cbl-mediated ubiquitination as a signal for targeting activated ErbB receptors to lysosomes where they undergo degradation. The work reported here has demonstrated that ubiquitin modification of EGFR is essential for its down-regulation. Furthermore, this modification is shown to be essential for EGFR trafficking between early and late endosome, while being dispensable for initial endocytosis. Further studies aim to establish the relative role of Cbl- dependent ubiqiuitinylation versus other endocytic motifs in ErbB receptor internalization, and dissect out components of the biochemical machinery that mediates ubiquitin-dependent lysosomal sorting of ErbB receptors. Elucidation of this novel pathway of ErbB receptor downregulation is likely to reveal novel targets to develop rational therapeutic agents for breast cancers with aberrant expression and/or activity of ErbB receptors.
DTIC
Epithelium; Cells (Biology); Mammary Glands; Cancer

20030112694 State Univ. of New York, Buffalo, NY
Environmental Exposures at Birth and at Menarche and Risk of Breast Cancer
Freudenheim, Jo L.; Jun. 2003; 69 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0417
Report No.(s): AD-A418073; No Copyright; Avail: CASI; A04, Hardcopy

This population-based study examines early life exposure to environmental pollutants from industrial sites, toxic waste sites and heavily trafficked roadways as risk factors for breast cancer; with a focus on exposure to benzene and PAHs. We have geocoded 15,340 individual addresses for 3, 286 participants in Erie and Niagara counties in the study. A validation study assessed the positional accuracy of addresses geocoded on the Dynamap2000 using a global positioning system receiver. Overall, geocoding was accurate. Analyses have been completed examining residential proximity to industrial sites contracting with the US Atomic Energy Commission (USAEC), for exposure to total suspended particulates (TSP), and exposure to environmental tobacco smoke (ETS) and breast cancer risk. Proximity to sites contracted by USAEC was not associated with risk. Exposure to TSP in early life was associated with a 2.75- fold increase in risk for postmenopausal women only. There was little evidence of an association between early life exposure to ETS and breast cancer. Clustering analyses identified geographic patterns of residence for breast cancer cases and controls at critical time periods in early life. These results provide evidence that environmental exposures in early life may be important for breast cancer risk.
DTIC
Birth; Mammary Glands; Cancer; Risk; Environment Effects; Contaminants

20030112696 Rochester Univ., NY, USA
Selective DNA Delivery to Breast Cancer Cells
Dewhurst, Stephen; Jun. 2003; 39 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9361
Report No.(s): AD-A418068; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis of this research was that specific cell-binding proteins or peptides could be used to enhance (therapeutic) DNA delivery to breast carcinomas. This hypothesis was experimentally tested, with the following results: (1) Recombinant adenovirus type 7 penton base protein (Ad7PB) was shown to mediate DNA transfer into mammalian cells, when coupled to plasmid DNA via a bifunctional peptide linker. However, the efficiency of DNA transfer was poor. (2) Since CD40 is highly expressed on some breast carcinomas, we selected for CD40-binding peptides using phage display technology. When coupled to the surface of adenovirus vectors, these peptides dramatically enhanced virally-mediated gene delivery to CD40-positive murine and human cells. (3) Since alpha v beta 3 integrin is expressed in many breast carcinomas, we generated novel alpha v beta 3-binding proteins by the directed mutagenesis of a natural integrin-binding protein, the tenth fibronectin type III domain (FNfn10). A novel derivative of FNfn10 was identified and shown to bind with high affinity and specificity to purified alpha v beta 3 integrin. It also interacted with cell surface-expressed alpha v beta 3, as determined by flow cytometry, but did not bind detectably to other cell surface integrins. Overall, these experiments have provided important tools and insights that will enhance gene transfer to breast carcinomas.
DTIC
Adenoviruses; Cancer; Deoxyribonucleic Acid; Cells (Biology); Mammary Glands

20030112700 Michigan Univ., Ann Arbor, MI
Interleukin-6 and Prostate Cancer Progression
Keller, Evan T.; Jul. 2003; 69 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0530
Report No.(s): AD-A418080; No Copyright; Avail: CASI; A04, Hardcopy

Prostate carcinoma (PCA) initially responds to androgen deprivation. However, it usually reoccurs in a form that is unresponsive to further hormonal manipulations. This latter form of PCA, termed androgen independent cancer, inexorably progresses resulting in the demise of the patient. Interleukin-6 (IL-6) and IL-6 receptor are expressed in PCA and activates the androgen receptor (AR) . In the current work we explored the hypothesis that IL-6 contributes to the progression of PCA that is observed post-androgen deprivation, through enhancing AR activity. We determined that blocking IL- 6 diminishes development and progression of androgen- independent human PCA in a murine model Furthermore, we have identified several transcription factors that are candidate mediators of this effect. These data strongly support a role for IL-6 in the progression of prostate cancer to an androgen- independent tumor and provide potential molecular therapeutic targets.
DTIC
Prostate Gland; Cancer

20030112701 West Virginia Univ., Morgantown, WV
Novel Histone Deacetylase Inhibitors
Strobl, Jeannie S.; Jul. 2003; 66 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0500
Report No.(s): AD-A418081; No Copyright; Avail: CASI; A04, Hardcopy

HDAC (histone deacetylase) is a novel target for anti-cancer drug discovery. A database of guinoline compounds was characterized for the ability to inhibit HDAC, promote differentiation and cell death in tissue culture lines of human breast cancer. Antimalarials, chloroquine and quinidine promote breast tumor cell differentiation and cell death. A novel mechanism, regulation of HDAC1 by stimulating ubiguitination and proteasomal degradation of HDAC1 is proposed to explain the actions of antimalarials in breast cancer. NSC 3852 and NSC 10010 are novel breast tumor differentiation agents. NSC 3852 inhibits HDAC enzyme activity in vitro. NSC 10010 causes differentiation by a unique mechanism, and does not inhibit HDAC activity or stimulate HDAC1 ubiquitination. We conclude that these novel compounds hold promise for breast cancer treatment and because of their independent mechanisms of action, may be even more active in combination than when used as single agents.
DTIC
Inhibitors; Drugs; Mammary Glands; Cancer

20030112704 Texas Univ., Dallas, TX, USA
Do Telomerase Inhibitors Prevent the Spontaneous Immortalization of Breast Eptihelial Cells From Individuals Predisposed to Breast Cancer?
Herbert, Brittney-Shea; Jul. 2003; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0438
Report No.(s): AD-A418083; No Copyright; Avail: CASI; A04, Hardcopy

The activity of telomerase has been shown to be absent in normal somatic cells, with the exception of stem cells. The reactivation of telomerase has been seen as an early event in most cancers, especially breast cancer. I have shown that the inhibition of telomerase, by various types of inhibitors, led to the inhibition of cell growth via telomere- based mechanisms. To understand the mechanism of telomere shortening and growth inhibition, microarray analyses were performed to detect changes in the transcriptional profiling. The effects of telomerase inhibitors were found to be independent of p53 and pRB status. Furthermore, I showed that telomerase inhibitors and tamoxifen could prevent the spontaneous immortalization of Li-Fraumeni Syndrome-derived breast epithelial cells. Microarray analyses detected changes in the transcriptional profiling after treatment with tamoxifen and telomerase inhibitors. Also, Northern analyses of the spontaneously immortalized breast epithelial cells showed that while the cells were negative for estrogen receptor-alpha (ER alpha) by histology, the data show that the cells possibly contain ER beta. Tamoxifen mechanism's may be to utilize orphan receptors. These studies should lead to new insights in preventing the occurrence or recurrence of breast cancer.
DTIC
Cancer; Mammary Glands; Inhibitors; Cells (Biology)

20030112706 California Univ., Irvine, CA
Novel Mechanisms by which Estrogen Induces Antiapoptosis in Breast Cancer
Lavin, Ellie R.; Aug. 2003; 50 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0188
Report No.(s): AD-A418105; No Copyright; Avail: CASI; A03, Hardcopy

We investigated the mechanisms of membrane estrogen receptor signaling to breast cancer. We discovered that serine 522 of mouse ER alpha is required for membrane localization. Importantly, when expressed in MCF-7 cells, this S522A mutant ER alpha heterodimerizes with endogenous ER alpha, sequestering it from the membrane and inhibiting ERK activation by E2. This mutant has no effect on endogenous nuclear ER. We found that cyclin D1 synthesis, Cdk4 activity and G1/S progression is stimulated via ERK and inhibited by S522A mutant ER alpha expression in MCF-7 (Mol Cell Biol 23(3): 1633-46, 2003). We also found that estradiol signaling to ERK involves transactivation of the EGF receptor, through Gq alpha and Gi alpha signaling to Src, Mmp activation and HB-EGF liberation. Only the E domain of ER alpha is required for these events initiated at the plasma membrane.
DTIC
Biology; Estrogens; Membranes; Cancer; Mammary Glands

20030112707 Texas Univ., Austin, TX
Synthesis of Aceogenin Analogs as Potential Therapeutics for Treating Prostate Cancer
Pagenkopf, Brian L.; Jul. 2003; 23 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0109
Report No.(s): AD-A418104; No Copyright; Avail: CASI; A03, Hardcopy

New synthetic routes for preparing both the bis- THF and butenolide protions of the targeted acetogenin analogs have been established that avoid the pitfalls of previous strategies. These routes provide practical solutions to the problems associated with securing late-stage advanced intermediates in guantities sufficient for analog preparation. Current research efforts are focusing on optimizing the final aceogenin assembly. A brief investigation into alternative ways to connect the bis-THF with the butenolide led to development of a new Horner-Wadsworth-Emmons type coupling reaction between alkenes and aldehydes that involves rhodium catalyzed olefin hydrophosphorylation and a novel phosphonate elimination as key steps.
DTIC
Synthesis (Chemistry); Prostate Gland; Cancer

20030112708 Georgetown Univ., Washington, DC, USA
Cadherin-11 and Breast Cancer
Byers, Stephen W.; May 2003; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0245
Report No.(s): AD-A418106; No Copyright; Avail: CASI; A03, Hardcopy

Cadherin-11 is unique amongst cadherins in that it is exists as two alternatively spliced forms that are expressed together in the same cell. In year 1 of this grant we showed that the presence of the cadherin-11 splice variant promotes invasion of cadherin-11 positive breast cancer cells, perhaps by promoting cell-ECM interactions. In year two of the grant we have tested the hypothesis that inhibition of cadherin-11 function using proprietary small molecule cadherin- 11 inhibitors influences the

ability of cadherin-11-expressing cells to invade in vitro. Our data show that a particular class of inhibitors designed to block the ability of cadherin- 11 to interact with the extracellular matrix does indeed inhibit cell invasion. Other molecules designed to disrupt the cell-cell adhesive function of cadherin-11 did not affect cell invasion. In other studies we have generated cell lines expressing siRNA directed at both cadherin-11 and cadherin-11 variant.
DTIC
Cancer; Mammary Glands; Cytology

20030112711 Case Western Reserve Univ., Cleveland, OH
Investigating the Role of Nuclear Clusterin (nCLU) in Lethality and Genomic Instability in Paclitaxel (Taxol) - Treated Human Breast Cancer Cells
Criswell, Tracy L.; Boothman, David A.; Jul. 2003; 50 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0194
Report No.(s): AD-A418107; No Copyright; Avail: CASI; A03, Hardcopy

Clusterin is a protein that has been implicated in many normal physiological processes (tissue remodeling, sperm maturation) as well as many pathological processes (Alzheimer disease, atherosclerosis, cancer). Our laboratory became interested in clusterin when we identified it as an x-ray induced protein/transcript in human melanoma cells. The secretory form of clusterin (sCLU) has been shown to have cytoprotective effects after cellular stress and injury. Recently, Redondo et. al demonstrated that sCLU was overexpressed in breast cancer. sCLU over expression may provide a selective advantage in malignant cells. The most effective therapies for breast cancer after surgery include chemo- and radiation therapies. These therapies often fail as the tumor develops drug and radiation resistance. Our lab has shown that sCLU is induced by physiological doses of taxol, taxotere and radiation. Additionally, we have shown that sCLU is transcriptionally repressed by the tumor suppressor protein, p53, which is found mutated in approximately 20% of mammary tumors. Understanding the cellular and molecular responses of malignant and normal cells to these chemo- and radiation therapy would allow us to increase the efficacy of these treatments. Insight into the regulation of sCLU will allow us to better understand some of these processes.
DTIC
Proteins; Cancer; Mammary Glands; Nuclear Chemistry; Molecular Clusters; Glucosides

20030112713 Meharry Medical Coll., Nashville, TN
Comparative Biology of Brea2 Gene Expression in Caucasian and African American Female Breast Cells
Chaudhuri, Gautam; Jun. 2003; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0341
Report No.(s): AD-A418109; No Copyright; Avail: CASI; A03, Hardcopy

The overall goal of this proposed project is to understand the mechanism of regulation of human BRCA2 gene expression in order to explore the possibility of epigenetic malfunction in this mechanism, which may lead to sporadic breast cancer. The majority (less than 95%) of human breast cancer happens sporadically and caused by mutations in a variety of genes. On the other hand, the familial breast cancers are caused by the defects in either of the two DNA repair protein genes, BRCA1 and BRCA2. Possibility of epigenetic malfunction in the expression of these genes in developing sporadic breast cancer has been proposed. BRCA2 mRNAs were only detected in dividing cells but not at all in quiescent cells. Recently, we have found an Alu-repeat containing transcriptional silencer at the upstream of human BRCA2 gene. This silencer is active only in the quiescent cells but not in the dividing breast cells, thus explaining the absence of BRCA2 mRNA in the quiescent cells. The mechanisms of that activation and inactivation of this silencer in the quiescent and dividing cells, respectively, are presently unknown. We have shown that specific nuclear proteins from quiescent breast cell nuclear extract sequence-specifically binds to this silencer. Understanding the structure-activity relationships in these bindings in reference to covalent modifications of the DNA elements and the protein factors may reveal the mechanisms of the regulation of the silencer function. Thus, we believe that the human BRCA2 gene is silenced in the quiescent stage of breast cells but is activated in the dividing cells by the inactivation of an Alu- containing silencer located at the upstream of the BRCA2 gene promoter. Possible transient epigenetic malfunction in this silencer inactivation process by environmental factors in the dividing cells may lead to defect in DNA repair and subsequence onset of mutations in any key gene leading to oncogenesis.
DTIC
Genes; Cancer; Mammary Glands; Defects; Cells (Biology)

20030112715 Georgetown Univ., Washington, DC, USA
A Comprehensive Postdoctoral Training Program in Breast Cancer
Dickson, Robert B.; Jul. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0271
Report No.(s): AD-A418112; No Copyright; Avail: CASI; A02, Hardcopy

The Comprehensive Postdoctoral Training Program in Breast Cancer Biology has successfully completed its third year. The goal of the program is to significantly extend our existing, highly successful Doctoral Training Program in Tumor Biology and several Cancer Center mechanisms that provide traditional postdoctoral training and junior faculty career development. The education and training of new investigators is essential to our progress in the prevention, detection, diagnosis, and treatment of breast cancer. The Postdoctoral Training Program in Breast Cancer provides comprehensive career development and integrates interactive research in the basic biology of breast cancer, formal and informal course work in key areas, and individualized guidance in career development. The program is enriched with both new and existing courses of interest to postdoctoral fellows covering scientific writing, teaching methodologies, scientific resources and technologies for cancer research, ethics in science, career development seminar series, and provides a firm foundation in the skills needed to succeed in a career science, as well as a focused research experience in basic breast cancer biology in a strong laboratory environment.
DTIC
Education; Genetics; Cancer; Mammary Glands

20030112722 Kentucky Univ., Lexington, KY, USA
Consensus Conference on Sedation Assessment: A Collaborative Venture by Abbott Laboratories, American Association of Critical-Care Nurses, and Saint Thomas Health System
De Jong, Marla J.; Jan. 2003; 24 pp.; In English
Report No.(s): AD-A418170; AFIT-CI02-1293; No Copyright; Avail: CASI; A03, Hardcopy

In August of 2002, a group of critical care experts met in Nashville, Tennessee, for a consensus conference on sedation assessment. The conference was made possible though a collaboration between the American Association of Critical-Care Nurses, Abbott Laboratories, and the Saint Thomas Health System (Nashville, TN) to address the critical need for a valid and reliable sedation assessment scale for use with critically ill patients. The collaboration was initially envisioned to be a three-phase process: Phase I, Convene a group of experts in sedation assessment to validate the state of the science surrounding sedation assessment and to recommend characteristics of an 'ideal' sedation assessment scale; Phase II, Develop a new sedation assessment scale for critically ill adult patients; and Phase III, Conduct a multisite clinical research project to test the validity and reliability of the new scale. Conference participants were selected based on their expertise in a variety of critical care arenas and aspects of sedation to get a broad perspective on the sedation needs in critical care practice. In addition, members were selected for participation in the panel based on expertise specifically relevant to sedation assessment, including pain management, anxiety/fear, sleep problems, patient-ventilator synchrony, delirium, clinical pharmacology, and sedation scale development. This paper is a summary of the expert panel's perspectives on the current status of sedation assessment in critically ill patients and their recommendations for the development of a new sedation assessment scale. A series of questions were posed to the expert panel members; their responses to these questions during the 1-day conference are summarized in this paper.
DTIC
Analgesia; Decision Support Systems; Sedatives; Health

20030112728 Minnesota Univ., Minneapolis, MN
Role of IRS-1 Phosphorylation in IGF-1 and IL-4 Signaling in Breast Cancer
Sachdev, Deepali; Jun. 2003; 60 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0347
Report No.(s): AD-A418308; No Copyright; Avail: CASI; A04, Hardcopy

Insulin-like growth factor-1 (IGF-1) stimulates proliferation of MCF-7 cells via the type I IGF receptor (IGF IR) and causes phosphorylation of the adaptor protein, insulin receptor substrate-1 (IRS-1). Interleukin 4 (IL-4) inhibits breast cancer cells and also phosphorylates IRS-1. The hypothesis was that IGF-1 and IL-4 phosphorylate different residues with IGF-1 treatment targeting IRS-1 for degradation via the proteasome. The goal of this project was to identify amino acids of IRS-1 phosphorylated by IGF-1 compared to IL-4 using two-dimensional electrophoresis (2DE) of phosphorylated IRS-1. However, as reported in the two previous reports, several technical difficulties and limitations of 2DE were encountered and impeded the completion of the tasks. In the final year, work was continued on 2DE of IRS-1 but despite sustained efforts, it has not been possible to detect IRS-1 after 2DE. Unfortunately, it appears that the large size, abundance in cells, and perhaps charge

of IRS-1 may make it difficult to use this technique. As the long-term objective of my training was to identify new targets for breast cancer therapy and inhibit IGF action, I have successfully worked on two other projects - one to inhibit IGF-1 action in breast cancer cells using a humanized single chain antibody against IGF 1 R and a second project to inhibit metastasis of cancer cells using a truncated IGFIR that I have shown behaves in a dominant negative manner.
DTIC
Electrophoresis; Phosphorylation; Cancer

20030112729 Northern California Inst. for Research and Education, San Francisco, CA
The Roles of the Y Chromosome Genes in Prostate Cancer
Lau, Yun-Fai C.; Feb. 2003; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0039
Report No.(s): AD-A418194; No Copyright; Avail: CASI; A03, Hardcopy

Currently we lack information on the role of the men-only chromosome, the Y chromosome, on prostate cancer. This project is designed to address this problem and to identify candidate genes on the Y chromosome involved in this male-specific cancer. The objectives are: 1) to study the expression of Y chromosome genes in prostate cancer and, 2) to evaluate their effects in over-expression in the prostate of transgenic mice. We have completed a survey on the expression of 31 Y chromosome genes in prostate cancer and have identified TSPY gene to be the most likely one to play a role in male oncogenesis. We have isolated and sequenced several polymorphic TSPY transcripts in normal and cancerous prostate samples, demonstrated that over-expression of TSPY potentiates cell proliferation in vitro and tumor formation in vivo. TSPY interacts with the mitotic cyclin B. Its expression is influenced by androgen. For the no-cost extension period, we hope to finish our transgenic study in over-expressing this and other Y chromosome gene(s) in prostates of mice and to evaluate its effects in prostatic oncogenesis and to define the TSPY domain(s) important for its interaction with the mitotic cyclin B. These studies will provide important information on the role of this male-specific chromosome on prostate cancer development and treatments.
DTIC
Cancer; Prostate Gland; Chromosomes; Genes; In Vitro Methods and Tests

20030112730 Alabama Univ., Birmingham, AL
Internet Support and Information for Women with Breast Cancer
Owen, Jason E.; Tucker, Diane C.; Jul. 2003; 72 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0121
Report No.(s): AD-A418309; No Copyright; Avail: CASI; A04, Hardcopy

A large body of literature indicates that psychosocial support interventions for cancer patients, which provide specific cognitive-behavioral and coping skills training, are effective in the reduction of cancer pain, nausea, depression, and anxiety, and may improve indices of survival. However, few patients take advantage of available support groups, and these support groups do not typically provide the structured components demonstrated to result in positive outcomes. In our interactions with newly-diagnosed breast cancer patients, patients also cite logistical constraints (e.g., travel distance or lack of information) as reasons for non participation. Through the implementation of the currently-funded protocol, SURVIVE, substantial progress has been made in making structured supportive/informational group services more readily available to breast cancer patients. Although the computer-facilitated Internet-based group intervention was not significantly predicted changes over time in quality of life. These findings suggest that future efforts will need to clarify the role of computer versus professional facilitation and mechanisms by which participation can be maximized.
DTIC
Cancer; Females; Anxiety

20030112733 Baylor Coll. of Medicine, Houston, TX
Linking Sister Chromatid Cohesion to Apoptosis and Aneuploidy in the Development of Breast Cancer
Pati, Debananda; Jul. 2003; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0143
Report No.(s): AD-A418197; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study is to identify effector molecules that act as a link between cell proliferation, cell survival and chromosomes stability. We have hypothesized that chromosomal segregation and apoptotic pathways are linked and have a role in breast cancer. Rad2l is one of the major cohesion subunits that holds sister chromatids together until anaphase, when proteolytic cleavage by separase allows chromosomal separation. Our study demonstrates that in contrast to described

functions of Rad2l, in chromosome segregation and DNA repair, cleavage of the cohesion protein and translocation of the C-terminal cleavage product to the cytoplasm are early events in the apoptotic pathway that amplify the apoptotic signal in a positive feed back manner by activating more caspases. Overexpression of the 64 kDa cleavage product results in apoptosis in MCF-7 breast cancer cells. Given the role of hRad21 in chromosome cohesion, the cleaved C-terminal product and its translocation to the cytoplasm may act as a nuclear signal for apoptosis. Furthermore, hRad21 is differentially expressed in human breast tumors and in breast cancer derived cell lines in comparison to normal breast epithelial cells. We are currently analyzing this data and evaluating Rad2l as a prognostic marker for breast cancer.
DTIC
Mammary Glands; Cancer; Chromosomes; Cohesion; Tumors; Molecules

20030112735 University of Southern California, Los Angeles, CA
Evaluation of DNA Methylation as a Target for Intraductal Therapy for Ductal Carcinoma In Situ of the Breast
Skinner, Kristin A.; Aug. 2003; 4 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0569
Report No.(s): AD-A418200; No Copyright; Avail: CASI; A01, Hardcopy

Ductal carcinoma in situ(DCIS), the preinvasive form of infiltrating ductal breast cancer, accounts for 20-30% of breast cancers and is treated surgically. In DCIS, the malignant cells are confined within the basement membrane. DCIS is a local disease, and so an ideal candidate for local therapies. DNA methylation is one mechanism for tumor suppressor gene inactivation. It is an early event in the course of malignant progression. Because methylation is a potentially reversible mechanism for tumor suppressor gene inactivation, it is an intriguing target for molecular therapeutics. Drugs, such as 5-aza-deoxycytidine (DAC), are available that can reverse methylation changes and prevent neoplasia in vivo.
DTIC
Methylation; Cancer; Deoxyribonucleic Acid; Mammary Glands

20030112737 Washington Univ., Seattle, WA
Does the Phenotyping of Disseminated Prostate Cancer Cells in Blood and Bone Marrow Prior to Radical Prostatectomy Provide Prognostic Information?
Vessella, Robert; Jul. 2003; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0115
Report No.(s): AD-A418201; No Copyright; Avail: CASI; A03, Hardcopy

Nearly 20% of men who undergo a radical prostatectomy later relapse with bone metastases. The cellular events that are predictive of subsequent progressive disease remain unknown. We've focused attention on the detection of disseminated prostate cancer (CaP) cells in the blood and bone marrow. Our hypothesis is that these disseminated cells may provide critical insight regarding biomarkers of use in prognostication. We've developed enrichment and isolation techniques that allow the isolation of individual disseminated CaP cells for study as a pool of cells or single cells. Our proposal is to isolate these cells form 50 patients prior to radical prostatectomy and from 10 patients with advanced disease. The cells will be both phenotypically and molecularly analysed. To date 57 patients have been accrued and the analyses well underway. For example, we are finding that 70% of patients prior to radical prostatectomy have disseminated CaP cells in their bone marrow. Also, we show a good correlation between patients with cytokeratin positive cells and human epithelial positive cells. In 36 of 37 specimens having disseminated CaP cells we found aberrant features of chromosome 8 by FISH analysis. Micro-array gene expression analysis is planned on single cells form the first 10 patients to recur.
DTIC
Bone Marrow; Blood Cells; Prostate Gland; Cancer; Predictions; Metastasis

20030112743 Texas Univ., Houston, TX, USA
BRCA2 and Genome Integrity
Su, Li-Kuo; Jul. 2003; 36 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0317
Report No.(s): AD-A418196; No Copyright; Avail: CASI; A03, Hardcopy

The BRCA2 tumor suppressor gene has been suggested to be important for DNA repair and maintaining genome integrity. Most evidences supporting this hypothesis, however, were obtained from studying mouse embryonic cells. The importance of BRCA2 in maintaining genome integrity in human cells is not very clear. We have completed all tasks of this study. We have generated derivatives of Capan-1 cells, which expressed only mutant BRCA2, that express wild-type BRCA2.

Characterization of Capan-1 derivatives showed that expression of wild-type BRCA2 did not have a detectable effect of the sensitivity to gamma-irradiation or DNA damaging drugs of Capan-1 cells. Characterization of MCF12A derivatives showed that reduction of BRCA2 diminished the formation of gamma- irradiation induced RAD51 nuclear foci and increased the sensitivity to gamma-irradiation of MCF12A cells. Unexpectedly, we also found that expression of wild-type BRCA2 suppressed the growth of Capan-1 cells in vitro and in vivo. On the other hand, reduction of BRCA2 appears to inhibit the growth of MCF7 cells.
DTIC
Genes; Cancer; Mammary Glands; Tumors; Suppressors

20030112748 Health Research, Inc., Buffalo, NY, USA
Functional Interactions of the TACC2 Breast Tumor Suppressor Gene and Its Relevance to Breast Tumor Progression
Still, Ivan H.; Jul. 2003; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0208
Report No.(s): AD-A418198; No Copyright; Avail: CASI; A03, Hardcopy

Dysregulation of the human Transforming acidic coiled coil (TACC) genes is thought to be important in the development of breast cancer. However, the mechanism by which they function still remains to be clarified. We have demonstrated that the full length TACC2 protein can inhibit the tumorigenic phenotype of certain breast cancer cells. We have now performed mapping experiments that demonstrate that the conserved coiled coil domain is critical for this effect. We have confirmed that the histone acetyltransferases (HATs), hCGN5, and pCAF bind to this domain, suggesting that interaction between TACC2 and these proteins may be critical for the maintenance of the normal mammary epithelium. Although breast cancer cells do not significantly express hGCN5, they do express pCAF. A biological function of TACC2 was indicated by its effect to efficiently negate the in vitro suppression of DNA-dependent protein kinase (DNA-PK) mediated pCAF activity. Taken together these findings appear to imply that one of the functions of TACC2 is to counteract a negative modulator of his tone acetylase activity, thereby potentially regulating the expression of genes involved in the maintenance of normal mammary development.
DTIC
Genes; Mammary Glands; Cancer

20030112750 Columbia Univ., New York, NY
Understanding Treatment Dropout in Outpatient Mental Health Services: An Economic Framework Exploring the Relationship between Patient Satisfaction and Appointment
Ozanian, Rhonda G.; Nov. 14, 2003; 210 pp.; In English
Report No.(s): AD-A418321; CI02-1305; No Copyright; Avail: CASI; A10, Hardcopy

Noncompliance in the form of treatment dropouts is a major problem across outpatient mental health settings and can range from 40-50% of all clients. Economic theory suggests that noncompliance is consumer signaling about patient preferences. The mental health industry standard for evaluating patient preferences is the patient satisfaction measure. This study examined the relationship between treatment noncompliance and patient satisfaction. After controlling for sociodemographic and health status factors, it was hypothesized that patient satisfaction would predict duration of mental health treatment. Using 1996-1999 data from the Agency for Healthcare Research and Quality Medical Expenditure Panel, a satisfaction measure was constructed and regression models developed to examine the impact of satisfaction on treatment duration for patients having at least one mental health visit. Survival analysis was used to examine the hazard rate of patients having high versus low satisfaction. The findings suggest that individuals satisfied with and having confidence in the provider were significantly more likely to have a subsequent visit. The importance of satisfaction in predicting treatment continuation was not constant with respect to the number of visits or patient sociodemographic characteristics. Satisfaction was strongly predictive of continuation for the college educated and individuals with a mental health diagnosis, but less important for African Americans, the high-school educated, and individuals ages 25-44. Practical aspects of care such as access were significantly more important for Hispanics and the publicly insured. Evidence suggests there is a distinct group of consumers who seek and are satisfied with consultation only. MEPS measures satisfaction with 'usual source of care,' but it lacks specificity and does not reflect satisfaction with mental health care. The role of treatment preferences needs to be investigated further. 37 tables, 22 figures, 156 re7
DTIC
Therapy; Mental Health; Patients; Medical Services

20030112751 Wright State Univ., Dayton, OH

The Two Isoforms of Rat Metallothionein are Coordinately Regulated in Vivo

Todd, Diane M.; Jan. 2003; 60 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418322; CI02-1302; No Copyright; Avail: CASI; A04, Hardcopy

Metallothionein (MT) is an inducible protein whose unique structure contributes to its many functions. One of MT's functions is the detoxification of heavy metals. Cadmium (Cd), which is an environmental pollutant and a hazard to both humans and animals, is detoxified by MT. There are four known MT isoforms (MT I-IV) and this study focuses on MT I and MT II. Even though a lot is known about the effect of Cd on MT induction, little has been reported about the MT isoforms and their pattern of mRNA expression. This study investigates the hypothesis that the two isoforms of rat MT are coordinately regulated in vivo. To test this hypothesis, rats were dosed intravenously via the lateral tail vein with 0.0, 0.5, 1.0 or 2.0 mg/kg Cd acetate and the mRNA levels in the liver tissue were determined by Real-Time PCR at various time points (0, 0. 5, 1, 3, 6, 9, 12, 18 and 24 hours). The fold increase in mRNA expression was determined using the comparative C (sub T) method and plotted versus time. MT I mRNA exhibits a similar induction pattern at the 0.5, 1.0 and 2.0 mg/kg doses up to the 6-hour time point. By 12 hours both the 0.5 mg/kg and 1.0 mg/kg doses decline to baseline levels, whereas the 2.0 mg/kg dose remains elevated. The pattern of induction for MT II mRNA is similar for all three doses up to the 9-hour time point. At the 0.5 mg/kg and 1.0 mg/kg doses MT II mRNA declines to baseline at the 12-hour time point and then increases at 24 hours. At the 2.0 mg/kg dose, MT II mRNA remains elevated at times greater than 12 hours. In comparing MT I and MT II mRNA expression, the results demonstrate that at all doses, MT II peaks first followed by a decline at 3-6 hours at which time MT I peaks. MT I mRNA decreases between 6 and 12 hours, while MT II mRNA peaks at 9 hours. At the 0.5 mg/kg and 1.0 mg/kg dose both MT I and MT II decrease at the 12-hour time point and then increase at 24 hours, while at the 2.0 mg/kg dose, both mRNAs remain elevated between 12 and 24 hours.

DTIC

Proteins; Cadmium; Contaminants

20030112752 John Wayne Inst. for Cancer Treatment and Research, Santa Monica, CA, USA

Gangliosides During Tumor Progression in Patients With Prostate Cancer

Ravindranath, Mepur H.; Jul. 2003; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0062

Report No.(s): AD-A418202; No Copyright; Avail: CASI; A03, Hardcopy

The project objectives are 1 to identify the gangliosides Gs of Prostate cancer (CaP) that are immunogenic so that they can be used as targets to develop immunotherapy for prostate cancer; 2 to determine the total and specific Cap- Gs released into the blood and 3 to assess the nature of immunosuppression induced by CaP-Cs. Last year, we have found out that the neoplastic transformation of prostate epithelial cells involve Cs with Cal-CalNAc-Cal-Glucosylceramide backbone by comparing the normal prostatic epithelial with five prostate cancer cell lines, namely PC-3, DUl45, LNCaP-FCC-lO, LNCaP-FCC and HH87O. This year, we have made novel and unique observations relevant to early diagnosis of the localized disease, which include 1 Identifying GMlb, GD1a, GalNAc-GM1b and GalNAc-GD1a as unique Cs of CaP. 2 IgM antibodies in the sera of CaP patients with localized disease (T1b/c) reacted strongly to GM1b in thin layer chromatography (TLC). 3 Patients with localized disease had high titers of GD1a. 4 A study of the total serum Cs profile was completed for all stages. 5 Using endogenous immune response, we identify that the Cs GMlb and GD1a are released into circulation. 6 The Cs GM2 and GMlb observed in CaP cell lines may be artifacts of tissue culture conditions, which are known to augment the expression of GalNAc-transferase. The endogenous immune response to GMlb and GD1a make the anti-GsIgM as potential markers of early diagnosis of localized prostate cancer. Ultimately these findings will enable formulating an allergenic CaP vaccine.

DTIC

Prostate Gland; Ganglia; Cancer; Diagnosis

20030112753 Texas Univ., Austin, TX, USA

Detection and Diagnosis of Oral Neoplasia with Confocal Microscopy and Optical Coherence

Clark, Anne L.; Aug. 2003; 174 pp.; In English

Report No.(s): AD-A418323; AFIT-CI02-1303; No Copyright; Avail: CASI; A08, Hardcopy

In the USA, over 27,000 new cases and approximately 7,000 deaths attributable to oral cancer are expected in 2003. In some areas of the world this malignancy is much more common; oral cancer is the most common cancer among men and the third most common cancer in women in India. Prognosis for patients with oral cancer remains low with 5- year survival rates hovering in the 50th percentile. High resolution, in vivo optical imaging may offer a clinically useful adjunct to standard histopathologic diagnosis. The work in this dissertation centered on optical imaging in the oral cavity to determine whether

confocal microscopy and optical coherence microscopy could detect and diagnose oral neoplasia. A survey of features of normal epithelium and SSCs using a reflectance confocal microscope resolved nuclear density and morphology differences between neoplastic and non-neoplastic oral cavity specimens and features of noncancerous and cancerous oral tissue such as inflammation, fibrosis, muscle fibers, and salivary glands. A detailed study of the differences between normal, preneoplastic, and neoplastic oral cavity tissue using images from a reflectance confocal microscope found that descriptive statistics characterizing nuclear morphology allowed slight differentiation between normal and dysplastic epithelium. Reviews of confocal images by trained pathologists and untrained engineers emphasized the need for situational awareness of the region of the epithelium occupied by the image plane. An optical coherence microscope with subcellular resolution and an estimated penetration depth (based on SNR) of 690-1,227 microns was built to support imaging deeply within oral mucosa. This increased penetration depth supported a study of epithelial scattering coefficients from reflected nuclear intensities that was successful in non- hyperkeratotic layers and showed differentiation between scattering properties of normal and dysplastic epithelium and SCCs.
DTIC
Epithelium; Cancer; Mouth

20030112760 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD
Development of a Guinea Pig Model for Low-Dose Chronic Exposure to Organophosphorus Nerve Agents
Atchison, Chessley R.; Sheridan, Robert E.; Duniho, Steven M.; Shih, Tsung-Ming A.; May 2003; 34 pp.; In English
Contract(s)/Grant(s): Proj-PE61384A
Report No.(s): AD-A418295; USAMRICD-TR-03-05; No Copyright; Avail: CASI; A03, Hardcopy

An animal dosing model and related maximum tolerated dose (MTD) were developed for repeated exposures in guinea pigs to three organophosphorus chemical warfare nerve agents (CWNA). Male animals were injected subcutaneously with sarin (GB), soman (GD) or VX once a day (Monday through Friday) for 2-, 4-, or 13-weeks. An initial 13-week study for each CWNA employed doses of vehicle (normal saline), 0.2, 0.4, 0.6, and 0.8 x the previously established acute LD50. A 2-week and 4-week exposure were also performed for each agent at doses less than the 13-week MTD to verify lack of toxicity. Animals dosed daily for 13 weeks with 0.4 x LD50 of GB or GD or with 0.2 x LD50 of VX did not display signs of acute cholinergic toxicity. In animals dosed daily for either 2- or 4-weeks, the MTDs were 0.4 x the acute LD50 for all 3 CWNA. There were no differences among these groups and their respective vehicle controls for weight gains, body temperature, complete blood cell counts, blood chemistries, nor by histopathology. At the MTD in all groups, red blood cell cholinesterase activity one hour alter the last exposure was inhibited up to 90% compared with controls.
DTIC
Chemical Warfare; Pathology; Organic Phosphorus Compounds; Exposure; Guinea Pigs

20030112783 Mount Sinai School of Medicine, New York, NY
Post-Doctoral Training Program in Bio-Behavioral Breast Cancer Research
Bovbjerg, Dana H.; Jun. 2003; 216 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9303
Report No.(s): AD-A418207; No Copyright; Avail: CASI; A10, Hardcopy

Accumulating evidence indicates that the 'biobehavioral model' of health and disease may have considerable relevance for cancer generally, and breast cancer in particular. Broadly stated, this model proposes that what people think and feel affects the state of their health in two basic ways: by affecting their behavioral choices (e.g., smoking) and by affecting biological processes (e.g., cortisol levels) that affect risk and response to disease. Given the complexity of the interactions postulated by the biobehavioral model, to fully explore its implications for breast cancer it will be important to increase the number of researchers with the broad-based training that allows them to conduct truly interdisciplinary research addressing issues that transcend traditional disciplinary boundaries. Our Post-doctoral Training Program in Biobehavioral Breast Cancer Research was designed to provide trainees with advanced degrees in relevant areas (e.g., epidemiology, medicine, psychology, public health) with the necessary intellectual background needed to 'speak the language' of the multiple relevant disciplines and with the 'hands-on' experience under the tutelage of experienced mentors necessary to do interdisciplinary research and become independent investigators. Trainees have demonstrated proficiency in doing research and reporting results.
DTIC
Mammary Glands; Cancer; Education; Sim

20030112789 Northwestern Univ., Evanston, IL
The Role of PRIP in Breast Cancer
Zhu, Yijun; Reddy, Janardan K.; Badve, Sunil S.; Jul. 2003; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0355
Report No.(s): AD-A418213; No Copyright; Avail: CASI; A03, Hardcopy

Estrogen plays an important role in the normal breast and breast cancer development. Estrogens exert their cellular effects through ER that is a member of nuclear receptor superfamily. PRIP(Peroxisome proliferator receptor interacting protein) is a nuclear receptor coactivator that is amplified and overexpressed in breast cancer. The proposal was to investigate how the PRIP dysregulation contributes to abnormal growth and neoplastic development of breast. During the second year of the award, we disrupted PRIP gene in mice by homologous recombination. Mice nullizygous for PRIP died between embryonic day 11.5 and 12.5 (post coitum), indicating that PRIP like PBP, CBP, and p300 is an essential and nonredundant coactivator. We have created heterozygous mice with conditional inactivated PRIP gene which will finally help to reveal the function of this important coactivator in mammary gland. We found that PRIP overexpression occurs in about 60% and gene amplification occurs 10% of the breast cancers, suggesting that this coactivator plays an important role in the breast cancer development.
DTIC
Cancer; Mammary Glands; Estrogens; Abnormalities

20030112793 Boston Univ., Boston, MA
Living With Early Prostate Cancer: Decision and Outcomes
Clark, Jack A.; Aug. 2003; 40 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0026
Report No.(s): AD-A418215; No Copyright; Avail: CASI; A03, Hardcopy

To examine men's perceptions of life transitions associated with prostate cancer through an analysis of their narratives, obtained in-depth, qualitative interviews; compare men's narratives of perceived transitions with respect to quality of life outcome states, i.e., good vs. poor prostate cancer-related quality of life. Phase 1: interview participants in our quality of life survey of previously treated patients, stratified by quality of life. Phase 2: interview members of our prospective cohort who have completed 36-month follow-up, stratified by quality of life states and observed changes in urinary, bowel, and sexual function. Phase 3: prospectively interview patients with new diagnoses of early prostate cancer prior to treatment and 12 months later.
DTIC
Cancer; Urology; Diagnosis

20030112808 Northern California Inst. for Research and Education, San Francisco, CA
Magnetic Resonance and Spectroscopy of the Human Brain in Gulf War Illness
Weiner, Michael W.; Aug. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0764
Report No.(s): AD-A418261; No Copyright; Avail: CASI; A02, Hardcopy

The goal of this project is to test the hypotheses that: 1.) Subjects with GWI have reduced NAA in the basal ganglia and pons, which are not accounted for by confounds such as depression, post traumatic stress disorder, and alcoholism. 2.) Reduced NAA in basal ganglia and pons correlates with CNS signs and symptoms of GWI. Thus far we have mailed out a total of 505 letters describing our study. Dr Weiner appeared on several radio and TV programs, in response to our press release. Over 262 subjects have contacted us expressing interest in this study. Since we began enrolling subjects, we have largely met our goals of studying 2 subjects/week with the complete study battery which includes medical evaluation, neuropsychological testing, startle testing, MRI/MRS and the 'Haley Questionnaire.' Thus far, we have studied a total of 84 subjects. At this time, 22 of these subjects have met the criteria for GWI and 26 are controls, with 36 having an intermediate classification. We currently have 5 subjects scheduled for study for the remainder of the month. Although some preliminary data analysis has been performed, at the current time the sample size is much too small for any formal data analysis.
DTIC
Brain; Evoked Response (Psychophysiology); Neurology

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20030111866

Hangtian Yixue Yu Yixue Gongcheng) Volume 16, Number 1, February 2003

We, J. H.; Feb. 2003; 88 pp.; In Chinese

Report No.(s): PB2004-100912; No Copyright; Avail: CASI; A05, Hardcopy

Contents include the following: + Gz Protection of a New Bladder Anti-G System; Characteristics of Human Body Dynamic Responses to Landing Impact in Supine Position; Development and Application of Self-powered Short Arm Human Centrifuge; Differential Visual Attention Scales Directed by Location Versus Semantic Cue; Effects of + Gz Exposure Time on Memory and Behavior in Rats; Cardiovascular Effect of Positive Pressure Breathing using G-Suits with Different Bladder Coverage; Effects of Nutritional Intervention on Brain Functions and its Related Biochemical Indexes in Mice Exposed to High + Gy; Study on Mitochondrial Membrane Mechanism of Rat Heart Injury Induced by Constraining Stress; Effects of Microwave Irradiation on ATPase Activity and Voltage Dependent Ion Channel of Rat Hippocampus Cell Membrane; Blood Oxygen and Lactate Concentrations in Skeletal Muscles during Exercise; Analysis of Heat Transfer in Skin Tissues Subjected to Hot Water; The Linear Dimensions of Human Body Measurements of Chinese Male Pilots in Standing Posture; A Simulation Study on Cardiac Assist Device: Hemopump; Measurement and Analysis of Operation Performance of the 'Endocare' Cryoprobe System; Development of Data Acquisition Card in Exercise-ECG Detection System; Study on Increasing Bioactivity of Hydroxy-poly-calcium Sodium Phosphate Appatite Modified by Cold Plasma Technique; A Study on Visual Search and Selection of Pull-Down Menu; Effect on Extremely Low Frequency Magnetic Field on the Focal Brain Injury in Rats; and Encapsulated ANP cDNA Transfection Cells Attenuate Hypertension in Hypertensive Rats.

NTIS

Aerospace Medicine; Medical Equipment

20030112047 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA

SEEDling Grant to Establish Pilot Data for a Consortium on Magnetic Nanoparticle Assemblies: A New Tool for Drug Delivery, Sensors and Electronic Devices

Riffle, Judy S.; Claus, Richard O.; Hafeli, Urs; Oct. 2003; 12 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0407

Report No.(s): AD-A417938; Rept-4-30917; AFRL-SR-AR-TR-03-0450; No Copyright; Avail: CASI; A03, Hardcopy

This project has entailed the development of magnetic materials with potential suitability as vehicles for magnetic field-directed drug delivery, and the design and implementation of a laboratory-scale instrument for measuring the magnetophoretic behavior of new materials in flowing media. Triblock copolymers comprised of hydrophilic poly(ethylene oxide) tail blocks and a polyurethane anchor block containing carboxylic acid binding groups were designed and synthesized. A method for preparing stabilized dispersions of magnetite nanoparticles coated with the stabilizers was developed, and these coated nanoparticles could be dispersed in water. Dispersions of the particle-copolymer complexes remained stable (did not separate) when these materials were dialyzed rigorously and subjected to repeated centrifugation steps to eliminate potentially toxic extractables. An in-vitro assay of toxicity was developed to assess cell survival in the presence of the magnetite nanoparticle-copolymer complexes. A first generation magnet system was designed in collaboration with our colleagues at Stereotaxis (St. Louis, MO). This research scale magnetic guidance system is now in place at VA Tech.

DTIC

Magnetic Materials; Tools; In Vitro Methods and Tests; Drugs

20030112799 Naval Postgraduate School, Monterey, CA

Alternative Audio Solution to Enhance Immersion in Deployable Synthetic Environments

Mosbruger, Michael C.; Sep. 2003; 191 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418234; No Copyright; Avail: CASI; A09, Hardcopy

The purpose behind this thesis was to examine the effect of vibro-tactile feedback on a user 5 degree of immersion in a synthetic environment. Sub-woofers usually provide the vibro-tactile feedback in surround sound systems. The alternate method explored in this thesis utilized a 'seat shaker' to generate the appropriate tactile feedback in the environment. The solution theoretically enables the user to receive a compelling, multi-modal presentation of the environment with deployable

(small footprint), unobtrusive equipment. Physiological responses (electrodermal activity, heart rate, and temperature) were measured in an attempt to determine if there was a statistically significant difference between a user 5 degree of immersion and emotional response in a 5.2 surround sound environment versus one with stereo headphones and a seat shaker.
DTIC
Physiological Effects; Audio Data; Physiological Responses; Submerging; Activity (Biology)

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20030111949
Test Results of Phase 3 Level A Suits to Challenge by Chemical and Biological Warfare Agent and Simulants: Executive Summary
Lindsay, Robert S.; Pappas, Alex G.; Aug. 2003; 15 pp.; In English
Report No.(s): AD-A417811; ECBC-TR-312; No Copyright; Avail: CASI; A03, Hardcopy

Swatches from four commercially available Level A protective suits were challenged with liquid droplets of sarin (GB) and mustard (HD) using modifications of the static diffusion procedure described in TOP 8-2-501. The cumulative mass of each agent that permeated each swatch was determined over time, and the results for all swatches were used to determine a weighted-average cumulative mass for each suit. From these data, a physiologically-derived breakthrough time was calculated for each suit for the purposes of comparison. In addition, intact suits were challenged with corn-oil aerosol to simulate a biological or chemical aerosol. Protection factors were determined for each suit.
DTIC
Biological Weapons; Chemical Warfare; Protective Clothing

20030112585
Machine Detection of Operationally Significant Cognitive Events for C4ISR
Lankford, Christopher P.; Jun. 22, 2003; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAH01-03-RO58
Report No.(s): AD-A418055; TR-ECROOO2Z; No Copyright; Avail: CASI; A03, Hardcopy

A machine capable of detecting cognitively significant events in its user could prevent potential disaster by signaling to commanders that a soldier is under high stress. This project seeks to establish that these cognitive events can be captured in an autonomous fashion through the use of an eye-tracking system. The experiment in this study requires subjects to find a particular person hidden in a sequence of complex images that contain crowded scenes of different people performing different activities. Project tasks included creating the test stimulus, running test subjects, and analyzing the captured data. This analysis indicates that a pupil dilation increase during a period of prolonged fixation occurs when the test subject finds the target person in the stimulus. Additional testing is necessary to validate this finding in a more realistic setting, but this study represents a preliminary step in developing a machine capable of autonomously detecting cognitive events.
DTIC
Autonomy; Man Machine Systems

20030112634 Army Research Lab., Aberdeen Proving Ground, MD
Physiological Evaluation of First Responder Mask
Weiss, Ronald A.; Pasternak-Silva, Judith; Sep. 2003; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417998; ARL-TR-3060; No Copyright; Avail: CASI; A03, Hardcopy

The First Responder Mask (FIRM) was developed for domestic preparedness/ counterterrorism personnel (e.g., firefighters, police, medical support, search and rescue, security, investigators) to provide at least 12 hr of continuous protection against chemical/biological exposure when a terrorist incident or chemical emergency required their participation. It is a powered air- purifying respirator with adjustable hood, nosecup, and one-size-fits-all neck dam configuration. This physiological evaluation of the FIRM tested its suitability for human use prior to submission to the National Institute for Occupational Safety and Health for certification. The mask provided adequate filtered ventilation for sustained heavy workloads. Oxygen and carbon dioxide concentration within the FIRM remained at or near ambient levels during rest and exercise with the blower on. With blower off or loose nosecup, the oxygen concentration fell to 20.2% and carbon dioxide rose

an average of 0.29% over the 20- min test period. This would allow ample time for anyone in a contaminated area to reach safety when a blower fails or the battery is discharged. Visual acuity, color acuity, depth perception, field of view, and contrast sensitivity wearing the mask were essentially the same as the unmasked control values in the same subject. A commercial soda/water bottle can be connected to the FIRM's drink tube fitting.
DTIC
Respirators; Masks

20030112662 Northeastern Univ., Boston, MA
Quantitative Characterization of Pulmonary Pressure-Volume Curve for Improved Care of Acute Lung Injury
Narusawa, Uichiro; Sep. 2003; 153 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0195
Report No.(s): AD-A418013; No Copyright; Avail: CASI; A08, Hardcopy

Based on the analyses of over seventy existing pressure- volume (pV) curves, continuous (tangent-hyperbolic or error function) pV model equations are confirmed to represent clinical pV curves accurately and also quantify differences and similarities among various p-V data sets effectively. A mechanistic model of the total respiratory system (TRS) is constructed, based on the principle of statistical mechanics applied to TRS as an ensemble of a large number of elements, each consisting of a piston-spring subsystem. The mechanistic model of the inflation process relates characteristics of the p-V model equation to the internal respiratory conditions such as an extent to which alveoli are recruited and the wall tissues are distended as pressure is increased. The model also computationally simulates an ideal deflation process, in which the volume decrease is solely due to the tissue contraction with the differences between a measured deflation curve and the corresponding ideal deflation curve representing the effects of airway closure and collapse on the deflation process.
DTIC
Respiratory System; Lungs; Hyperbolic Functions

20030112764 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD, USA
Test Results of Phase 3 Level A Suits to Challenge by Chemical and Biological Warfare Agents and Simulants
Lindsay, Robert S.; Procell, Suzanne A.; Baldauf, Frederick C.; Pappas, Alex G.; Aug. 2003; 50 pp.; In English
Report No.(s): AD-A417822; ECBC-TR-301; No Copyright; Avail: CASI; A03, Hardcopy

Swatches from four commercially-available Level A protective suits were challenged with liquid droplets of sarin ((GB) and mustard (HD) using modifications of the static diffusion procedure described in TOP 8-2-501. The cumulative mass of each agent that permeated each swatch was determined over time, and the results for all swatches were used to determine a weighted-average cumulative mass for each suit. From these data, a physiologically-derived breakthrough time was calculated for each suit for the purposes of comparison. In addition, intact suits were challenged with corn-oil aerosol to simulate biological and chemical aerosols. Protection factors were determined for each suit.
DTIC
Biological Effects; Biological Weapons; Chemical Warfare; Protection

55
EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20030110613 Universita degli Studi G. D'Annunzio, Chieti, Italy
Europa: Chaos Terrains Formation and Its Exobiological Potential
Glamoclija, M.; Mitri, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Processes and conditions of Europa's crust support assumptions about habitability of this icy satellite. A combined ice/liquid water shell approx. 80-170 km thick is indicated by Galileo space craft gravity measurements, this ice shell has undergone through geological resurfacing in a time period of approx. 10 million of years. Different models predict tidal heating strong enough to maintain a global subsurface ocean of liquid water and geothermal activity sufficient to cause regional melting of icy lithosphere. Features like chaotic terrains might be formed by this kind of processes, which will involve mixing of subsurface liquid water with ice material from surface. With cover of 40% of Europa's surface, obvious mixing of

water and ice and past presence of thermal activity, the chaotic terrains present area where we should look for habitable zones of Europa.
Author
Europa; Terrain; Extraterrestrial Life; Exobiology; Extraterrestrial Environments; Satellite Surfaces; Terrain Analysis

20030110733 ExxonMobil Production Co., Houston, CO, USA
Siliceous Shrubs in Yellowstone's Hot Springs: Implications for Exobiological Investigations
Guidry, S. A.; Chafetz, H. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): GSA-6239-98; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Potential relict hot springs have been identified on Mars and, using the Earth as an analog, Martian hot springs are postulated to be an optimal locality for recognizing preserved evidence of extraterrestrial life. Distinctive organic and inorganic biomarkers are necessary to recognize preserved evidence of life in terrestrial and extraterrestrial hot spring accumulations. Hot springs in Yellowstone National Park, Wyoming, U.S.A., contain a wealth of information about primitive microbial life and associated biosignatures that may be useful for future exobiological investigations. Numerous siliceous hot springs in Yellowstone contain abundant, centimeter-scale, spinose precipitates of opaline silica (opal-A). Although areally extensive in siliceous hot spring discharge channel facies, these spinose forms have largely escaped attention. These precipitates referred to as shrubs, consist of porous aggregates of spinose opaline silica that superficially resemble miniature woody plants, i.e., the term shrubs. Shrubs in carbonate precipitating systems have received considerable attention, and represent naturally occurring biotically induced precipitates. As such, shrubs have great potential as hot spring environmental indicators and, more importantly, proxies for pre-existing microbial life.
Author
Yellowstone National Park (ID-MT-WY); Extraterrestrial Life; Microorganisms; Springs (Water)

20030110974 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
High-Resolution Electrospray Ionization/Ion Mobility Spectrometer for Detection of Abiotic Amino Acids
Beegle, L. W.; Terrell, C. A.; Kim, H.; Kanik, I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the primary goals of the current NASA thrust in Astrobiology is the detection and identification of organic molecules as part of an in-situ lander platform on the surface of Mars or Europa. The identification of these molecules should help determine whether indigenous organisms exist on the surface of Mars or in an undersea environment on Europa. In addition, a detailed organic chemical inventory of surface and near surface molecules will help elucidate the possibilities of life elsewhere in the Universe. Terrestrial life has, as its backbone, the family of molecules known as the amino acids (AA), and while AA can be found in the terrestrial environments as part of more complex molecules, such as peptides, and proteins, they also exist as individual molecules due to of the hydrolyses of biopolymers. In terrestrial biochemistry, there are 20 principal amino acids which are necessary for life. However, some forms of these molecules can be found in nature synthesized via abiotic process. For example, they are known to exist extraterrestrially as a component of carbonaceous meteorites. The idea that amino acids are readily created by abiotic means has been demonstrated by their positive identification in the Murchison CM2 meteorite, which fell in 1969. This meteorite was analyzed before contamination by terrestrial microbes could result. Three laboratories individually tested parts of the meteorite and concluded that the amino acids present in them were indigenous to the meteorite because, among other reasons, they had equal L- and D- enantiomers. Final identification of the constituents of the Murchison included 33 amino acids which have no known biotic source, 11 amino acids which have limited distribution and 8 (Glycine, Alanine, Valine, Proline, Leucine, Isoleucine, Aspartic Acid, and Glutamic Acid), which readily occur in terrestrial proteins.
Derived from text
Amino Acids; Ion Mobility Spectroscopy; Drift Rate; Extraterrestrial Life; Proteins

20030111040 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Chiral Determination of Amino Acids Using X-Ray Diffraction of Thin Films
Dragoi, D.; Kulleck, J.; Kanik, I.; Beegle, L. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The astrobiological search for life, both extinct and extant, on other solar system bodies will take place via several planned lander missions to Mars Europa and Titan. The detection and identification of organic molecules that have been associated with life is a major technical challenge. Terrestrial life utilizes organic molecules, such as amino acids, as its basic building block. Amino acids can be synthesized by natural processes as is demonstrated by their detection in meteoritic material. In this process, the organic molecules are produced roughly in a even mixture of D and L forms. Biological process, however, can utilize almost uniquely one form or the other. In terrestrial biology, only the L-amino acids is common in biological processes. If signature of life existed elsewhere in the D form it then be concluded that life had evolutionary beginning on that body. Detection of an enantiomeric excess of L over D would also be a powerful sign that life had existed on that body at one time. Derived from text

Chirality; Detection; Amino Acids; Exobiology

20030111537 Hungarian Astronomical Association, Budapest, Hungary

The Astrobiology Matrix and the 'Drake Matrix' in Education

Mizser, A.; Kereszturi, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We organized astrobiology lectures in the Eotvos Lorand University of Sciences and the Polaris Observatory in 2002. We present here the 'Drake matrix' for the comparison of the astrobiological potential of different bodies [1], and astrobiology matrix for the visualization of the interdisciplinary connections between different fields of astrobiology. Conclusion: In Hungary it is difficult to integrate astrobiology in the education system but the great advantage is that it can connect different scientific fields and improve the view of students. We would like to get in contact with persons and organizations who already have experience in the education of astrobiology.

Derived from text

Exobiology; Observatories; Education

20030111625 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Determining D/L Ratios of Amino Acids Found in Ice Above Lake Vostok Using ESI/CIT Mass Spectroscopy

Tsapin, A.; Kanik, I.; Beegle, L. W.; Wu, L.; Cooks, R. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Astrobiology is an area where longevity of (micro) organisms is of great interest. Cryospheres are common phenomena in the solar system, particularly on satellites, comets and asteroids, as well as at least some of the planets. Recent data from the Mars Global Surveyor mission suggest the possibility of permafrost or perhaps even liquid water under the Martian surface [2]. These environments may be the areas in which the probability of finding life is the highest. This issue is of concern due to the probable evolution of planetary environments such as that of Mars from more hospitable to less hospitable conditions over the history of the solar system. In addition, evaluation of the possible transfer of living organisms between planets via impact ejecta [3] is dependent on knowledge of the maximum time periods over which microorganisms can remain dormant and subsequently revive and reproduce.Amino acid racemization dating, or aminostratigraphy, has been used for many years to date biological systems, and has been examined as a possible biosignature detection technique for Mars. We have suggested using amino acid racemization as one of the most indicative biosignatures [4]. Only life systems produce preferential synthesis of L-amino acids versus D-amino acids. Almost all amino acids in terrestrial organisms can be found only in the L-enantiomeric form.We studied the level of amino acid racemization, specifically of aspartic acid, in permafrost samples from eastern Siberia. Also we analyzed samples of ice from borehole drilled to lake Vostok, Antarctica.

Derived from text

Siberia; Permafrost; Exobiology; Amino Acids

20030111770 NASA Marshall Space Flight Center, Huntsville, AL, USA

Comparative Results of Using Different Methods for Discovery of Microorganisms in very Ancient Layers of the Central Antarctic Glacier above the Lake Vostok

Abyzov, S. S.; Hoover, R. B.; Imura, S.; Mitskevich, I. N.; Naganuma, T.; Poglazova, M. N.; Ivanov, M. V.; [2002]; 2 pp.; In English; 34th COSPAR Scientific Assembly, the Second World Space Congress Committee on Space Research, 10-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Other Sources; Abstract Only

The ice sheet of the Central Antarctic is considered by the scientific community worldwide, as a model to elaborate on different methods to search for life outside Earth. This became especially significant in connection with the discovery of the

underglacial lake in the vicinity of the Russian Antarctic Station Vostok. Lake Vostok is considered by many scientists as an analog of the ice covered seas of Jupiter's satellite Europa. According to the opinion of many researchers there is the possibility that relict forms of microorganisms, well preserved since the Ice Age, may be present in this lake. Investigations throughout the thickness of the ice sheet above Lake Vostok show the presence of microorganisms belonging to different well-known taxonomic groups, even in the very ancient horizons near close to floor of the glacier. Different methods were used to search for microorganisms that are rarely found in the deep ancient layers of an ice sheet. The method of aseptic sampling from the ice cores and the results of controlled sterile conditions in all stages when conducting these investigations, are described in detail in previous reports. Primary investigations tried the usual methods of sowing samples onto different nutrient media, and the result was that only a few microorganisms grew on the media used. The possibility of isolating the organisms obtained for further investigations, by using modern methods including DNA-analysis, appears to be the preferred method. Further investigations of the very ancient layers of the ice sheet by radioisotopic, luminescence, and scanning electron microscopy methods at different modifications, revealed the quantity and morphological diversity of the cells of microorganisms that were distributed on the different horizons. Investigations over many years have shown that the microflora in the very ancient strata of the Antarctic ice cover, nearest to the bedrock, support the effectiveness of using a combination of different methods to search for signs of life in ancient icy formations, which might play a role in the long-term preservation and transportation of microbial life throughout the Universe.
Author
Antarctic Regions; Glaciers; Microorganisms; Exobiology; Extraterrestrial Life; Analogs; Lakes

20030111834 NASA Ames Research Center, Moffett Field, CA, USA
Research in Computational Astrobiology
Chaban, Galina; Colombano, Silvano; Scargle, Jeff; New, Michael H.; Pohorille, Andrew; Wilson, Michael A.; [2003]; 51 pp.; In English
Contract(s)/Grant(s): NCC2-5509; No Copyright; Avail: CASI; A04, Hardcopy
We report on several projects in the field of computational astrobiology, which is devoted to advancing our understanding of the origin, evolution and distribution of life in the Universe using theoretical and computational tools. Research projects included modifying existing computer simulation codes to use efficient, multiple time step algorithms, statistical methods for analysis of astrophysical data via optimal partitioning methods, electronic structure calculations on water-nuclei acid complexes, incorporation of structural information into genomic sequence analysis methods and calculations of shock-induced formation of polycylic aromatic hydrocarbon compounds.
Author
Exobiology; Computation; Computer Programs; Statistical Analysis; Research

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20030111816 NASA Ames Research Center, Moffett Field, CA, USA
Job Superscheduler Architecture and Performance in Computational Grid Environments
Shan, Hongzhang; Oliker, Leonid; Biswas, Rupak; July 1, 2003; 15 pp.; In English; SC2003, 15-21 Nov. 2003, Phoenix, AZ, USA
Contract(s)/Grant(s): DE-AC03-76SF-00098; RTOP 704-44-54; No Copyright; Avail: CASI; A03, Hardcopy
Computational grids hold great promise in utilizing geographically separated heterogeneous resources to solve large-scale complex scientific problems. However, a number of major technical hurdles, including distributed resource management and effective job scheduling, stand in the way of realizing these gains. In this paper, we propose a novel grid superscheduler architecture and three distributed job migration algorithms. We also model the critical interaction between the superscheduler and autonomous local schedulers. Extensive performance comparisons with ideal, central, and local schemes using real workloads from leading computational centers are conducted in a simulation environment. Additionally, synthetic workloads are used to perform a detailed sensitivity analysis of our superscheduler. Several key metrics demonstrate that substantial performance gains can be achieved via smart superscheduling in distributed computational grids.
Author
Computational Grids; Resources Management; Human Performance; Workloads (Psychophysiology); Scheduling

20030111873 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Galois Action on the Torsor of Homotopy Classes of Paths on a Projective Line Minus a Finite Number of Points
Wojtkowiak, Z.; 2002; 18 pp.
Report No.(s): PB2004-100906; IHES/M/02/29; No Copyright; Avail: CASI; A03, Hardcopy
The plan of the paper: Introduction; Torsors of paths; Lie algebras of actions of Galois groups on torsors; Examples.
NTIS
Homotopy Theory; Lie Groups

20030111879 Royal Inst. of Tech., Stockholm, Sweden
Prologations and Cyclic Vectors
Ross, W. T.; Shapiro, H. S.; Feb. 2003; 34 pp.
Report No.(s): PB2004-100921; TRITA-MAT-03-MA-05; No Copyright; Avail: CASI; A03, Hardcopy
In this paper we continue and refine a discussion begun concerning the continuation properties of the non-cyclic vectors for the backward shift operator Bf=f-f(o)/z on a general Banach space X contained in Hol(D), the analytic functions on the open unit disk D: =<z in. C:/z/< 1>. Here we say fEX is cyclic if /f/:=VB (sup n) f: n=0,1,2>=X (V denotes the closed linear span).
NTIS
Banach Space; Vectors (Mathematics)

20030111881 Royal Inst. of Tech., Stockholm, Sweden
Notes on Algebraic-Geometric Codes
Giulietti, M.; May 2003; 36 pp.
Report No.(s): PB2004-100925; TRITA-MAT-03-MA-11; No Copyright; Avail: CASI; A03, Hardcopy
Ideas from algebraic geometry became useful in coding theory after Goppa's construction. He had the beautiful idea of associating to a curve X defined over F (sub g) the finite field with q elements, a code C. This code, called Algebraic-Geometric (AG) code, is constructed from two divisors D and G on X, where one of them, say D, is the sum of n distinct F (sub q)-rational points of X. It turns out that the minimum distance d of C satisfies d is greater than or equal to n-deg. (G). These notes are based on a series of lectures given in May 2003 at the Mathematical Department of KTH in Stockholm. Contents: (1) Linear codes; (2) Reed-Solomon codes; (3) Algebraic curves; (4) Algebraic-Geometric codes; (5) Bounds on linear codes; (6) One-point AG codes; and (7) MDS codes and Almost MDS codes.
NTIS
Algebra; Geometry

20030111882 Royal Inst. of Tech., Stockholm, Sweden
Ullemar's Formula for Jacobian Complex Moments Mapping
Kuznetsova, O.; Tkachev, V.; May 2003; 24 pp.
Report No.(s): PB2004-100926; TRITA-MAT-2003-10; No Copyright; Avail: CASI; A03, Hardcopy
The authors establish the explicit formula of the Jacobian of the complex moments mapping that was being previously conjectured by C. Ullemar. The authors also give alternative representations of the Jacobian in terms of the derivative's roots and resultants. As a corollary the authors show that the boundary of the class of all locally univalent polynomials in the unit disk is contained in the union of three irreducible algebraic surfaces.
NTIS
Polynomials; Functions

20030111883 Royal Inst. of Tech., Stockholm, Sweden
Faces Problem for Perfect Codes
Heden, O.; Feb. 2003; 18 pp.
Report No.(s): PB2004-100927; TRITA-MAT-03-MA-03; No Copyright; Avail: CASI; A03, Hardcopy
No abstract available
Binary Codes; Algebra

20030111890 Rutherford Appleton Lab., Oxford, UK, Air Force Office of Scientific Research, Bolling AFB, Washington, DC, USA

Convergence of Successive Linear Programming Algorithms

Byrd, R. H.; Gould, N. I. M.; Nocedal, J.; Waltz, R. A.; Apr. 29, 2003; 20 pp.; In English

Report No.(s): PB2004-101062; RAL-TR-2003-013; No Copyright; Avail: CASI; A03, Hardcopy

An analysis is made of the global convergence properties of a class of penalty methods for nonlinear programming. These methods include successive linear programming approaches, and more specifically the SLP-EQP approach. Every iteration requires the solution of two trust region subproblems involving linear and quadratic models, respectively. The interaction between the trust regions of these subproblems requires careful consideration. It is shown under mild assumptions that there exist an accumulation point which is a critical point foe the penalty function.

NTIS

Convergence; Nonlinear Programming; Algorithms

20030111893 Rutherford Appleton Lab., Oxford

Class of Incomplete Orthogonal Factorization Methods, 2, Implementation and Results

Papadopoulos, A. T.; Duff, I. S.; Wathen, A. J.; May 29, 2002; In English

Report No.(s): PB2004-101091; RAL-TR-2002-019; No Copyright; Avail: National Technical Information Service (NTIS)

The authors present, implement and test several incomplete orthogonal factorization methods based on Givens rotations for large sparse unsymmetric square and rectangular matrices. The methods are applied to a variety of square systems and their performance as preconditioners is tested against standard incomplete LU factorization techniques. For rectangular matrices corresponding to least-squares problems, the resulting incomplete factorizations are applied as preconditioners for conjugate for the system of normal equations. A comprehensive discussion about the uses, advantages and shortcomings of these preconditioners is givens.

NTIS

Factorization; Linear Equations

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20030111922 Naval Postgraduate School, Monterey, CA

A FORCEnet Framework for Analysis of Existing Naval C4I Architectures

Roche, Patrick G.; Jun. 2003; 129 pp.; In English; Original contains color illustrations

Report No.(s): AD-A417558; No Copyright; Avail: CASI; A07, Hardcopy

This thesis explores the definition of FORCEnet, determines what degree of consensus exists about its concepts and evaluates the Joint Fires Network against FORCEnet principles. The military has been moving toward network based information operations, but struggles to stay current with information technology (IT). IT and knowledge management are not mature disciplines. The services struggle to choose durable standards, processes and systems, and field them across a vast enterprise quickly. Additionally, complex acquisition and configuration processes are incapable of producing interoperable networks on the timescale of IT growth. Though the services and agencies have fielded capable systems in the past, they become legacy if a newer standard is adopted that disenfranchises them. Organizational transformation is required to support flexibility in the Department of Defense. Sea Power 21 is a comprehensive attempt to address the implications of the IT revolution. The legs of the vision are Sea Basing, Sea Shield and Sea Strike. The enabler is FORCEnet, 'the operational construct and architectural framework of naval warfare in the information age that integrates Warriors, sensors, networks, command and control, platforms, and weapons into a networked, distributed combat force that is scalable across all levels of conflict from seabed to space and sea to land.

DTIC

Architecture (Computers); Information Systems; Durability

20030112104 NASA Marshall Space Flight Center, Huntsville, AL, USA

Pore Formation and Mobility Investigation (PFMI): Concept, Hardware Development, and Initial Analysis of Experiments Conducted Aboard the International Space Station

Grugel, Richard N.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Porosity in the form of 'bubbles and pipes' can occur during controlled directional solidification processing of metal alloys. This is a consequence that 1) precludes obtaining any meaningful scientific results and 2) is detrimental to desired material properties. Unfortunately, several Microgravity experiments have been compromised by porosity. The intent of the PFMl investigation is to conduct a systematic effort directed towards understanding porosity formation and mobility during controlled directional solidification (DS) in a microgravity environment. PFMl uses a pure transparent material, succinonitrile (SCN), as well as SCN 'alloyed' with water, in conjunction with a translating temperature gradient stage so that direct observation and recording of pore generation and mobility can be made. PFMl is investigating the role of thermocapillary forces and temperature gradients in affecting bubble dynamics as well as other solidification processes in a microgravity environment. This presentation will cover the concept, hardware development, operations, and the initial results from experiments conducted aboard the International Space Station.

Author

Porosity; Experimentation; Directional Solidification (Crystals); Computers

20030112739 Naval Postgraduate School, Monterey, CA

The Feasibility of Web-Enabled Digitized Video in a Learning Environment

Westmoreland, Lanier A.; Sep. 2003; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418312; No Copyright; Avail: CASI; A04, Hardcopy

Traditional methods of instruction limit a person's ability to gain required knowledge, yet many advanced technologies are not used. The potential is unlimited when digitally videotaping a course. Streamlining video over the Internet (wireless or hardwire), Digital Versatile Disc (DVD), Video Home System (VHS), and other modes of multi-media delivery, many of which are accomplished with little or no coordination, may be the wave of future. The technology and flexibility provided by digitizing a course may be extremely beneficial and cost effective. In addition, if educators use methods of network, customer relations, and knowledge management to implement and to maintain processes, operations tend to run smoothly from start to finish. Essentially, digitally videotaping a course makes it possible to disseminate lessons to facilities by accessing the Internet, and providing that data to organizations with computer hardware and software, or simply store that data for future use. Adopting this method enables the product to be created efficiently and expeditiously. Whether at a university, a government installation, a civilian organization, or on a ship, by employing the hardware and software to show digitized video, educators can disseminate courses to enhance the learning process in a timely and fairly inexpensive manner.

DTIC

Digital Television; Education

20030112757 Naval Postgraduate School, Monterey, CA

Network-Based Control, Monitoring and Calibration of Shipboard Sensors

DA Silva, Eusebio P.; Sep. 2003; 83 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418289; No Copyright; Avail: CASI; A05, Hardcopy

The objective of this thesis is to develop a new calibration system for analog and smart digital pressure sensors, operable by only one person, and capable of calibrating local and remote sensors connected via RS232 cables, Bluetooth or an 802.11b wireless LAN. It is proposed that the operator uses a portable calibration standard and a tablet PC to conduct the sensor calibration. In order to handle local sensors directly connected to the tablet PC and remote sensors connected to the tablet PC via a network capable application- processor (NCAP), a dual module application is proposed and developed using LabVIEW. The application has a Master Module and a Slave Module. Both modules are able to connect to multiple digital sensors at the same time. The Master Module was designed to run on the operator's tablet PC offering an easy-to-use graphical user interface (GUI) that allows the monitoring or calibration of any connected sensors. The Slave Module was designed to run on any networked PC, including the operator's tablet and an NCAP. A dedicated Virtual Instrument (VI) was designed for an iterative calibration process based on a least squares fitting method. This VI automatically computes the calibration constants that minimize the measurements errors, and writes the calibration constants to the sensor's RAM or EEPROM,

DTIC

Calibrating; Detectors; Remote Sensors; Ships

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20030110780 Arizona State Univ., Tempe, AZ, USA
2001 Mars Odyssey THEMIS Data Archive
Murray, K. C.; Christensen, P. R.; Mehall, G. L.; Gorelick, N. S.; Harris, J. C.; Bender, K. C.; Cherednik, L. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Thermal Emission Imaging System (THEMIS) onboard the 2001 Mars Odyssey Orbiter began its Primary Mapping Mission in February, 2002; public access to the THEMIS standard data archive began in October, 2002. The archive includes the raw, calibrated, and derived images generated from the infrared and visible observations. THEMIS standard data products are generated by the staff at the Arizona State University Mars Space Flight Facility, and are available at the Planetary Data System (PDS) and ASU-THEMIS internet sites.
Author
2001 Mars Odyssey; Imaging Techniques; Data Processing

20030110916 Cornell Univ., Ithaca, NY, USA
'Curious About Astronomy?': Cornell University's Ask an Astronomer Website
Carruba, V.; Carter, L. M.; Cuk, M.; Jackson, M. A.; Jordan, C. E.; Krco, M.; Masters, K. L.; Pandian, J. D.; Rothstein, D. M.; Saintonge, A., et al.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

'Curious About Astronomy? Ask an Astronomer' is a website (http://curious.astro.cornell.edu) run by graduate and undergraduate student volunteers at Cornell University. Questions from the general public, submitted either by email or using a convenient web form, are answered by members of the Curious Team, and particularly interesting questions are posted on the website for visitors to browse. We receive and answer a few hundred questions each month from people of diverse backgrounds, including K12 and post-secondary students and instructors, amateur astronomers, parents, scientists in various fields and others around the world with an interest in astronomy. We have recently upgraded the website, creating 22 different sections about specific topics in astronomy, a searchable index of hundreds of cross-listed questions and a page of suggestions and guidelines for teachers. The Curious Page has already become a source of useful information for the public. Questions and answers about the so-called 'Moon Hoax' and a recent news article about the Sun going supernova have received thousands of hits. By offering individual responses about any aspect of astronomy to anyone who has Internet access and by continually updating our archive of answered questions, we hope to provide a unique, growing astronomy resource for students, educators and the general public-as well as a valuable opportunity for the Curious Team to participate in educational outreach and improve its communication skills in a setting that requires no formal budget or faculty supervision.
Derived from text
Education; Electronic Mail; Websites; Supernovae; Astronomy

20030111137 Geological Survey, Flagstaff, AZ, USA
PIGWAD: Continuing to Offer GIS Services to the Planetary Community
Hare, T. M.; Tanaka, K. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Planetary Interactive GIS on the Web Analyzable Database, or PIGWAD, has been online for nearly five years. During this period, GIS web technologies have evolved at a furious pace and will continue to do so. For our on-line GIS mapping sites, we will continue to use the technology called ArcIMS, by Environmental Systems Research Institute (ESRI). We have also just implemented a Java front-end called Maplicity, by Telemorphic. This abstract will focus on our current progress, new changes we will implement this year, and ideas for future functionality (see [1] to compare the status of PIGWAD one year ago).
Author
On-Line Systems; Planetary Geology

20030111633 Osaka Prefecture Univ., Sakai, Japan
Marsv for Plan 9
Okamoto, Kenji; Suzuki, Yoshitatsu; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

After GUI was spread, we have to deal with huge sized programs written for investigation of planetary data. There are many commercial based utilities to make those smaller such that GUI libraries or more abstracted forms as language based IDL etc.. Those utilities are, unfortunately, suffered from very often updates, which makes us annoying sometime. We searched many operating systems and found Plan 9 from Bell Labs, which was newly designed from scratch with the aim of replacing Unix in a future, and has a very compact graphics system. Plan 9 is now open to researchers without fee. Based on that Plan 9 OS, we expected to make a smaller sized and well featured GUI program for our investigation of Mars MOLA and image data, and got such with total C source codes of about 10,300 lines. We call the program as marsv. Marsv has no icon, and only has top menu bar where some menus are shown as their default values. Each menu item has a list of other similar menu items behind it, which is shown by mouse button3. Mouse button2 executes the item shown in the menu bar, etc, which is similar to pulldown menu of X, but not same. Marsv displays each window as a stratified and tiled window. The size of individual window can be changed by mouse at anytime and anywhere as if it has window manager like such in X.
Derived from text
Graphical User Interface; Unix (Operating System); Display Devices

20030111709 Starline Software Ltd., Oakton, VA, USA
Investigating Investigation Methodologies
Benner, Ludwig, Jr.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 209-220; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

Recent years have seen an increase in the number of investigation methodologies. For example, today investigators can choose among investigation methodologies like ICAO, ISIM. MES, Root Cause Analysis, Tripod-Beta, or TOR, to name a few. How do investigations and work products produced with these investigation methodologies compare? Several investigators have reported comparisons of investigation methodologies but criteria for comparison, developed in different ways, have been inconsistent, leaving the question of their comparative merits unresolved. This paper is a progress report of an inquiry to develop a comparison based on a desktop simulation of an investigation with one methodology using data from a published accident report prepared with another methodology. The work is disclosing substantial differences attributable to methodologies.
Author
Accident Investigation; Computerized Simulation

20030111712 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
JLab Web Based Tracking System for Integrated Incident, Accident, Inspection, and Assessments
Prior, S.; Lawrence, R.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 143-151; In English; See also 20030111704
Contract(s)/Grant(s): DE-AC05-84ER-40150; No Copyright; Avail: CASI; A02, Hardcopy

The Thomas Jefferson National Accelerator Facility, or JLab, is a Department of Energy particle accelerator used to conduct fundamental physics research. In such a facility there are numerous statutory, regulatory, contractual, and best practice requirements for managing and analyzing environmental health and safety (EH&S) related data. A tracking system has been developed at JLab that meets the needs of all levels of the organization, from the front line worker to the most senior management. This paper describes the system implementation and performance to date.
Author
World Wide Web; Accidents; Health Physics; Tracking Networks; Software Engineering

20030111717 Virginia Univ., Charlottesville, VA, USA
On Classification in the Study of Failure, and a Challenge to Classifiers
Wasson, Kimberly S.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 69-78; In English; See also 20030111704
Contract(s)/Grant(s): NAG1-2290; NAG1-02103; NSF CCR-02-05447; No Copyright; Avail: CASI; A02, Hardcopy

Classification schemes are abundant in the literature of failure. They serve a number of purposes, some more successfully than others. We examine several classification schemes constructed for various purposes relating to failure and its

investigation, and discuss their values and limits. The analysis results in a continuum of uses for classification schemes, that suggests that the value of certain properties of these schemes is dependent on the goals a classification is designed to forward. The contrast in the value of different properties for different uses highlights a particular shortcoming: we argue that while humans are good at developing one kind of scheme: dynamic, flexible classifications used for exploratory purposes, we are not so good at developing another: static, rigid classifications used to trap and organize data for specific analytic goals. Our lack of strong foundation in developing valid instantiations of the latter impedes progress toward a number of investigative goals. This shortcoming and its consequences pose a challenge to researchers in the study of failure: to develop new methods for constructing and validating static classification schemes of demonstrable value in promoting the goals of investigations. We note current productive activity in this area, and outline foundations for more.
CASI
Classifications; Accident Investigation; Failure Analysis; Classifiers

20030111720 Monash Univ., Clayton, Australia
ATTEST: an Automated-Test-Tool Evaluation and Selection Technology
Rowley, Daniel; Ramakrishnan, Sita; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 129-141; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

A significant part of software testing process improvement effort pertains to defect prevention, software testing technology change management and software testing process change management. ATTEST is an automated-test-tool evaluation and selection technology developed by the School of Computer Science & Software Engineering (CSSE) at Monash University in Australia to help SMEs (small- to medium-sized enterprises) improve their management of software testing technology change. Although ATTEST has software-process-improvement-oriented application, it can also be used to help forensic software engineers more easily identify candidate equipment for software-intensive incident and accident investigations. The problem with traditional automated-test-tool (or more generally, computer-aided software engineering (CASE) tools) evaluation and selection techniques is that they provide limited visibility/measurement into the selection (acquisition and/or equipping) of automated-test-tools (or CASE tools). In forensic investigations of software-intensive accidents and incidents, it is important that forensic software engineers correctly identify, measure, and collect the data needed to draw valid conclusions regarding technology adoption. Without an automated-test-tool evaluation and selection process that supports completeness and consistency between evaluations and selections, it becomes difficult for forensic software engineers to justify and evidence their software testing technology change management decisions. While most applications of ATTEST are oriented toward the prevention of software failures (or software-intensive incidents and accidents), we aim to demonstrate that ATTEST also has response-orientated application.
Author
Accident Investigation; Automatic Control; Software Development Tools; Computer Programming; Software Engineering

20030111888
Using Terminal Services to Serve Geospatial Software and Data Resources of Corps Project Offices
Graves, Mark R.; Aug. 2003; 29 pp.; In English
Report No.(s): AD-A417623; ERDC/EL-TR-03-13; No Copyright; Avail: CASI; A03, Hardcopy

Advances in geographic information systems (GIS) are causing the technology to no longer be considered a separate entity, but rather an integral component of the overall information technology infrastructure. Most GIS platforms are moving from simple file-based data structures to complex spatial geodatabases built within large-scale database platforms, such as Oracle. The move toward centralized databases has many ramifications for how geospatial tools and data are distributed throughout a complex organization such as the Corps of Engineers. Project offices, in particular, represent a special challenge due to the limitations of their network connections to the district offices. Windows Terminal Server technology represents one solution for serving these resources to project and field offices. This document addresses some of the technical issues related to the use of this technology and some of the advantages and limitations of such an approach.
DTIC
Software Engineering; Data Bases; Geography; Communication Networks

20030111923 Naval Postgraduate School, Monterey, CA
Next Generation Software Process Improvement
Turnas, Daniel; Jun. 2003; 143 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417560; No Copyright; Avail: CASI; A07, Hardcopy

Software is often developed under a process that can at best be described as ad hoc. While it is possible to develop quality software under an ad hoc process, formal processes can be developed to help increase the overall quality of the software under development. The application of these processes allows for an organization to mature. The software maturity level, and process improvement, of an organization can be measured with the Capability Maturity Model. The scope of this work is to use organizationally improved software processes on a small scale software product developed by the U.S. Army. The goal is to establish process improvement based on the Capability Maturity Model.
DTIC
Software Engineering; Computer Programming

20030111931 Rutherford Appleton Lab., Chilton, UK
Numerical Evaluation of HSL Packages for the Direct-Solution of Large Sparse, Symmetric Linear Systems of Equations
Gould, N. I. M.; Scott, J. A.; Sep. 22, 2003; In English
Report No.(s): PB2004-101078; RAL-TR-2003-019; No Copyright; Avail: National Technical Information Service (NTIS)
In recent years a number of new direct solvers for the solution of large sparse, symmetric linear systems of equations have been added to the mathematical software library HSL. These include solvers that are designed for the solution of positive-definite systems as well as solvers that are principally intended for solving indefinite problems. The available choice can make it difficult for users to know which solver is the most appropriate for their use. In this study, we use performance profiles as a tool for evaluating and comparing the performance of the HSL solvers on an extensive set of test problems taken from a range of practical applications.
NTIS
Numerical Analysis; Linear Systems

20030111937 Massachusetts Inst. of Tech., Cambridge, MA
Specifying and Checking Security Properties in an Evolving Software Base
Liskov, Barbara H.; Jul. 2003; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-1-0237; Proj-G377
Report No.(s): AD-A417672; AFRL-IF-RS-TR-2003-164; No Copyright; Avail: CASI; A03, Hardcopy
Research funded under this grant led to the development of techniques and tools for protecting privacy in a decentralized environment and achieving Byzantine Fault Tolerance (BFT), and a methodology that enables BFT replicas to run different implementations. The work led to an innovative new security model that allows static checking of security properties, a new annotation language for expressing security properties, extensions to Java that allow code to use the new model, lightweight tools for checking security properties of both source code (via a new compiler) and byte codes (via a new bytecode verifier), and a study of runtime support needed by the model. A new replications algorithm (BFT) that is robust against Byzantine failures was developed. It is efficient, works in an asynchronous environment and can be used to harden critical system services. An extension to BFT, called BFT with Abstract Specification Encapsulation (BASE), was developed to allow different software to run at different replicas so as to avoid failures due to software bugs. It provides a way of achieving practical N-version programming in which different versions are developed by different organizations and also the different versions may differ in the details of their behavior, i.e., support slightly different specifications.
DTIC
Computer Programs; Algorithms; Software Development Tools; Synchronism

20030112001 Booz-Allen and Hamilton, Inc., McLean, VA
A Proof of Concept for 10x+ Efficiency Gains for Multi-Sensor Data Fusion Utilizing a Howard Cascade Parallel Processing System
Howard, Kevin; Jul. 2003; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-02-C-0102; DARPA ORDER-N231; Proj-POC1
Report No.(s): AD-A417911; AFRL-IF-RS-TR-2003-176; No Copyright; Avail: CASI; A03, Hardcopy
Tools and techniques were developed by Massively Parallel Technologies Inc. (MPT) which enable intrinsically non-parallel processing problems to be processed by inexpensive parallel processing architectures. The objective of this contract effort was to create a more effective method for multi-sensor searches, and toward that goal, to improve data fusion and processing capability by greater than 10 times over current capabilities (when compared to the capability as shown in a uniprocessor environment). This objective was met, and the performance speed up yielded a greater than 70 times speed up

on a 127-node Howard Cascade RAIS (Redundant Array of Inexpensive Systems). The processing solution implemented is original and innovative; it can be implemented in a non- intrusive manner, yielding accurate results and efficient scaling into existing processing environments, using inexpensive off-the-shelf components. In addition a methodology has been developed that provides for rapid integration of new algorithms into the defined multi-sensor fusion processing solution.
DTIC
Architecture (Computers); Multisensor Fusion; Parallel Processing (Computers); Computer Programs

20030112134 Naval Research Lab., Stennis Space Center, MS
Spatio-Temporal Data Access for Information-Based Decision Making
Ladner, Roy V.; Warner, Elizabeth G.; Petry, Frederick E.; May 29, 2003; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417631; NRL/PP/7440--03-1018; No Copyright; Avail: CASI; A02, Hardcopy

Supporting large volumes of multi-dimensional data is an inherent characteristics of modem database applications. such as Geographical Information Systems (GIS), and Image and Multimedia Databases. Such databases need underlying systems with extended features like query languages, data models, and indexing methods, as compared to traditional databases, mainly because of the complexity of representing and retrieving data. In particular, spatio-temporal information systems must efficiently store and access potentially very large quantities of spatial and temporal data so we have developed index structures that can capture the time varying nature of moving objects, namely spatio-temporal structures. This paper describes the design of a query system for such data.
DTIC
Data Bases; Decision Making; Information Systems

20030112392
Aspect Oriented Programming
Kiczales, Gregor; Hugunin, James; Hilsdale, Erik; Kersten, Mik; Palm, Jeff; Jul. 2003; 155 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-C-0246; DARPA ORDER-J138; Proj-F374
Report No.(s): AD-A417906; AFRL-IF-RS-TR-2003-173; No Copyright; Avail: CASI; A08, Hardcopy

Over the lifetime of the project we developed a general-purpose aspect-oriented programming (AOP) extension to Java, called AspectJ, cultivated a user community for AspectJ, and showed that the technology was useful for a wide range of software development problems. AspectJ is now the de facto standard AOP language, not just for Java, but in some sense for languages beyond Java. This significant milestone came about through major scientific, engineering, and community building accomplishments throughout the life of the project.
DTIC
Programming Languages; Computer Programming; Java (Programming Language)

20030112443 NASA Marshall Space Flight Center, Huntsville, AL, USA
Using a Genetic Algorithm to Design Nuclear Electric Spacecraft
Pannell, William P.; October 27, 2003; 10 pp.; In English; Huntsville Simulation Conference, 30-31 Oct. 2003, Huntsville, AL, USA; No Copyright; Avail: CASI; A02, Hardcopy

The basic approach to to design nuclear electric spacecraft is to generate a group of candidate designs, see how 'fit' the design are, and carry best design forward to the next generation. Some designs eliminated, some randomly modified and carried forward.
Derived from text
Genetic Algorithms; Computer Programs; Nuclear Electric Propulsion

20030112529 NASA Ames Research Center, Moffett Field, CA, USA
Developing An Autonomy Infusion Infrastructure for Robotic Exploration
Bualat, Maria G.; Kunz, Clayton G.; Wright, Anne R.; Nesnas, Issa A. D.; [2003]; 1 pp.; In English; IEEE Aerospace Conference, 6 Mar. 2003, Big Sky, MT, USA; No Copyright; Avail: CASI; A01, Hardcopy

Future robotic exploration missions will require autonomy in order to accomplish mission goals for operational efficiency and science return. For example, it will require three communication cycles for the Mars Exploration Rovers, Spirit and Opportunity, to place an instrument on a science target. Reducing this time necessitates highly accurate navigation, obstacle

avoidance, target tracking, target analysis, manipulation, and fault diagnosis. Technologies to address these and other operational elements are currently being developed at NASA and within academia. However, infusion into missions has always been a difficult task for researchers. In order to keep risk down, mission managers are reluctant to include new technologies unless they have undergone extensive testing and verification under flight-realistic conditions. Furthermore, infusion of new technologies into missions is made more difficult by the variety of software frameworks under which these technologies are developed. Missions would like to see competing solutions demonstrated on a common platform so that they can compare performance and choose the solution best suited to their application.
Author
Robotics; Mars Exploration; Computer Programs

20030112534 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Collecting Real-Time Test Data
May 23, 2002; 12 pp.; In English
Contract(s)/Grant(s): NCC-00006
Report No.(s): SE-2002-05-00042-SSC; No Copyright; Avail: CASI; A03, Hardcopy

The TAXI Direct-to-Direct interface, in conjunction with the Disk Recording System (DRS) software developed by the SSC Boeing group, supplies a solution that provides higher integrity data that can be processed and made available to the customer with hours. The TAXI Direct-to-Direct interface is a special purpose interface solution developed by ISC for demultiplexing data from a Racal Storeplex (or equivalent) multichannel recorder onto one or more hard discs that reside in, and/or are controlled by, a personal computer (PC). (The name 'TAXI' is the acronym for 'transparent asynchronous transceiver interface'). The installation of the TAXI Direct-to Disk interface, in conjunction with other modifications, causes the transfer of data to be recorded directly to disk so it can be extracted and analyzed after the test.
Derived from text
Synchronism; Recording; Demultiplexing; Real Time Operation; Computer Programs

20030112537 Evolving Logic, Topanga, CA, USA
Computer Assisted Reasoning for Robust Strategies
Bankes, Steven C.; Lempert, Robert J.; Popper, Steven W.; May 30, 2003; 38 pp.; In English
Contract(s)/Grant(s): DAAH01-O1-C-R161; ARPA ORDER-K724/26
Report No.(s): AD-A416370; TR-A004; No Copyright; Avail: CASI; A03, Hardcopy

Evolving Logic successfully completed a project to build upon its existing, patented Computer Assisted Reasoning system (CARs, (trade mark)) technology. CARs 2.0 allows users to generate compound computational experiments as well as to analyze their outputs. This is key to creating a capability that for the first time allows users to reason under conditions of complexity and deep uncertainty in order to develop and test robust adaptive strategies. This capability is essential to gaining operational facility in asymmetric warfighting environments, for assessing threats, and developing postures that are robust to surprise. The document details technical capabilities within CARs (trade mark) and reports extensively on feedback from various user communities.
DTIC
Robustness (Mathematics); Applications Programs (Computers); Adaptive Control; Warfare

20030112570 Aerospace Corp., El Segundo, CA
A Practical Guidebook for Performing Software Capability Appraisals
Owens, K. L.; Troup, B. R.; Sep. 20, 2003; 139 pp.; In English
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A418135; TR-2003(8550)-1; SMC-TR-04-01; No Copyright; Avail: CASI; A07, Hardcopy

This guidebook provides practical guidance on why software capability appraisals are performed and how to prepare for them. It incorporates lessons learned from past and recent Software Development Capability Evaluation (SDCE) appraisals and provides example instructions and an initial set of questions to be tailored for a specific program. Also provided are new questions and criteria for evaluating the contractor's processes for developing COTS software-based systems.
DTIC
Computer Programs; Software Engineering

20030112640 Naval Postgraduate School, Monterey, CA
Interoperability, Data Control and Battlespace Visualization using XML, XSLT and X3D
Neushul, James D.; Sep. 2003; 197 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418222; No Copyright; Avail: CASI; A09, Hardcopy

This work represents the realization of Network-Centric goals of interoperability, information management, systems integration and cohesive battlespace visualization using networked computer technology. The application of structured data methodologies using the Extensible Markup Language (XML) allows organizations and systems to exchange and process battlespace information cooperatively. The practical application of this technology is demonstrated. Governance of information systems using structured data and the rejection of proprietary, application specific solutions is a leadership responsibility that is defined as Data Control. XML is presented as a leadership control measure that can be used to achieve Network-Centricity on the battlefield. The fundamental principles of XML application development are presented in the context of warfighting. Exemplars address a cross-section of battlespace applications. The visualization of the physical battlefield is demonstrated with network delivered 3D terrain views. Geodesy and position reporting is addressed using an XML defined data structure to enforce interoperability. An XML expression of the Battlespace Generic Hub is applied to joint and multilateral interoperability and information exchange. An approach to the effective employment of multiple different, but cooperative, autonomous systems in the battlespace uses XML to define parameters that determine artificial intelligence multi agent behavior and environmental factors. This thesis combines a critical analysis of the priorities of Network-Centricity and interoperability with practical and functional exemplars that demonstrate the efficacy of extensible architectures. The pragmatic approach is directed at the warfighter, and leadership challenges are identified.
DTIC
Document Markup Languages; Information Management; Interoperability; Scientific Visualization; Systems Integration

20030112709 Naval Postgraduate School, Monterey, CA
An Open-Source and Java-Technologies Approach to Web Applications
Siripala, Seksit; Sep. 2003; 141 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418299; No Copyright; Avail: CASI; A07, Hardcopy

Web applications have become a critical component of the global information infrastructure. In government organizations, proprietary software is currently being replaced by open-source. This thesis explores using open- source and Java technologies to implement Web applications. A prototype of the Web applications have become a critical component of the global information infrastructure, In government organizations, proprietary software is currently being replaced by open-source. This thesis explores using open- source and Java technologies to implement Web applications. A prototype of the framework was implemented for a military information site. Implementation was straightforward and performance of the prototype was excellent, demonstrating advantages in terms of reliability, portability, maintainability, and economy.
DTIC
Computer Networks; Java (Programming Language)

20030112710 Carnegie-Mellon Univ., Pittsburgh, PA
Interpreting Capability Maturity Model(Trademark) Integration (CMMI(Trademark)) for COTS-Based Systems
Tyson, Barbara; Albert, Cecilia; Brownsword, Lisa; Oct. 2003; 65 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A418384; CMU/SEI-2003-TR-022; ESC-TR-2003-022; No Copyright; Avail: CASI; A04, Hardcopy

Experience shows that engineering commercial off- the-shelf (COTS)-based systems requires fundamental changes from traditional engineering: adjusted roles and responsibilities, new skills, and different processes. Practitioners are often surprised to find that building and supporting COTS-based systems demands more, not less, discipline in their management and engineering practices. Many organizations have derived benefit from process improvement using capability maturity models and want to apply them as they build COTS-based systems. In addition, organizations building COTS-based systems want to apply the Capability Maturity Model Integration (CMMI). This leads to the question, 'How should CMMI be interpreted for organizations building, fielding, and supporting a COTS-based system?' This report shows that developing and maintaining COTS-based systems is more than selecting products and managing vendor relationships and is, therefore, more than just applying the Supplier Sourcing discipline within CMMI. The four CMMI disciplines- Systems Engineering, Software Engineering, Integrated Product and Process Development, and Supplier Sourcing-require interpretation and must be used together to promote improvement of an organization's processes for developing and maintaining COTS-based systems. This report summarizes what makes COTS-based systems unique and provides high-level guidance for interpreting and using

CMMI practices to facilitate appropriate processes for COTS-based systems.
DTIC
Software Engineering; Commercial Off-the-Shelf Products

20030112721 Naval Postgraduate School, Monterey, CA
Software Defined Radio Datalink Implementation Using PC-Type Computers
Zafeiropoulos, Georgios; Sep. 2003; 211 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418303; No Copyright; Avail: CASI; A10, Hardcopy

The objective of this thesis was to examine the feasibility of implementation and the performance of a Software Defined Radio datalink, using a common PC type host computer and a high level programming language. Dedicated transceivers were used, plugged on the PCI bus of host PCs running Windows 2000. Most of the functionality was programmed using the Microsoft Visual C++ language. The tasks to be performed included the channels configuration (number of active channels, center frequencies, sampling and data rates, choice of the appropriate up and down conversion filters), the management of the data transfer between the host computer and the transceiver, the baseband data modulation and demodulation, and the data organization into packets with appropriate headers in order to achieve phase and time synchronization solely by software. A part of the transceivers' configuration was achieved using a configuration utility running in Excel, provided by the manufacturer. Several combinations of M-PSK modulation schemes, channel numbers and datarates were tested in order to measure the performance limits of the system and its ability to perform the required tasks in real-time. The received data streams were further analyzed with the use of Matlab, in order to verify the proper functionality of the communication scheme.
DTIC
Software Engineering; Computer Programming; Data Links; C++ (Programming Language); Data Flow Analysis

20030112776 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Allocating Air Force Career Field Accession Targets: An Optimization Based Tool
Sickorez, Robert D.; Jan. 2003; 61 pp.; In English
Report No.(s): AD-A418206; AFIT-CI02-1301; No Copyright; Avail: CASI; A04, Hardcopy

The USAF officer accession sources annually produce three thousand non-rated line officers who must be classified into career fields. Under the current system, many career field accession goals are not met. This mismatch occurs primarily because of unreasonable targets set for the various commissioning sources. This thesis presents an optimization- based target allocation tool that mitigates the existing mismatch between long-term manpower needs and near-term accession source outputs. This Java-based application enables users to weight multiple objectives, set priorities for filling various career fields, solve for optimal targets, and then explore results, presented in the form of interactive tables and charts. Within a friendly graphical user interface, users determine practical targets with ease by interactively adjusting the optimality criteria and fill priorities and then reviewing the resulting classifications. These new targets will vastly improve the ability of the USAF to meet accession needs, exploit the unique skills of its officers, and satisfy officer preferences. This means that officer recruiting dollars will be better utilized as long-term manpower needs are better met. Additionally, job performance and retention are likely to improve as more career fields are filled with highly qualified officers and officers are more frequently placed into their desired career fields.
DTIC
Manpower; Personnel Development; Armed Forces

20030112794 Naval Postgraduate School, Monterey, CA
Auto-Configuration of Cisco Routers with Application Software
Prado, Alexandre B.; Sep. 2003; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418220; No Copyright; Avail: CASI; A05, Hardcopy

The context of this research is to facilitate the control of routers with the Server and Agent based Active Network Management (SAAM), to optimize allocation of network resources, and to satisfy user Quality of Service (QoS) requirements. The SAAM network determines the Quality of Service parameters based on current network conditions and user requirements. These parameters are dynamic, so they must be uploaded into the Cisco routers to take effect. The focus is on determining the most efficient way of communicating between the Cisco routers and the SAAM system. This is accomplished by several key components of the proxy-based solution as the first step for integrating with a legacy network. This thesis develops methods and application software to automatically update the configurations of Cisco routers based on the current network condition. These methods are required by any solution that resolves to upgrade the existing legacy network to provide QoS

without expensive equipment replacement. As a result users are provided with a network they can expect to function properly.
DTIC
Computer Programs; Computer Networks; User Requirements; Applications Programs (Computers)

20030112800 Army Research Lab., Aberdeen Proving Ground, MD
Scalability Analysis of Linear Equation Solvers for Sparse Positive Definite Systems
Davis, Robert L.; Henz, Brian J.; Shires, Dale R.; Sep. 2003; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418241; ARL-TR-3076; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Army Research Laboratory (ARL) is currently developing a suite of parallel codes to model liquid composite molding (LCM) manufacturing processes. This software suite utilizes the finite element method in order to model the LCM process, thus requiring the solution of sparse linear equations. Code profiles have revealed that, similar to other scientific computing codes, the majority of the execution time is spent solving large systems of linear equations. Accordingly, it is desirable to use the most efficient solver package or combination of packages to quickly solve large sparse symmetric positive definite systems of equations as found in the LCM simulation software. A collection of linear equation solvers is being developed at ARL that the process simulation code accesses in order to automatically select the optimal solver for the given problem at runtime. The optimal solver is determined by considering factors such as architecture type, number of processors, matrix size and type, etc. This report evaluates several different linear equation solver packages to determine their applicability to this and other unstructured grid problems. Several factors, including accuracy, error, scalability, and runtime, are analyzed and reported.
DTIC
Computer Aided Manufacturing; Resin Transfer Molding; Linear Equations; Scale (Ratio); Finite Element Method

20030112802 COMMANDER-IN-CHIEF 21ST CENTURY/NAVY (CINC21) WASHINGTON DC, Norfolk, VA, USA
Commander in Chief 21st Century (CINC21): Decision Focused Command and Control (DFC2) vB.2, User's Manual. Version 1.0
Oct. 15, 2003; 99 pp.; In English
Report No.(s): AD-A418247; No Copyright; Avail: CASI; A05, Hardcopy

This document describes the user interface, which will hereafter be called the DFC2 desktop or application, for the Commander in Chief 21 (CINC21) Decision Focused Command and Control (DFC2) application. Readers of this document will acquire a basic understanding of the system software tools as well as navigation of the application. This document does not address the system hardware or system administration functions.
DTIC
Command and Control; User Manuals (Computer Programs); Navigation; Software Development Tools

20030112804 Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, MD
Development of a Mathematica Tool for Implementation of Prognostics Based on Life History
Cushing, Michael J.; Stanley, Kristin R.; Oct. 2003; 100 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418250; AMSAA-TR-736; No Copyright; Avail: CASI; A05, Hardcopy

In order to increase mission reliability and reduce the logistics footprint, considerable interest is now being focused on the implementation of prognostics. One approach to prognostics is to track usage in terms of miles, hours or cycles, and generate replacement-before-failure rules for components subject to aging whenever the system is preparing to enter a period during which failures must be zealously avoided (e.g., deployments or combat pulses). This report documents the development and notional application of a new tool that implements this approach. The tool, which is an extension of Mathematica, generates graphs and tables for a variety of metrics that one could use in an interactive decision-making process. Mathematica is a leading commercial software package for performing mathematics. Key chapters in this report constitute a basic set of electronic templates for applying the new tool. The tool itself is provided in the appendices.
DTIC
Computer Programs; Cycles

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20030110757 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Deploying Object Oriented Data Technology to the Planetary Data System
Kelly, S.; Crichton, D.; Hughes, J. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

How do you provide more than 350 scientists and researchers access to data from every instrument in Odyssey when the data is curated across half a dozen institutions and in different formats and is too big to mail on a CD-ROM anymore? The Planetary Data System (PDS) faced this exact question. The solution was to use a metadata-based middleware framework developed by the Object Oriented Data Technology task at NASA s Jet Propulsion Laboratory. Using OODT, PDS provided - for the first time ever - data from all mission instruments through a single system immediately upon data delivery.
Author
Data Systems; Data Management; Object Programs; Computer Networks

20030111491 Washington Univ., Saint Louis, MO, USA
2001 Mars Odyssey Science Data Archives
Slavney, S.; Arvidson, R. E.; Guinness, E. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In its first two data releases, the 2001 Mars Odyssey Mission has delivered to the Planetary Data System more than 200 gigabytes of data from its suite of science instruments. The data are available online for public access. PDS-D, a new online service from the Planetary Data System, provides the capability to search for and download user-selected data products. Odyssey data releases are scheduled every three months through the end of the Primary Mission in August 2004.
Author
2001 Mars Odyssey; Data Retrieval

20030111815 NASA Ames Research Center, Moffett Field, CA, USA, Computer Sciences Corp., USA
First Experiences Using XACML for Access Control in Distributed Systems
Lorch, Marcus; Proctor, Seth; Lepro, Rebekah; Kafura, Dennis; Shah, Sumit; [2003]; 19 pp.; In English; 2003 ACM Workshop on XML Security, 31 Oct. 2003, Washington, DC, USA
Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; Copyright; Avail: CASI; A03, Hardcopy

Authorization systems today are increasingly complex. They span domains of administration, rely on many different authentication sources, and manage permissions that can be as complex as the system itself. Worse still, while there are many standards that define authentication mechanisms, the standards that address authorization are less well defined and tend to work only within homogeneous systems. This paper presents XACML, a standard access control language, as one component of a distributed and inter-operable authorization framework. Several emerging systems which incorporate XACML are discussed. These discussions illustrate how authorization can be deployed in distributed, decentralized systems. Finally, some new and future topics are presented to show where this work is heading and how it will help connect the general components of an authorization system.
Author
Computer Information Security; Access Control

20030111917
The Serrano Project Final Report: Non-Invasively Retrofitting Legacy Applications to Withstand Intrusions
Ricciardi, Aleta; Marzullo, Keith; Jul. 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-96-1-0313; DARPA ORDER E284; Proj-E017
Report No.(s): AD-A417896; AFRL-IF-RS-TR-2003-170; No Copyright; Avail: CASI; A03, Hardcopy

The Serrano project's goals were to develop new techniques for making secure and reliable distributed systems. There was a special focus on legacy environments and exploiting modern, object oriented techniques to incorporate them in distributed applications based on secure, reliable middleware. The final results arose in five general areas: the implication of reliable

multicast on further transmitting system infection, making safe progress in a distributed application despite the presence of network partitions, mechanism for making systems intrusion tolerant, efficient epidemiological update protocols, and software engineering approaches for automating the design of fault-tolerant distributed applications.
DTIC
Retrofitting; Intrusion Detection (Computers); Software Engineering; Applications Programs (Computers)

20030111929 Naval Postgraduate School, Monterey, CA
A Design Comparison Between IPv4 and IPv6 in the Context of MYSEA, and Implementation of an IPv6 MYSEA Prototype
O'Neal, Matthew R.; Jun. 2003; 85 pp.; In English
Report No.(s): AD-A417706; No Copyright; Avail: CASI; A05, Hardcopy

Internet Protocol version six (IPv6) is only sparsely implemented in the world today. However, as it gains popularity, it will grow into a vital part of the Internet and communications technology in general. Many large organizations, including the Department of Defense, are considering deployment of IPv6. Experiments will ensure that IPv6 will work with both existing and planned applications. One area where its success is essential is that of systems designed to support multilevel security. This thesis focuses on the design and implementation issues that accompany a migration of the Monterey Security Enhanced Architecture (MYSEA) from Internet Protocol version four (IPv4) to IPv6. The research for this thesis consists of two major parts: a functional comparison between the IPv4 and IPv6 designs, and a prototype implementation of MYSEA in an IPv6 environment. The current MYSEA prototype relies on a subset of Network Address Translation (NAT) functionality to support the network's operation; and, since IPv6 has no native support for it, a NAT mechanism was created in IPv6. This thesis provides a preliminary examination of IPv6 in MYSEA, which is a necessary step in determining whether the new protocol will assist with or detract from the enforcement of MYSEA policies.
DTIC
Protocol (Computers); Prototypes; Operating Systems (Computers); Computer Networks; Architecture (Computers)

20030112002 Drexel Univ., Philadelphia, PA
Ultra-High Capacity Networking Enabled By Optical Technologies
Personick, Stewart; Aug. 2003; 411 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0501; Proj-J181
Report No.(s): AD-A417912; AFRL-IF-RS-TR-2003-178; No Copyright; Avail: CASI; A18, Hardcopy

Project Pegasus, as this project came to be called, consisted of collaborative work in the following four areas: exploration of a novel internet protocol packet router using waveguide grating router devices; research into next generation internet backbone networks that are scalable by 1000 time the aggregate capacity of current internet backbone networks; development of applications requiring very high speed networking that enable leading edge research; and finally the design and demonstration of an all optical regenerator based upon terahertz optical asymmetric demultiplexes.
DTIC
Optical Properties; Computer Networks; Protocol (Computers)

20030112067 Nippon Telegraph and Telephone Public Corp., Tokyo, Japan
Activities Targeting the Standardization of the Liberty Alliance
Terada, Kenji; Takahashi, Kenji; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 94-96; In English; See also 20030112065; Copyright; Avail: Other Sources

With the increasing popularity of the Internet, various types of personal information (usernames, passwords, usage histories, etc.) are being created, shared, and utilized on diverse websites. The Liberty Alliance is a standardization organization that establishes technical specifications designed to link these scattered forms of personal information and share it safely and efficiently in the form of an Identity that expresses all aspects of the individual. As of February 2002, the Alliance had 159 member companies from diverse backgrounds, including telecommunications (e.g., NTT and NTT DoCoMo), vendors (e.g., Sun Microsystems), and finance (e.g., VISA International).
Author
Computer Information Security; Organizations; Access Control; Standardization

20030112082 Nippon Telegraph and Telephone Public Corp., Tokyo, Japan

Development of MovingFirewall, a System that Mitigates DDoS Attacks Upstream Nodes and Defends the Entire Network: Protecting Legitimate Traffic by Sefregating Attack Traffic

NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 99-100; In English; See also 20030112065; Copyright; Avail: Other Sources

NTT has developed a prototype of DDoS countermeasures called MovingFirewall. This defends against distributed denial of service (DDoS) attacks and protects the entire network effectively. A DDoS attack involves compromising multiple hosts and commanding them to send a large number of packets towards a target server or network in order to interrupt its service. While most conventional DDoS countermeasures attempt to defend against attacks at one fixed spot, MovingFirewall takes a different approach and blocks attack packets at upstream nodes close to the attacking machines. In November last year, NTT developed its Vision for a new optical generation-Broadband leading to the world of resonant communication, and has directed its R&D efforts towards this vision. MovingFirewall is an R&D project that aims to realize the next-generation network architecture (Resonant Communication Network Architecture: RENA).

Derived from text

Firewalls (Computers); Intrusion Detection (Computers); Computer Networks; Computer Security; World Wide Web

20030112092 Computer Sciences Corp., Moffett Field, CA, USA

Performance Analysis of a Hybrid Overset Multi-Block Application on Multiple Architectures

Djomehri, M. Jahed; Biswas, Rupak; July 14, 2003; 16 pp.; In English; HiPC International Conference on High Performance Computing, 17-20 Dec. 2003, Hyderabad, India; Original contains black and white illustrations

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a detailed performance analysis of a multi-block overset grid compu- tational fluid dynamics app!ication on multiple state-of-the-art computer architectures. The application is implemented using a hybrid MPI+OpenMP programming paradigm that exploits both coarse and fine-grain parallelism; the former via MPI message passing and the latter via OpenMP directives. The hybrid model also extends the applicability of multi-block programs to large clusters of SNIP nodes by overcoming the restriction that the number of processors be less than the number of grid blocks. A key kernel of the application, namely the LU-SGS linear solver, had to be modified to enhance the performance of the hybrid approach on the target machines. Investigations were conducted on cacheless Cray SX6 vector processors, cache-based IBM Power3 and Power4 architectures, and single system image SGI Origin3000 platforms. Overall results for complex vortex dynamics simulations demonstrate that the SX6 achieves the highest performance and outperforms the RISC-based architectures; however, the best scaling performance was achieved on the Power3.

Author

Computational Fluid Dynamics; Parallel Processing (Computers)

20030112543 Dartmouth Coll., Hanover, NH

ActComm Project on Transportable Agents and Wireless Networks

Cybenko, George; Jan. 2001; 10 pp.; In English

Contract(s)/Grant(s): F49620-97-1-0382

Report No.(s): AD-A418120; 536128; AFRL-SR-AR-TR-03-0386; No Copyright; Avail: CASI; A02, Hardcopy

The goal of the ActComm project is to develop technologies that will maximize the usability of complex, global computer and communications networks for modern command- and-control applications. The focus of the project is on wireless networks. The main technical innovation is the concept of an active communications system. An active communications system consists of dynamic elements: active software, active information, active hybrid networks, and active resource allocation. These active elements are introduced to make future military wireless computer and communications networks more robust, more powerful, and more flexible under a wide variety of operating environments. Active elements will be coordinated by a novel architecture that uses advanced agents to manage network, computer, and information assets delivering high confidence communications and computing. This document lists 50 publications that resulted from this project, graduate and undergraduate students who were supported by this project in FY 2001, 39 presentations that were made by ActComm participants in FY 2001, agencies and organizations that served as consultants to the project, and other DoD projects related to ActComm.

DTIC

Command and Control; Communication Networks; Interprocessor Communication

20030112724 Arizona State Univ., Tempe, AZ, USA
Equipment for Research on Dependable Information Infrastructure
Ye, Nong; Lai, Ying-Cheng; Dasgupta, Partha; Apr. 2003; 19 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0271
Report No.(s): AD-A418175; AFRL-SR-AR-TR-03-0384; No Copyright; Avail: CASI; A03, Hardcopy

This report reviews computing and network equipment purchased through a DURIP grant and their usage for supporting a currently funded DOD/AFOSR project. The research goal of the project is to develop the bottom-up self- synchronization of QoS (quality of service)-centric stateful resource management, according to Complexity Theory for Complex Adaptive Systems, for a dependable information infrastructure that will be used to host network-centric information operations for the JBI, NCW and IO towards Joint Vision 2010. To support this research, we needed to build a testbed for managing information infrastructure to: 1) run large simulations of models developed for QoS management and analysis of emergent network behavior, 2) run large simulations of network activity under a variety of security threats to test the viability and efficiency of protocols being developed in this research project, and 3) run actual tests of network routing and QoS management while a large number of host machines generate substantial network traffic of varying profiles.
DTIC
Data Processing; Security; Information Management; Management Analysis; Resources Management

20030112785 Naval Postgraduate School, Monterey, CA
A Realistic Model of Network Survivability
Ozkok, Ozlem; Sep. 2003; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418209; No Copyright; Avail: CASI; A04, Hardcopy

This thesis focuses on evaluating network survivability and Quality of Service (QoS) in a network. There have been studies on developing network survivability metrics; however the implementation of these survivability measures usually are based on unrealistic assumptions. This thesis has some experiment results based on identifying all min-cuts of a network and computing survivability of the nodes based on these criteria. The main contribution of the thesis is a novel approach to handling correlated or dependent component failures. In a complex network it is not trivial to compute the probability of failures of the nodes even if the component failures are independent. with this new approach network administrators could predict the optimal nodes in a network under more realistic conditions. Java-based simulation programs are developed to evaluate the approach. This project is motivated by network security problems in which a decision maker has to select nodes to host critical information servers when there is an attack to the network. The solution will give the decision makers criteria that would help them to make better decisions.
DTIC
Data Processing; Computer Networks; Management; Network Analysis

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20030111740 NASA Ames Research Center, Moffett Field, CA, USA
Robosphere: Self Sustaining Robotic Ecologies as Precursors to Human Planetary Exploration
Colombano, Silvano P.; [2003]; 8 pp.; In English; AIAA Space 2003, 23-25 Sep. 2003, Long Beach, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy

The present sequential mission oriented approach to robotic planetary exploration, could be changed to an infrastructure building approach where a robotic presence is permanent, self sustaining and growing with each mission. We call this self-sustaining robotic ecology approach robosphere and discuss the technological issues that need to be addressed before this concept can be realized. One of the major advantages of this approach is that a robosphere would include much of the infrastructure required by human explorers and would thus lower the preparation and risk threshold inherent in the transition from robotic to human exploration. In this context we discuss some implications for space architecture.
Author
Robotics; Space Exploration

20030111947

Applied Computational Electromagnetics Society Journal. Volume 18, Number 2. Special Issue on Neural Network Applications in Electromagnetics

Christodoulou, Christos; Jul. 2003; 82 pp.; In English

Report No.(s): AD-A417719; No Copyright; Avail: CASI; A05, Hardcopy

Neural computing and machine learning algorithms have arrived and are here to stay! In the last ten years neural networks have experienced an unbelievable growth, both in terms of novel neural network architectures that have appeared in the literature, and new applications where neural networks have been used successfully. The high-speed capabilities and 'learning' abilities of neural networks can be applied to quickly solving numerous complex optimization problems in electromagnetics, and this special issue shows you how. Even if you have no background in neural networks, the papers that appear in this issue will give you a flavor of the different applications that neural networks can be applied to.

DTIC

Algorithms; Computational Electromagnetics; Neural Nets; Artificial Intelligence

20030112028

The Fundamental Skills Training Project

Steuck, Kurt W.; Meyer, Thomas N.; Aug. 2003; 54 pp.; In English

Contract(s)/Grant(s): F41624-95-C-5006; Proj-1123

Report No.(s): AD-A417507; AFRL-HE-AZ-TR-2003-0041; No Copyright; Avail: CASI; A04, Hardcopy

From 1990 to 2000, the Air Force Research Laboratory (AFRL), with strong support from the University of Texas at San Antonio, engaged in research to bring state-of- the-art intelligent tutoring technology to bear on our nation's growing literacy skills problem in areas such as mathematics, writing, and science. The primary goals of the Fundamental Skills Training (FST) Project were to design and develop, implement, evaluate, and transfer intelligent tutoring systems (ITSs) to participating public schools and, when appropriate, to industry under federal technology transfer guidelines. ITSs are automated training systems that deliver individualized instruction. These systems are possible through the application of artificial intelligence principles to computer-based training and education. Recent ITS research in training and education demonstrated a level of maturity that made this technology transfer feasible and worthwhile. In the FST project, tutors were built to supplement the work of the teacher in the classroom. The intelligent tutoring systems, therefore, were not intended to replace teachers, but rather to help teachers cope with the demands of teaching an increasingly challenging student population. The goal of this report is to summarize AFRL's ten-year FST Project.

DTIC

Technology Transfer; Artificial Intelligence; Students; Education

20030112084 Nippon Telegraph and Telephone Public Corp., Japan

Language Model Adaptation with Additional Text Generated by Machine Translation

Nakajima, H.; Yamamoto, H.; Watanabe, T.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 101; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

Statistical language modeling requires a large corpus for the application domain. When a large corpus is not available, the language model adaptation technique has often been used. This adaptation needs only a small corpus of the application domain (the target corpus and the corpus should be written in the language of the model. However, it is sometimes difficult to collect even a small corpus, especially of spoken language, due to its high cost. To address this problem, this paper proposes a novel scheme that generates a small target corpus in another language. As information about adjacent words is stored in the translation knowledge, it can be extracted by machine translation and used for adaptation. Experiments showed that the improvement was about half of that obtained with a human collected corpus, and this provided some initial proof of the concept experiments.

Author

Machine Translation; Mathematical Models; Statistical Analysis; Language Programming

20030112107 NASA Ames Research Center, Moffett Field, CA, USA

GT-CATS: Tracking Operator Activities in Complex Systems

Callantine, Todd J.; Mitchell, Christine M.; Palmer, Everett A.; June 1999; 195 pp.; In English

Contract(s)/Grant(s): NCC2-824

Report No.(s): NASA/TM-1999-208788; NAS 1.15:208788; No Copyright; Avail: CASI; A09, Hardcopy

Human operators of complex dynamic systems can experience difficulties supervising advanced control automation. One remedy is to develop intelligent aiding systems that can provide operators with context-sensitive advice and reminders. The research reported herein proposes, implements, and evaluates a methodology for activity tracking, a form of intent inferencing that can supply the knowledge required for an intelligent aid by constructing and maintaining a representation of operator activities in real time. The methodology was implemented in the Georgia Tech Crew Activity Tracking System (GT-CATS), which predicts and interprets the actions performed by Boeing 757/767 pilots navigating using autopilot flight modes. This report first describes research on intent inferencing and complex modes of automation. It then provides a detailed description of the GT-CATS methodology, knowledge structures, and processing scheme. The results of an experimental evaluation using airline pilots are given. The results show that GT-CATS was effective in predicting and interpreting pilot actions in real time.
Author
Artificial Intelligence; Automatic Pilots; Aircraft Control; Flight Control; Man Machine Systems; Pilot Support Systems

20030112114 NASA Ames Research Center, Moffett Field, CA, USA
A Voice and Mouse Input Interface for 3D Virtual Environments
Kao, David L.; Bryson, Steve T.; September 10, 2003; 2 pp.; In English; 13th International Conference on Artificial Reality and Telexistence, 3-5 Dec. 2003, Tokyo, Japan
Report No.(s): RTOP 704-40-42; No Copyright; Avail: CASI; A01, Hardcopy

There have been many successful stories on how 3D input devices can be fully integrated into an immersive virtual environment. Electromagnetic trackers, optical trackers, gloves, and flying mice are just some of these input devices. Though we can use existing 3D input devices that are commonly used for VR applications, there are several factors that prevent us from choosing these input devices for our applications. One main factor is that most of these tracking devices are not suitable for prolonged use due to human fatigue associated with using them. A second factor is that many of them would occupy additional office space. Another factor is that many of the 3D input devices are expensive due to the unusual hardware that are required. For our VR applications, we want a user interface that would work naturally with standard equipment. In this paper, we demonstrate applications or our proposed muitimodal interface using a 3D dome display. We also show that effective data analysis can be achieved while the scientists view their data rendered inside the dome display and perform user interactions simply using the mouse and voice input. Though the sphere coordinate grid seems to be ideal for interaction using a 3D dome display, we can also use other non-spherical grids as well.
Author
Virtual Reality; Scientific Visualization; Voice Communication; Mice; Input; Three Dimensional Models

20030112126 NASA Ames Research Center, Moffett Field, CA, USA
Issues and Concerns in Robotic Drilling
Glass, Brian; [2003]; 1 pp.; In English; Online Course, 29 Sep.2003, Rio Tinto, Spain; No Copyright; Avail: Other Sources; Abstract Only

Exploration of the Martian subsurface will be essential in the search for life and water, given the desiccated and highly oxidized conditions on the surface. Discovery of these, at least in non-fossil form, is unlikely without drilling or other physical access to the subsurface. Hence subsurface access will be critical for both future in-situ science and Mars sample return. Drilling applications present many new challenges for diagnosis and control technology. Traditionally, diagnosis has concentrated on determining the internal state of a system, and detecting failures of system components. In the case of drilling applications, an additional challenge is to diagnose the interactions between the drill and its environment. This is necessary because particular observations of the drilling operation may be consistent with a number of possible problems, including faults in the equipment, but also changes in the material being drilled (for example, from rock to ice). The diagnosis of a particular observation may also depend on knowledge of geological formations previously encountered during drilling, and different remedial actions may be required for each diagnosis. Current 2009 Mars mission scenarios call for no more than 33 sols to be spent drilling. Yet they also call for a baseline of two 2m-deep holes in each of three target areas, for a total of six drilling operations. Using current levels of automation, it is estimated that 15-16 sols would be required to drill each hole. As a result of this, either the drilling part of the mission plan will need to be severely downscoped to no more than two holes total, or on-board automation and robotics must be increased in order to reduce the number of sols required per hole by removing ground control from the drilling control loop. This lecture will discuss salient issues and concerns of robotic drilling automation compares with other applications, and implementation constraints.
Author
Drilling; Robotics; Mars Surface; Mars Exploration; Automatic Control

20030112210 NASA Marshall Space Flight Center, Huntsville, AL, USA

Evaluating the Usability of Pinchigator, a system for Navigating Virtual Worlds using Pinch Gloves

Hamilton, George S.; Brookman, Stephen; Dumas, Joseph D. II; Tilghman, Neal; [2003]; 1 pp.; In English; Huntsville Simulation Conference, 29-31 Oct. 2003, Huntsville, AL, USA; Copyright; Avail: Other Sources; Abstract Only

Appropriate design of two dimensional user interfaces (2D U/I) utilizing the well known WIMP (Window, Icon, Menu, Pointing device) environment for computer software is well studied and guidance can be found in several standards. Three-dimensional U/I design is not nearly so mature as 2D U/I, and standards bodies have not reached consensus on what makes a usable interface. This is especially true when the tools for interacting with the virtual environment may include stereo viewing, real time trackers and pinch gloves instead of just a mouse & keyboard. Over the last several years the authors have created a 3D U/I system dubbed Pinchigator for navigating virtual worlds based on the dVise dV/Mockup visualization software, Fakespace Pinch Gloves and Pohlemus trackers. The current work is to test the usability of the system on several virtual worlds, suggest improvements to increase Pinchigator s usability, and then to generalize about what was learned and how those lessons might be applied to improve other 3D U/I systems.

Author

Conferences; Human-Computer Interface; Computerized Simulation; Two Dimensional Models

20030112265 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA's Scientific Visualization Studio

Mitchell, Horace G.; [2003]; 1 pp.; In English; ASPRS 2003 Annual Conference, 7-9 May 2003, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

Since 1988, the Scientific Visualization Studio(SVS) at NASA Goddard Space Flight Center has produced scientific visualizations of NASA s scientific research and remote sensing data for public outreach. These visualizations take the form of images, animations, and end-to-end systems and have been used in many venues: from the network news to science programs such as NOVA, from museum exhibits at the Smithsonian to White House briefings. This presentation will give an overview of the major activities and accomplishments of the SVS, and some of the most interesting projects and systems developed at the SVS will be described. Particular emphasis will be given to the practices and procedures by which the SVS creates visualizations, from the hardware and software used to the structures and collaborations by which products are designed, developed, and delivered to customers. The web-based archival and delivery system for SVS visualizations at svs.gsfc.nasa.gov will also be described.

Author

Scientific Visualization; NASA Programs; Remote Sensing; Research and Development

20030112562 Massachusetts Univ., Amherst, MA

A Software Control Framework for Learning Coordinated, Multi-Robot Strategies in Open Environments

Grupen, Roderic; Oct. 22, 2003; 11 pp.; In English

Contract(s)/Grant(s): DABT63-00-1-0004

Report No.(s): AD-A418131; No Copyright; Avail: CASI; A03, Hardcopy

The UMass MARS team contributed technology and infrastructure for the control of adaptive sensory and motor processes. We developed a suite of techniques for capturing interesting process dynamics in specific run-time contexts in order to learn control decisions. Particular attention was paid to the ability of teams of robots to adapt dynamically to changes in environment and mission requirements. The UMass effort marries high-level process descriptions, discrete event analysis and model checking, learning and stochastic exploration, and a control theoretic substrate to accomplish these goals. Distributed control Technologies have been transferred to SPAWAR in San Diego, CA. 'Whole-body' distributed manipulation controllers and finger gaiting code for autonomous manipulation tasks have been ported to NASA-JSC for use in the Robonaut program. With related funding under the DARPA DASADA program, contractors of the U.S. Army for the Rotorcraft Pilot's Associate (RPA) and * Theater High Altitude Area Defense (THAAD) programs are exploring the use of Containment Units (CUs) to build adaptable systems.

DTIC

Robotics; Distributed Parameter Systems; Stochastic Processes

20030112679 NASA Glenn Research Center, Cleveland, OH, USA

Sensitivity and Calibration of Non-Destructive Evaluation Method That Uses Neural-Net Processing of Characteristic Fringe Patterns

Decker, Arthur J.; Weiland, Kenneth E.; [2003]; 10 pp.; In English; SPIE Annual Meeting, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy

This paper answers some performance and calibration questions about a non-destructive-evaluation (NDE) procedure that uses artificial neural networks to detect structural damage or other changes from sub-sampled characteristic patterns. The method shows increasing sensitivity as the number of sub-samples increases from 108 to 6912. The sensitivity of this robust NDE method is not affected by noisy excitations of the first vibration mode. A calibration procedure is proposed and demonstrated where the output of a trained net can be correlated with the outputs of the point sensors used for vibration testing. The calibration procedure is based on controlled changes of fastener torques. A heterodyne interferometer is used as a displacement sensor for a demonstration of the challenges to be handled in using standard point sensors for calibration.
Author
Calibrating; Neural Nets; Nondestructive Tests; Sensitivity; Artificial Intelligence

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20030109382 Pennsylvania State Univ., University Park, PA
Research Instrumentation for Investigating Vibration Delocalization and Control of Nearly Periodic Structures via Piezoelectric Networks
Wang, Kon-Well; Jan. 2002; 8 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0350
Report No.(s): AD-A417606; AFRL-SR-AR-TR-03-0440; No Copyright; Avail: CASI; A02, Hardcopy

The overall goal of this DURIP project is to acquire major facilities that are critical in the development of a comprehensive experimental testbed for advancing the technology of low vibration periodic structures (e.g., bladed- disk assemblies and satellite antennae). Some of the main hardware components include a laser vibrometer system, an isolation table, high-performance mid-range travel linear stages and motion controller, and a 6-channel power amplifier. The proposed new equipment will directly enhance the Principal Investigator's current AFOSR research program (Grant number F49620-01-1-0156). The research results will be useful for many Air Force applications, such as in space structures and jet engine fan/turbine blade structures (conclusion based on technical discussions with Wright-Patterson and Kirtland Air Force Research Labs).
DTIC
Piezoelectricity; Periodic Variations; Power Amplifiers

20030110765 California Univ., Santa Cruz, CA, USA
Impact Tsunami Calculations: Hydrodynamical Simulations vs. Linear Theory
Korycansky, E.; Asphaug, E.; Ward, S. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NCC2-5480; NAG5-8914; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tsunamis generated by the impacts of asteroids and comets into the Earth oceans are widely recognized as a potential catastrophic hazard to the Earth s population. Our general conclusion is that linear theory is a reasonably accurate guide to behavior of tsunamis generated by impactors of moderate size, where the initial transient impact cavity is of moderate depth compared to the ocean depth. This is particularly the case for long wavelength waves that propagate fastest and would reach coastlines first. Such tsunamis would be generated in the open ocean by impactors of 300 meters in diameter, which might be expected to strike the Earth once every few thousand years, on the average. Larger impactors produce cavities deep enough to reach the ocean floor; even here, linear theory is applicable if the starting point is chosen at a later phase in the calculation when the impact crater has slumped back to produce a cavity of moderate depth and slope.
Derived from text
Tsunami Waves; Hydrodynamic Equations

20030111889 Rutherford Appleton Lab., Chilton, UK
Chebyshev-Based Two-Stage Iterative Method as an Alternative to the Direct Solution of Linear Systems
Arioli, M.; Ruiz, D.; Jul. 01, 2002; In English
Report No.(s): PB2004-101061; RAL-TR-2002-021; No Copyright; Avail: National Technical Information Service (NTIS)

The authors consider the solution of ill-conditioned symmetric and positive definite large sparse linear systems of

equations. These arise, for instance, when using some symmetrizable preconditioning technique for solving a general (possibly unsymmetric) ill-conditioned linear system, or in domain decomposition of a numerically difficult elliptic problem. They are also concerned with the consecutive solution of several linear systems with the same matrix and different right-hand sides. In such cases, the consecutive runs of some iterative methods like the conjugate gradient or the block conjugate gradient algorithms might be computationally prohibitive, and it might be preferable to use direct methods which are very well suited for this type of situation. The purpose of the study is to analyze a two-phase approach: analogously to direct methods, it includes a preliminary phase which they call a 'partial spectral factorization phase', followed by a 'cheap' solution phase, both only based on numerical tools that are usually exploited in iterative methods.
NTIS
Linear Systems; Chebyshev Approximation; Polynomials

20030111911 California Inst. of Tech., Pasadena, CA
The Role of Biorthogonal Partners in Sampling Theory for Non Bandlimited Signals: A Review
Vrcelj, Bojan; Vaidyanathan, P. P.; Jan. 2002; 5 pp.; In English
Contract(s)/Grant(s): N00014-99-1-1002
Report No.(s): AD-A417861; No Copyright; Avail: CASI; A01, Hardcopy

It is well known that a broad class of non bandlimited signals can be reconstructed from uniformly spaced samples by relating the problem to the inversion of a digital filter. This simple idea has given rise to many applications, some of them quite sophisticated. This includes spline interpolation, fractionally spaced equalization (FSE) of noisy channels and more recently, rational FSEs. On the theoretical front, it has given rise to the idea of biorthogonal partners which unify many aspects of wavelet theory into the same framework. In this paper we give an overview of the main results in this area.
DTIC
Signal Processing; Bandwidth; Spline Functions; Orthogonality

20030111939 Paul Scherrer Inst., Villigen
Proper Orthogonal Decomposition of Direct Numerical Simulation Data: Data Reduction and Observer Construction
Frouzakis, C. E.; Kevrekidis, Y. G.; Lee, J.; Boulouchos, K.; Alonso, A. A.; Jan. 2000; 8 pp.; In English
Report No.(s): AD-A417762; No Copyright; Avail: CASI; A02, Hardcopy

In this paper, direct numerical simulation (DNS) data of an opposed-jet hydrogen/air diffusion flame are in a postprocessing step, analyzed using the proper orthogonal decomposition (POD) technique. The aim of this work is twofold. The first goal is to compute a small number of space- dependent empirical eigenfunctions, so that a low-dimensional representation of the data generated by the large model of the discretized partial differential equations can be obtained using a weighted sum of these few eigenfunctions (POD modes). It is found that only six modes are needed for an accurate representation of the data in an extended range of inflow velocities. This large data reduction takes into account not only chemical kinetics but also transport phenomena in a full two-dimensional context and constitutes the first step toward the construction of low-dimensional dynamic models for the opposed-jet system. It is also found that the PODs have very good interpolatory properties. The second goal is to use part of the available data (i.e., partial measurements), together with the computed modes, to estimate, or, in the terminology of process control, to observe, the 'unmeasured' quantities. It is found that only a small number of measurements are needed to obtain accurate estimates of the rest of the data.
DTIC
Data Reduction; Decomposition; Direct Numerical Simulation; Orthogonality; Mathematical Models

20030111995 Louisville Univ., KY, USA
Pneumatic Muscle Actuator Control
Lilly, John H.; Jan. 2000; 7 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0300
Report No.(s): AD-A417796; AFRL-SR-AR-TR-03-0433; No Copyright; Avail: CASI; A02, Hardcopy

This research is relevant to the Air Fore mission because pneumatic muscle actuation devices arc advantageous for certain types of robotics as well as for strength and/or mobility assistance for humans. For space robotics, PMs are advantageous because they require little electrical power (being pneumatically powered), are lightweight, and can be easily constructed from cheap, readily available materials. The fact that PMs require little electrical power means that heavy generators and/or batteness are not necessary. The fact that they are easily constructed from cheap, readily-available materials insures that an actuator failure need not hamper the mission. Since PMs are similar in size and function to human muscles, PMs systems can

also be used to actuate exoskeleton frames worn by humans to enhance strength and provide mobility assistance for military operations in the field. A requirement exists for the building of strength augmentation devices to help military personnel perform certain tasks that require unusual strength for short periods of time. Such systems can be powered by pneumatic muscle actuators. According to the 1997 DoD Defense Technology Area Plan (STAR), 'performance enhancement technologies support future joint warfighting needs in teleoperation and physical aiding.'
DTIC
Pneumatic Control; Actuators

20030112094 NASA Ames Research Center, Moffett Field, CA, USA
Divergence Free High Order Filter Methods for the Compressible MHD Equations
Yea, H. C.; Sjoegreen, Bjoern; July 12, 2003; 17 pp.; In English; Proceedings of the International Conference on High Performance Scientific Computing, 10-14 Mar. 2003, Hanoi, Viet Nam; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The generalization of a class of low-dissipative high order filter finite difference methods for long time wave propagation of shock/turbulence/combustion compressible viscous gas dynamic flows to compressible MHD equations for structured curvilinear grids has been achieved. The new scheme is shown to provide a natural and efficient way for the minimization of the divergence of the magnetic field numerical error. Standard diver- gence cleaning is not required by the present filter approach. For certain MHD test cases, divergence free preservation of the magnetic fields has been achieved.
Author
Magnetohydrodynamics; Finite Difference Theory; Divergence

20030112246 NASA Glenn Research Center, Cleveland, OH, USA
Stator and Rotor Flux Based Deadbeat Direct Torque Control of Induction Machines
Kenny, Barbara H.; Lorenz, Robert D.; [2003]; 9 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

A new, deadbeat type of direct torque control is proposed, analyzed and experimentally verified in this paper. The control is based on stator and rotor flux as state variables. This choice of state variables allows a graphical representation which is transparent and insightful. The graphical solution shows the effects of realistic considerations such as voltage and current limits. A position and speed sensorless implementation of the control, based on the self-sensing signal injection technique, is also demonstrated experimentally for low speed operation. The paper first develops the new, deadbeat DTC methodology and graphical representation of the new algorithm. It then evaluates feasibility via simulation and experimentally demonstrates performance of the new method with a laboratory prototype including the sensorless methods.
Author
Torque; Mathematical Models

20030112277 NASA Glenn Research Center, Cleveland, OH, USA
Algorithms for the Fractional Calculus: A Selection of Numerical Methods
Diethelm, K.; Ford, N. J.; Freed, A. D.; Luchko, Yu.; [2003]; 42 pp.; In English; Computer Methods in Applied Mechanics and Engineering
Contract(s)/Grant(s): SAA3-515; Copyright; Avail: CASI; A03, Hardcopy

Many recently developed models in areas like viscoelasticity, electrochemistry, diffusion processes, etc. are formulated in terms of derivatives (and integrals) of fractional (non-integer) order. In this paper we present a collection of numerical algorithms for the solution of the various problems arising in this context. We believe that this will give the engineer the necessary tools required to work with fractional models in an efficient way.
Author
Algorithms; Numerical Analysis; Calculus; Differential Equations; Mathematical Models

20030112797 Naval Postgraduate School, Monterey, CA
Algorithmic Approaches to Finding Cover in Three- Dimensional, Virtual Environments
Morgan, David J.; Sep. 2003; 112 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418236; No Copyright; Avail: CASI; A06, Hardcopy

In order for an agent to be credible in simulating a human opponent in a first-person combat simulation, it must be able to find and use cover from direct fire weapons. The ability to find cover is fairly intuitive for humans, but current attempts at replicating this ability in computer simulations and video games have been either simplistic or totally missing. This thesis

explores a range of algorithms which computer agents can use for finding cover from direct- fire weapons in high-detail, dynamic, three-dimensional environments. The first method treats the enemy as a point light source and uses binary space partition trees to create shadow volumes to find areas of cover. The second method uses a depth-mapping technique to find potential areas where the agent could get behind cover. The third method uses a sensor grid centered on the agent that allows it to check the area around it for cover locations. We implemented the sensor grid technique inside of the first-person shooter computer game America's Army: Operations as a proof of concept.
DTIC
Algorithms; Game Theory; Virtual Reality

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20030111733
Methods of Dealing with Values Below the Limit of Detection using SAS
Croghan, C.; Egeghy, P.; 2003; 8 pp.; In English; Prepared in cooperation with Environmental Protection Agency, Las Vegas, NV. National Exposure Research Lab
Report No.(s): PB2004-100886; No Copyright; Avail: CASI; A02, Hardcopy

Due to limitations of chemical analysis procedures, small concentrations cannot be precisely measured. These concentrations are said to be below the limit of detection (LOD). In statistical analyses, these values are often censored and substituted with a constant value, such as half the LOD, the LOD divided by the square root of 2, or zero. These methods for handling below-detection values results in two distributions, a uniform distribution for those values below the LOD, and the true distribution. As a result, this can produce questionable descriptive statistics depending upon the percentage of values below the LOD. An alternative method uses the characteristics of the distribution of the values above the LOD to estimate the values below the LOD. This can be done with an extrapolation technique or maximum likelihood estimation. An example program using the same data is presented calculating the mean, standard deviation, t-test, and relative difference in the means for various methods and compares the results. The extrapolation and maximum likelihood estimate techniques have smaller error rates than all the standard replacement techniques. Although more computational, these methods produce more reliable descriptive statistics.
NTIS
Chemical Analysis; Statistical Analysis

20030111796
An Introduction to Bayesian and Dempster-Shafer Data Fusion
Koks, Don; Challa, Subhash; Jul. 2003; 49 pp.; In English
Report No.(s): AD-A417895; DSTO-TR-1436; DODA-AR-012-775; No Copyright; Avail: CASI; A03, Hardcopy

The Kalman Filter is traditionally viewed as a Prediction-Correction Filtering Algorithm. In this report we show that it can be viewed as a Bayesian Fusion algorithm and derive it using Bayesian arguments. We begin with an outline of Bayes theory, using it to discuss well-known quantities such as priors, likelihood and posteriors, and we provide the basic Bayesian fusion equation. We derive the Kalman Filter from this equation using a novel method to evaluate the Chapman-Kolmogorov prediction integral. We then use the theory to fuse data from multiple sensors. Vying with this approach is Dempster-Shafer theory, which deals with measures of 'belief', and is based on the nonclassical idea of 'mass' as opposed to probability. Although these two measures look very similar, there are some differences. We point them out through outlining the ideas of Dempster-Shafer theory and presenting the basic Dempster-Shafer fusion equation. Finally we compare the two methods, and discuss the relative merits and demerits using an illustrative example.
DTIC
Kalman Filters; Algorithms; Bayes Theorem; Multisensor Fusion

20030111876 National Aerospace Lab., Amsterdam
Joint Probabilistic Data Association
Blom, H. A. P.; Bloem, E. A.; Dec. 1995; 24 pp.
Report No.(s): PB2004-100918; NAL/TR-95661-U; No Copyright; Avail: CASI; A03, Hardcopy

For the problem of tracking multiple targets the Joint Probabilistic Data Association (JPDA) filter has shown to be very

effective in handling clutter and missed detections. The JPDA, however, also tends to coalesce neighboring tracks. Through comparing JPDA with the Exact Nearest Neighbor PDA (ENNPDA) filter, Fitzgerald has shown that hypotheses pruning is an effective way to prevent track coalescence. The dramatic pruning used for ENNPDA however, leads to an undesired sensitivity to clutter and missed detections. In this paper new algorithms are derived which combine the advantages of JPDA and ENNPDA. The effectiveness of the new algorithms is shown through Monte Carlo simulations.
NTIS
Tracking (Position); Coalescing

20030111935 Rutherford Appleton Lab., Chilton, UK
FILTRANE: A Fortran 95 Filter-Trust-Region Package for Solving Nonlinear Feasibility Problems
Gould, N. I. M.; Toint, P. L.; Sep. 08, 2003; In English
Report No.(s): PB2004-101079; RAL-TR-2003-017; No Copyright; Avail: National Technical Information Service (NTIS)

This paper describes the algorithm and performance of FILTRANE, a new Fortran 95 package for finding vectors satisfying general sets of nonlinear equations and/or inequalities. A number of algorithmic variants are discussed and extensively compared on a set of CUTE(r) test problems, indicating that the default variant is both reliable and efficient. This discussion provides a first experimental study of the parameters inherent to filter algorithms.
NTIS
Nonlinear Programming; Fortran

20030111999 State Univ. of New York, Stony Brook, NY, USA
Prediction Using Numerical Simulations, A Bayesian Framework for Uncertainty Quantification and its Statistical Challenge
Glimm, James; Lee, Yunha; Ye, Kenny Q.; Sharp, David H.; Jan. 2002; 8 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0642
Report No.(s): AD-A417842; ARO-42254.24-MA; No Copyright; Avail: CASI; A02, Hardcopy

Uncertain quantification is essential in using numerical models for prediction. While many works focused on how the uncertainty of the inputs propagate to the outputs, the modeling errors of the numerical model were often overlooked. In our Bayesian framework, modeling errors play an essential role and were assessed through studying numerical solution errors. The main ideas and key concepts will be illustrated through an oil reservoir case study. In this study, inference on the input has to be made from the output. Bayesian analysis is adopted to handle this inverse problem, then combine it with the forward simulation for prediction. The solution error models were established based on the scale- up solutions and fine-grid solutions. As the central piece of our framework, the robustness of these error models is fundamental. In addition to the oil reservoir computer codes, we will also discuss the modelling of solution error of shock wave physics.
DTIC
Bayes Theorem; Mathematical Models; Simulation; Statistical Analysis; Uncertain Systems

20030112515 Massachusetts Inst. of Tech., Lexington, MA
Track Association with Bayesian Probability Theory
Hurley, Michael B.; Oct. 2003; 28 pp.; In English
Contract(s)/Grant(s): F19628-OO-C-O0O2
Report No.(s): AD-A417987; TR-1085; ESC-TR-2003-057; No Copyright; Avail: CASI; A03, Hardcopy

Data association and track association algorithms have been developed over the course of thirty years. Almost all technical papers that describe these association algorithms have begun the derivations by adopting log- likelihood ratios as the measure of association. At best, this starting point has obscured the assumptions necessary to use log-likelihood ratios. At worst, the log-likelihood ratios have been improperly defmed. This report provides the first known derivation of a track association algorithm from the first principles of Bayesian probability theory. By starting with first principles, all the assumptions that are necessary to derive an association algorithm are explicitly stated as the derivation proceeds. The correct form for the log-likelihood ratios is obtained later in the derivation and can be traced back to first principles. The pitfalls and deficiencies of poorly performing association algorithms are identified easily by comparing the algorithms with the full derivation. These deficiencies arise from such mistakes as the incorrect definition of the log-likelihood ratio, poor selection of the probability density functions, incorrect construction of the cost matrices, and the application of an algorithm to a system that violates the assumptions that were adopted during the algorithm construction. In addition, the firm grounding in Bayesian probability theory provides the means to easily extend the derivation to produce more complex association algorithms, such as

feature-aided track association algorithms. The basic derivation provided in this report makes it clear that the ensemble of track association algorithms is much more extensive that most data fusion researchers would believe. These algorithms can be created by simply changing any of the derivation assumptions or the probability density functions.
DTIC
Algorithms; Probability Density Functions

20030112792 Naval Postgraduate School, Monterey, CA
Classification and Analysis of Low Probability of Intercept Radar Signals Using Image Processing
Persson, Christer; Sep. 2003; 148 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418219; No Copyright; Avail: CASI; A07, Hardcopy

The characteristic of low probability of intercept (LPI) radar makes it difficult to intercept with conventional signal intelligence methods so new interception methods need to be developed. This thesis initially describes a simulation of a polytime phase-coded LPI signal. The thesis then introduces a method for classification of LPI radar signals. The method utilizes a parallel tree structure with three separate 'branches' to exploit the image representation formed by three separate detection methods. Each detection method output is pre-processed and features are extracted using image processing. After processing the images, they are each fed into three separate neural networks to be classified. The classification output of each neural network is then combined and fed into a fourth neural network performing the final classification. The outcome of testing shows only 53%, which might be the result of the image representation of the detection methods not being distinct enough, the pre - processing/feature extraction not being able to extract relevant information or the neural networks not being properly trained. The thesis concludes with a brief discussion about a suitable method for image processing to extract significant parameters from a LPI signal.
DTIC
Image Processing; Radar Signatures; Interception; Classifications; Probability Theory

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SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20030110566 NASA Marshall Space Flight Center, Huntsville, AL, USA
Maximum Likelihood Estimation of the Broken Power Law Spectral Parameters with Detector Design Applications
Howell, Leonard W.; Nuclear Instruments and Methods in Physics Research Section A; 2002; ISSN 0168-9002; Volume 489, pp. 422-438; In English; Original contains black and white illustrations; Copyright; Avail: Other Sources

The method of Maximum Likelihood (ML) is used to estimate the spectral parameters of an assumed broken power law energy spectrum from simulated detector responses. This methodology, which requires the complete specificity of all cosmic-ray detector design parameters, is shown to provide approximately unbiased, minimum variance, and normally distributed spectra information for events detected by an instrument having a wide range of commonly used detector response functions. The ML procedure, coupled with the simulated performance of a proposed space-based detector and its planned life cycle, has proved to be of significant value in the design phase of a new science instrument. The procedure helped make important trade studies in design parameters as a function of the science objectives, which is particularly important for space-based detectors where physical parameters, such as dimension and weight, impose rigorous practical limits to the design envelope. This ML methodology is then generalized to estimate broken power law spectral parameters from real cosmic-ray data sets.
Author
Maximum Likelihood Estimates; Spectrum Analysis; Energy Spectra; Design Analysis

20030111754
Uncertainty Management for Complex Systems
Doyle, John; Marsden, J.; Ortiz, M.; Schroder, P.; Burdick, J.; Jan. 2002; 33 pp.; In English
Contract(s)/Grant(s): F49620-96-1-0471
Report No.(s): AD-A417866; AFRL-SR-AR-TR-03-0430; No Copyright; Avail: CASI; A03, Hardcopy

MURI researchers at Caltech have made dramatic progress in creating a fundamental theory of uncertainty management in complex, multiscale systems with a variety of applications from shear flow turbulence to networking protocols to global optimization. Military and commercial technological visions emphasize ubiquitous control, communications, and computing,

with both biology and nanotechnology creating additional novel multi-scale challenges. A rigorous, practical, and unified theoretical framework will be essential for this vision, but until now it has proven stubbornly elusive. This research offers not only a theoretical research direction of unprecedented promise, but one that has already proven remarkably useful in a wide variety of practical applications. The results of this research will not only provide a rigorous basis for designing future networks of networks involving ubiquitous control, communications, and computing, but also will resolve many persistent mysteries at the foundation of physics. The major objective of this research is to develop an understanding of uncertainty management in complex systems. In addition to fundamental theory, the authors' objective is to provide tools for modeling, tractable simulation, and control of complex systems, with an emphasis on uncertainty and robustness. The increase in robustness, productivity, and throughput created by the enormous internal complexity of the power grid, the Internet, and other complex systems is accompanied by new hypersensitivities to perturbations the system was not designed to handle. This phenomenon is at the heart of power law statistics observed in failure events, with mostly small events but a 'heavy tail' of large events. This 'robust-yet- fragile' feature is characteristic of complex systems throughout engineering and biology. Appendixes discuss highly optimized transitions to turbulence and laminar-turbulent transition forced by free-stream turbulence.
DTIC
Mathematical Models; Communication Networks; Control Theory; Uncertain Systems; Complex Systems

20030111772 Michigan Technological Univ., Houghton, MI
Optimal Design of Smart Structures
Parker, Gordon; Bettig, Bernhard; Chen, Wei; Buehler, Markus; Sep. 23, 2003; 55 pp.; In English
Contract(s)/Grant(s): F49620-O1-1-0152
Report No.(s): AD-A417882; AFRL-SR-AR-TR-03-0425; No Copyright; Avail: CASI; A04, Hardcopy

The goal of this study was to investigate the benefits of simultaneously designing an active structure's topology, active material treatment, and control law. Both static and dynamic structures were considered. The goal for static structure design was to satisfy given load capability and displacements when activated. The goal of the dynamic structure design was increased stability margin. It was found that simultaneous design increases the performance as compared to a conventionally designed structure. The topology of the structure and the active material treatment work together to create a system that is less sensitive to spillover instability. A library of homogeneous, mixed material finite elements were created to facilitate simultaneous topological optimization of active and conventional material structures. Additionally, a general, parallel processing active structure design tool was created that combines a genetic algorithm optimization code with commercially available finite element (ABAQUS) and control design (MATLAB) codes.
DTIC
Finite Element Method; Control Theory; Smart Structures; Topology; Optimization

20030111998 Texas Univ., Arlington, TX, USA
Nearly Optimal State Feedback Control of Constrained Nonlinear Systems Using a Neural Network HJB Approach
Lewis, Frank L.; Abu-Khalaf, Murad; Apr. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0366
Report No.(s): AD-A417841; 26-0401-10; ARO-43795.8-CI; No Copyright; Avail: CASI; A03, Hardcopy

In this paper, we treat constrained optimization of nonlinear systems. A rigorous solution method to obtain nearly optimal state feedback control that takes into consideration, actuator saturation, state space constraints, and minimum-time control requirement is presented. The constraints are encoded into the optimization formulation through special nonquadratic functionals. The associated Hamilton-Jacobi-Bellman (HJB) equation is then solved successively. Nonlinear approximating networks are used to obtain an approximate closed form solution of the value function of the HJB equation, which is then used to obtain a state feedback controller. The solution is carried over a compact set of the asymptotic stability region of an initial stabilizing control.
DTIC
Nonlinear Systems; Control Theory; Neural Nets; Hamilton-Jacobi Equation; Feedback Control

20030112675 OmniViz, Inc., Richland, WA, USA
Visualization and Integrated Data Mining of Disparate Information
Saffer, J. D.; Albright, C. L.; Calapristi, A. J.; Chen, G.; Crow, V. L.; May 11, 2001; In English
Report No.(s): DE2003-15004142; No Copyright; Avail: National Technical Information Service (NTIS)

The volumes and diversity of information in the discovery, development, and business processes within the chemical and life sciences industries require new approaches for analysis. Traditional listor spreadsheet-based methods are easily overwhelmed by large amounts of data. Furthermore, generating strong hypotheses and, just as importantly, ruling out weak ones, requires integration across different experimental and informational sources. We have developed a framework for this integration, including common conceptual data models for multiple data types and linked visualizations that provide an overview of the entire data set, a measure of how each data record is related to every other record, and an assessment of the associations within the data set.
NTIS
Data Mining; Life Sciences; Data Integration; Scientific Visualization

20030112765 Kansas Univ., Lawrence, KS
A Case-Based Reflective Negotiation Model
Tsatsoulis, Costas; Jul. 2003; 50 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-2-0502; Proj-H357
Report No.(s): AD-A417844; AFRL-IF-RS-TR-2003-174; No Copyright; Avail: CASI; A03, Hardcopy

The goal of our work was to create autonomous agents that worked in a domain of constrained resources and that used case-based negotiation to allocate resources in a satisfying manner. The domain of application was distributed sensor management for multi-target tracking. We developed two separate but similar formalisms for the implementation of the negotiation agents: first, a real-time architecture based on the Belief-Desire- Intention (BDI) agent framework and second, a near real-time architecture that relied on domain heuristics. Both architectures used Case-Based Reasoning (CBR) to select a negotiation strategy, and then negotiated using argumentation. The BDI architecture used a real-time Linux kernel to have time awareness. In addition to this main thrust of our work, we were also tasked to provide tools for analyzing the performance of Java code, real-time Linux services, a Communication Server to model the RF communication channels of the sensors, and for studying and improving the Challenge Problem code.
DTIC
Heuristic Methods; Radio Frequencies; Channels (Data Transmission)

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20030111874 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Atiyah-Singer Index Theorem, Cyclic Cohomology Chern Character, and Spectral Flow
Ponge, R. S.; May 2002; 28 pp.
Report No.(s): PB2004-100907; IHES/M/02/33; No Copyright; Avail: CASI; A03, Hardcopy

In this paper the authors first give an alternative short proof of the local index theorem by combining the pseudodifferential Greiner's representation of the heat kernel (Gr) with the Getzler rescalling. Extending the arguments of the proof the authors show that the Connes-Moscovici cocycle, representing the cyclic cohomology Chern character, for Diract operators on a compact spin manifold is exactly given by the A-form of the Riemann curvature. In the even dimensional case the authors recover the local form of the Atiyah-Singer index theorem and in the odd dimensional case the authors get back the spectral flow theorem of Atiyah-Patodi-Singler (APS).
NTIS
Homology; Theorem Proving

20030111880 Royal Inst. of Tech., Stockholm, Sweden
Lectures on Balayage
Gustafsson, B.; Jan. 2003; 52 pp.
Report No.(s): PB2004-100923; TRITA-MAT-03-MA-02; No Copyright; Avail: CASI; A04, Hardcopy

We give an expose over some recent developments in potential theory centered around the notion of partial balayage. Partial balayage means balayage (sweeping of measures) to a prescribed density, which then is attained on a set which is not known in advance. This gives a free boundary problem of obstacle type. Performed continuously in time partial balayage is

equivalent to moving boundary problems for Hele-Shaw flows, and in the backward direction (inverse balayage) it leads in the limit to notions of potential theoretic skeletons (sometimes called mother bodies).
NTIS
Mathematical Models; Estimates

20030112319 Air Force Research Lab., Hanscom AFB, MA
Impedance, Bandwidth, and Q of Antennas
Yaghjian, Arthur D.; Best, Steven R.; Jan. 2003; 4 pp.; In English
Report No.(s): AD-A418158; No Copyright; Avail: CASI; A01, Hardcopy

The primary purpose of this paper is twofold: first, to derive an approximate expression for the bandwidth of a tuned antenna in terms of its input impedance that holds at every frequency, that is, throughout the entire antiresonant as well as resonant frequency ranges of the antenna; and second, to relate this expression for bandwidth to the antenna quality factor Q. The definition of stored energy that we use to define the Q of an antenna is similar to that of previous authors 1-7. However, the approximate expression for the bandwidth and its relationship to Q are both more generally applicable and more accurate than previous formulas. The validity and accuracy of the expressions are confirmed by the numerical solutions to straight-wire and wire- loop, lossy and lossless tuned antennas over a wide enough range of frequencies to cover several resonant and antiresonant frequency bands. It is shown that the matched VSWR bandwidth is the more fundamental measure of bandwidth than conductance bandwidth because it exists in general for all frequencies at which an antenna is tuned. We also find that the Foster reactance theorem does not hold at all frequencies for antennas (whether or not the antenna is lossless) 8, SEC. 8-4. Although the general formula we derive for the bandwidth of an antenna involves the frequency derivative of resistance as well as the frequency derivative of reactance, quite remarkably, the half-power matched VSWR bandwidth of a general tuned lossy or lossless antenna is proven to approximately equal 2/Q for all frequencies if Q is greater than or approaches 4.
DTIC
Bandwidth; Impedance; Q Factors; Directional Antennas

20030112377 Air Force Research Lab., Hanscom AFB, MA, USA
Limitations of Inductive Circuit Model Representations of Meander Line Antennas
Best, Steven R.; Morrow, Jarrett D.; Jan. 2003; 4 pp.; In English
Report No.(s): AD-A418159; No Copyright; Avail: CASI; A01, Hardcopy

The resonant frequency of meander line antennas can be predicted using an equivalent inductor circuit model representation. As a function of increasing number of meander sections, these models provide a reasonable approximation of the relative change in resonant frequency. Here, some limitations of these inductor circuit model representations are examined for different meander line antennas having a fixed number of meander sections. These limitations are explained in a broad sense in terms of the equivalent circuit parameters of the meander line geometry.
DTIC
Inductors; Resonant Frequencies; Mathematical Models; Monopole Antennas; Equivalent Circuits

20030112571 California Inst. of Tech., Pasadena, CA
Simulation of Thermal Stability and Friction: A Lubricant Confined Between Monolayers of Wear Inhibitors on Iron Oxide
Cagin, Tahir; Zhou, Y.; Yamaguchi, E. S.; Frazier, R.; Ho, A.; Jan. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAAG55-97-1-0126
Report No.(s): AD-A418136; ARO-37254.104-CH-MUR; No Copyright; Avail: CASI; A02, Hardcopy

To understand antiwear phenomena in motor engines at the atomic level and provide evidence in selecting future ashless wear inhibitors, we studied the thermal stability of the self-assembled monolayer (SAM) model for dithiophosphate (DTP) and dithiocarbamate (DTC) molecules on the iron oxide surface using molecular dynamics. The interactions for DTP, DTC and Fe2O3 are evaluated based on a force field derived from fitting to ab initio quantum chemical calculations of dimethyl DTP (and DTC) and Fe(OH)2(H20)2-DTP (DTC) clusters. MD simulations at constant-NPT are conducted to asses relative thermal stabilities of the DTP and DTC with different pendant groups (n-propyl, i-propyl, n-pentyl, and i-pentyl). To investigate frictional process, we employ a steady state MD method in which one of the Fe2O3 slabs maintained at a constant linear velocity. We obtain the time averages normal and frictional forces from the interatomic forces. Then, we calculated the friction

coefficient at the interface between SAMs of DTP and the confined lubricant, hexadecane, to asses the shear stability of DTPs with different pendant groups.
DTIC
Thermal Stability; Lubricants

20030112647 Materials Research Society, Warrendale, PA
Materials Research Society Symposium Proceedings. Volume 746. Magnetoelectronics and Magnetic Materials - Novel Phenomena and Advanced Characterization
Zhang, Shufeng; Kuch, Wolfgang; Guentherodt, Gernot; Broholm, Collin; Kent, Andrew D.; Jan. 2003; 286 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0445; N00014-03-1-0202
Report No.(s): AD-A418228; No Copyright; Avail: CASI; A13, Hardcopy

The papers in this volume are drawn from Symposium Q, 'Magnetoelectronics-Novel Magnetic Phenomena in Nanostructures,' and Symposium R, 'Advanced Characterization of Artificially Structured Magnetic Materials,' which were held December 1-5 at the 2002 MRS Fall Meeting in Boston, Massachusetts. The common focus of interest was on artificially engineered nanostructured magnetic systems. The two symposia discussed new phenomena in such systems that are interesting for magnetoelectronic applications, their preparation, and advanced methodology for characterization. Interest in nanomagnetism has been catalyzed by advances in two fields of research: (i) Advances in materials synthesis of structures whose length scales transcend magnetic length scales and open the possibility for creating materials with new magnetic properties. Such structures include interfaces, superlattices, tunneling devices, nanostructures, and single- molecule magnets. (ii) Advances in sample characterization techniques for nanomagnetism allow detailed exploration of structure-property relationships in nanostructured magnetic systems. The symposia reviewed current trends in both fields, and provided a forum for discussions about the outlook for further advances and new capabilities.
DTIC
Magnetic Materials; Magnetic Properties; Nanostructures (Devices)

20030112727 California Inst. of Tech., Pasadena, CA
A Novel Approach to Large Electrostriction in Ferroelectrics
Bhattacharya, K.; Ravichandran, G.; May 31, 2003; 10 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0319
Report No.(s): AD-A418181; ARO-40191.3-EG; No Copyright; Avail: CASI; A02, Hardcopy

Ferroelectric materials are currently used in a variety of sensor and actuator applications. Conventional materials offer a high frequency, linear response with useful strains of up to 0.1 %. Additional applications ca be imagined for actuators that generate a great degree of strain. The current investigation is aimed at offering increased actuator performance over conventional materials. In addition, the study offers insight into the underlying principles of behavior of those materials currently in use. Experimental studies of large strain actuation has been carried out using a single crystal in novel configuration using Barium Titanate and Lead Titanate. Strains of about 0.9 % have been demonstrated in Barium Titanate and about 2 % in Lead Titanate. Theoretical studies have explored the possibility of extending this idea to polycrystals and to the ferroelectric/antiferroelectric phase transformation.
DTIC
Ferroelectric Materials; Electrostriction; Frequency Response; Phase Transformations

20030112731 Carnegie-Mellon Univ., Pittsburgh, PA
Measurement of Friction in Dynamic Systems
Akay, Adnan; Griffin, Jerry; Sep. 15, 2003; 7 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0393
Report No.(s): AD-A418183; AFRL-SR-AR-TR-03-0442; No Copyright; Avail: CASI; A02, Hardcopy

The goal of this project concerned the development of an experimental method to accurately infer and identify friction force in a dynamic system. During this one-year project, it was proposed to develop a method to measure friction and identify its damping and tangential stiffness components. From the measurements between surfaces of selected materials, tangential stiffness, friction damping properties, and coefficient of friction values were inferred. These results favorably compared with computational results obtained using available theories. The regime of relative motion used in the tests was primarily in the microslip region, which closely replicates bolted joints in large space structures as well as contact dampers between gas turbine blades. A comparison of measurement results for tangential stiffness with those obtained using Cattaneo-Mindlin theory is

shown in Fig 4 for two cases. The theoretical results agree well with those obtained from measurements for fresh surfaces, suggesting that the theories need further development for worn surfaces. This is a unique measurement device that allows repeatable and accurate measurements of relative motion and forces from which coefficient of friction, tangential stiffness, and friction damping properties can be inferred. Measurements are largely devoid of ancillary dynamic effects common in measurement systems.
DTIC
Friction; Friction Measurement

20030112732 Naval Postgraduate School, Monterey, CA
Design and Optimization of a 600-KJ Railgun Power Supply
Warnock, Dwight S.; Sep. 2003; 103 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418310; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this thesis is to explore the design options for a 1.2-m railgun power supply capable of accelerating a 150-g to 250-g projectile to 1000 m/s. In order to accomplish this task a MATLAB model will be constructed to conduct trade-off studies between various power supply configurations in an attempt to maximize the system performance. The final design shows that by distributing the system capacitance between four equal size banks and firing them sequentially the total system capacitance can be reduced by more than half. Because the capacitor banks are fired sequentially, the current pulse is lengthened resulting in more efficient use of the barrel. The final benefit of using a multiple-bank system is that the individual bank currents are reduced by a factor of four over the single-bank scenario. By reducing the bank currents solid-state switches are now an affordable option further improving the system performance. By applying a systematic approach to optimizing the power supply this study has shown that the energy required to accelerate a 172-g projectile to 1000 m/s can be reduced from 1.3 MJ in the single-bank scenario to 600 KJ by distributing the capacitance over four equal sized banks.
DTIC
Railgun Accelerators; Capacitance; Projectiles

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20030111110 Arizona Univ., Tucson, AZ, USA
Acoustic Fluidization and the Extraordinary Mobility of Sturzstroms
Collins, G. S.; Melosh, H. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Sturzstroms are a rare category of rock avalanche that travel vast horizontal distances with only a comparatively small vertical drop in height. Their extraordinary mobility appears to be a consequence of sustained fluid-like behavior during motion, which persists even for driving stresses well below those normally associated with granular flows. One mechanism with the potential for explaining this temporary increase in the mobility of rock debris is acoustic fluidization; where transient, high-frequency pressure fluctuations, generated during the initial collapse and subsequent flow of a mass of rock debris, may locally relieve overburden stresses in the rock mass and thus reduce the frictional resistance to slip between fragments. In this paper we develop the acoustic fluidization model for the mechanics of sturzstroms, and discuss the conditions under which this process may facilitate self-sustaining fluid-like flow of large rock avalanches at low driving stresses.
Derived from text
Acoustics; Fluidics; Avalanches; Mathematical Models; Rocks; Mobility

20030111909 Naval Postgraduate School, Monterey, CA
Performance of Acoustic Spread-Spectrum Signaling in Simulated Ocean Channels
Pelekanos, Georgios N.; Jun. 2003; 125 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417536; No Copyright; Avail: CASI; A06, Hardcopy

Direct-Sequence Spread Spectrum (DSSS) modulation is being advanced as the physical-layer basis for Seaweb undersea acoustic networking. DSSS meets the need for channel tolerance, transmission security, and multi-user access. This thesis investigates the performance of subspace-decomposition blind-equalization algorithms as alternatives to RAKE processing of DSSS signals. This approach is tailored for superior performance in time-dispersive and frequency- dispersive channels

characteristic of ocean acoustic propagation. Transmitter and receiver structures are implemented in Matlab and evaluated with a statistics-based model of a doubly spread channel with additive noise. Receiver performance is examined using Monte Carlo simulation. Bit- error rates versus signal-to-noise ratio are presented for various multipath assumptions, noise assumptions, and receiver synchronization assumptions.
DTIC
Acoustics; Signal to Noise Ratios; Channels (Data Transmission)

20030111994 State Univ. of New York, Buffalo, NY, USA
New Generation Photonics Materials: Design, Development, Characterization and Applications
Prasad, Paras N.; He, Guang S.; Sep. 19, 2003; 14 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0064
Report No.(s): AD-A417794; AFRL-SR-AR-TR-03-0399; No Copyright; Avail: CASI; A03, Hardcopy

Recent successes in developing two-photon absorption (2PA) materials and applications have now created significant interest in exploring three-photon absorption (3PA) based novel optical materials and new applications. 3PA- based techniques may exhibit two major advantages: (1) much longer IR wavelengths (1. 2-1.7 micronm) can be used, and (2) much better beam confinement (resolution) can be achieved owing to the cubic dependence of nonlinear absorption on the local intensity of the excitation IR light. We have demonstrated efficient three-photon excitation in a number of nonlinear organic materials developed at our Institute. Applications of novel and highly efficient three-photon absorbing materials include (i) three-photon pumped (3PP) and frequency upconverted lasing, (ii) 3PA-based optical power limiting and stabilization, (iii) 3PA-based bio-imaging via IR to visible conversion, and (iv) 3PA-associated 3D data storage and microfabrication. Some recent experimental results of 3PP lasing as well as 3PA-based power limiting are briefly presented.
DTIC
Optical Materials; Imaging Techniques; Absorbers (Materials); Photonics

20030112439 NASA Glenn Research Center, Cleveland, OH, USA
Determination of Dimensionless Attenuation Coefficient in Shaped Resonators
Daniels, C.; Steinetz, B.; Finkbeiner, J.; Raman, G.; Li, X.; [2003]; 25 pp.; In English; 145th Acoustical Society of America Conference, 28 Apr. - 2 May 2003, Nashville, TN, USA
Contract(s)/Grant(s): NCC3-840; NCC3-796; WBS 22-708-28-15
Report No.(s): Paper-4aPAa3; Copyright; Avail: CASI; A03, Hardcopy

The value of dimensionless attenuation coefficient is an important factor when numerically predicting high-amplitude acoustic waves in shaped resonators. Both the magnitude of the pressure waveform and the quality factor rely heavily on this dimensionless parameter. Previous authors have stated the values used, but have not completely explained their methods. This work fully describes the methodology used to determine this important parameter. Over a range of frequencies encompassing the fundamental resonance, the pressure waves were experimentally measured at each end of the shaped resonators. At the corresponding dimensionless acceleration, the numerical code modeled the acoustic waveforms generated in the resonator using various dimensionless attenuation coefficients. The dimensionless attenuation coefficient that most closely matched the pressure amplitudes and quality factors of the experimental and numerical results was determined to be the value to be used in subsequent studies.
Author
Attenuation Coefficients; Dimensionless Numbers; Resonators; Sound Waves

20030112548 Naval Surface Warfare Center, Bethesda, MD
Leading Edge Noise from Thick Foils in Turbulent Flows
Gershfeld, Jonathan; Sep. 2003; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418125; NSWCCD-72--TR-2003/099; No Copyright; Avail: CASI; A03, Hardcopy

The prediction of dipole sound from the diffraction of turbulence by the leading edge of a thick foil is made with the Kirchhoff integral for rigid surface scattering of the stagnation enthalpy. The incident field is determined from a volume integral and the rigid plane Green function using an equivalent form of Howe's (1975) acoustic analogy that is derived in terms of the mean free stream velocity and the fluctuating up-wash velocity found in Sears' (1941) analysis. A comparison of the measured and the predicted dipole sound made with the foil geometry and measured turbulence statistics from Paterson and Amiet (1976) shows good agreement. The thickness effect is incorporated in the governing Green function for the foil (Howe (1998a, 2001 a) and serves to exponentially attenuate the dipole sound pressure spectrum by the product of the convection

wave number and half the maximum section thickness. The dipole sound from a foil cutting through a mean shear layer is then calculated using an acoustic analogy where the source has retained the mean shear term. The ratio of the dipole sound of the mean shear source to the source without mean shear from the earlier calculation is determined to be proportional to the ratio of the mean shear to the frequency of the sources. Estimates of the dipole sound with and without the mean shear source are made for Olsen and Wagner's (1982) experiment.
DTIC
Turbulent Flow; Sound Pressure; Flow Velocity

20030112556 Woods Hole Oceanographic Inst., MA
Acoustic Scattering Classification of Zooplankton and Microstructure
Stanton, Timothy K.; Wiebe, Peter H.; Oct. 9, 2003; 9 pp.; In English
Contract(s)/Grant(s): N00014-95-1-0287
Report No.(s): AD-A418128; No Copyright; Avail: CASI; A02, Hardcopy

The long-term goals of this research were to understand the acoustic reverberation properties of zooplankton and microstructure and to apply these models, along with advanced instrumentation, to further our understanding of biological and physical processes in coastal and open ocean areas. The approach involved a combination of laboratory and in situ measurements of scattering by individual zooplankton, development of acoustic scattering models, development of broadband physics-based classification and signal processing techniques, surveying coastal waters with advanced instrumentation, and development and use of methods for discrimination between, and quantification of, the spatial and temporal patterns of biological and physical processes. Numerous papers were published in peer-reviewed scientific journals and many presentations were made at open conferences. The results were also summarized in books and book chapters. Impact on the scientific and navy communities was significant.
DTIC
Acoustic Scattering; Zooplankton

20030112693 Institute of Sound and Vibration Research, Southampton, UK
Stability and Accuracy of Finite Element Methods for Flow Acoustics, 2, Two Dimensional Propagation
Gabard, G.; Astley, R. J.; September 2003; 10 pp.; In English
Report No.(s): ISVR-TR-302; Copyright; Avail: Other Sources

The dispersion properties of finite element models for aeroacoustic propagation based on the convected scalar Helmholtz equation and on the Galbrun equation are examined. The current study focusses on the effect of the mean flow on the dispersion and amplitude errors present in the the discrete numerical solutions. A general two-dimensional dispersion analysis is presented for the discrete problem on a regular unbounded mesh, and results are presented for the particular case of one dimensional acoustic propagation in which the wave direction is aligned with the mean flow. The magnitude and sign of the mean flow is shown to have a significant effect on the accuracy of the numerical schemes. Quadratic Helmholtz elements in particular are shown to be much less effective for downstream-as opposed to upstream-propagation, even when the effect of wave shortening or elongation due to the mean flow is taken into account. These trends are also observed in solutions obtained for simple test problems on finite meshes. A similar analysis of two-dimensional propagation is presented in an accompanying report.
Author
Finite Element Method; Stability; Aeroacoustics; Flow Characteristics; Acoustic Propagation

20030112759 Naval Postgraduate School, Monterey, CA
Full-Duplex Underwater Networking
Tate, William R.; Sep. 2003; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418292; No Copyright; Avail: CASI; A05, Hardcopy

This thesis focuses on developing a full-duplex underwater acoustic network and in developing a new protocol utilizing demand assigned multiple access (DAMA) and frequency division multiple access code (FDMA). This new protocol will be utilized to expand networking capabilities in an underwater environment. A benefit of advancements in this area includes fiscal savings and optimization of bandwidth usage creating an increased rate of data transfer. The research conducted in establishing a full-duplex UAN using FDMA will put the Naval Postgraduate School at the forefront of UAN technology and make a significant contribution to understanding underwater networking, the benefits of full-duplex underwater networking, and full-duplex underwater networking using DAMA. These solutions will increase the efficiency and reliability of underwater

data transfer and in turn, could be used for further research or as a stepping stone towards improved monitoring of oceanographic anomalies and littoral waters.
DTIC
Underwater Acoustics; Communication Networks; Oceanography

20030112791 Naval Postgraduate School, Monterey, CA
The Optimization of a Dual Foil Flapping Device
Paganucci, Craigh J.; Sep. 2003; 72 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418218; No Copyright; Avail: CASI; A04, Hardcopy

Aquatic animals, such as dolphins and tuna, have the ability to swim and maneuver at much greater capacity than any man-made device. If their propulsion methods could be replicated mechanically, the benefits to underwater propulsion would be great. A dual foil pitching-plunging device is used to replicate the basic swimming motion of a dolphin. Numerical simulations are used to predict the behavior of a single foil configuration and its wake. The numerical results are used to predict the behavior of the device and to better direct the experimental study. Experimentally, both a single and dual foil configuration are optimized, with the goal being to determine the optimal conditions for maximizing aft foil thrust production.
DTIC
Underwater Propulsion; Optimization; Flapping; Foils (Materials); Dolphins

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

20030112695 Princeton Univ., NJ, USA
Probing 2D Physics with Microwave
Tsui, Daniel; Oct. 17, 2003; 4 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0284
Report No.(s): AD-A418070; AFRL-SR-AR-TR-03-0456; No Copyright; Avail: CASI; A01, Hardcopy

Microwave absorption, using the co-planar waveguide configuration that we developed earlier, was employed to investigate electron dynamics of the high mobility 2D charge carriers in GaAs/AlxGa1-xAs heterostructures. Three experiments were carried out: (1) Dynamic response of composite fermions in an anti-dot lattice (2) Observation of microwave induced cyclotron harmonics, and (3) Investigation of pinning of the Wigner crystal and measurement of the crystal correlation lengths as a function of carrier density.
DTIC
Quantum Electrodynamics; Crystals

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20030112103 NASA Marshall Space Flight Center, Huntsville, AL, USA
RF Manipulation and Detection of Protons in the High Performance Antiproton Trap (HiPAT) Experiment
Martin, James; Lewis, Raymond A.; Pearson, J. Boise; Sims, W. Herb; Chakrabarti, Suman; Fant, Wallace E.; Stan McDonald; [2003]; 1 pp.; In English; APS DPP Meeting, 27-31 Oct. 2003, Albuquerque, NM, USA; No Copyright; Avail: Other Sources; Abstract Only

HiPAT is a Penning-Malmberg trap designed to contain 10(exp 12) particles diagnostics of the plasma. Destructive particle detection is performed by extracting trapped ions from HiPAT and colliding them with a microchannel plate detector (providing number and energy information). The improved RF system has been used to detect various plasma modes for both electron and ion plasmas in the two traps at MSFC, including axd, cyclotron, and diocotron modes. New diagnostics are also being added to HiPAT to measure the axial density distribution of the trapped cloud to match measured RF plasma modes to

plasma conditions. In addition, plasma modeling efforts have been started using the XOOPIC code.
Author
Radio Frequencies; Protons; Detection; Trapped Particles

74
OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20030111954
Analysis and Design Tools for Passive Ranging and Reduced-Depth-of-Field Imaging
Cathey, W. T.; Braker, Benjamin; Sherif, Sherif; Sep. 19, 2003; 31 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0514
Report No.(s): AD-A417814; ARO-41404.6-PH; No Copyright; Avail: CASI; A03, Hardcopy

The imaging systems considered in this research involved optical image acquisition and digital signal processing. The work early during the period of this grant centered on a technique that is analogous to range detection in radar. This work used design tools in the spatial frequency domain, and the validity of the approach was confirmed in both simulations and experiments. Other work concentrated on design of the point spread function. An information theory approach was used, and the orthogonality of the images was considered. This work led to special forms of structured illumination that can be used to reduce the depth of field of an imaging system. An indirect, but important, result of the research during this period was an impact on the growth of the interest in the field of hybrid optical/digital imaging systems, or 'integrated computational imaging systems' or 'wavefront coding' as it is also called.
DTIC
Imaging Techniques; Rangefinding; Signal Processing; Digital Systems

20030112120 NASA Marshall Space Flight Center, Huntsville, AL, USA
Coherent Effects in Tiny Optics: Tunneling Through the Looking Glass
Smith, David D.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

I will discuss two types of one-dimensional photonic bandgap (PBG) effects that can arise in systems of coupled spherical resonators: (1) nearly-free-photon Fabry-Perot photonic bands that arise in quarter-wave concentrically stratified spheres and, (2) tight- binding photonic bands that arise in weakly-coupled mutually-resonant spheres as a result of whispering-gallery mode splitting. These effects can be derived directly from Mie theory, in a more straightforward manner, by exploiting an analogy with stratified planar systems. For odd numbers of mutually-resonant lossless coupled ring resonators, the circulating intensity can increase exponentially with the number of resonators, which can potentially be exploited for the development of advanced sensors. For even numbers of resonators, mode splitting and classical destructive interference lead to a cancellation of absorption and slow light on-resonance, reminiscent of electromagnetic induced transparency. The analogy between these coherent photon trapping effects and population trapping in an atomic system will be explored.
Author
Photons; Glass; Optics; Coherent Radiation

20030112257 NASA Marshall Space Flight Center, Huntsville, AL, USA
Large Solar Observatory
Choudhary, Debi Prasad; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

This article summarizes the scientific aim, design considerations and observatory site of a large optical solar telescope. The day time 'seeing' is better on the islands, surrounded by large body of water, compared to the mountain sites. Therefore, in order to obtain the solar images with sub-arcsec resolution, the observatory site should be preferably located on an island. A list of potential sites on Himalayas and surrounding region is given. A brief description of the telescope design, enclosure and back-end instruments are also presented.
Author
Solar Observatories; Design Analysis; Solar Optical Telescope

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20030111906 NASA Marshall Space Flight Center, Huntsville, AL, USA
Plasma Interactions with a Negative Biased Electrodynamic Tether
Vaughn, Jason A.; Welzyn, Ken J.; Curtis, Leslie; August 18, 2003; 1 pp.; In English; 8th Spacecraft Charging Conference, 20-24 Oct. 2003, Huntsville, AL, USA
Contract(s)/Grant(s): 718-30-01; No Copyright; Avail: Other Sources; Abstract Only

The ProSEDS conductive tether design incorporates two distinct types of tethers from a plasma interaction viewpoint. The 200 m closest to the Delta 11 spacecraft is insulated from the plasma, and the remaining 5000 m is semi-bare. This latter portion is semi-bare because it has a conductive coating applied to the wires to permit electron collection while also regulating the overall tether temperature. Because the tether possesses these two distinct types of tethers, a transition point exists between the two types that form a triple point with the space plasma. Insulated tethers can suffer from a second plasma interaction if the insulation is weakened or breached, such as by pinholes caused by small particle debris strikes. Because electrodynamic tethers are typically long, they have a high probability of such impacts. These impacting particles may not be of sufficient size to severe the tether, but they can easily be of sufficient size to damage the tether insulation. Samples of both the ProSEDS tether transition region and the insulated tether section (with various degrees of pinhole damage) were placed into the MSFC plasma chamber and biased to typical ProSEDS open circuit tether potentials (-500 V to -1600 V). The results of the testing showed that the transition region of the tether (i.e. the triple point) arced and burned the tether in two at -900 V, and the damaged insulated sections arced and burned in two between -1000 V and -1600, depending on the pinhole damage geometry. tether design and make the tether ready for flight. To reduce the pinhole arcing risk, ProSEDS mission operations were changed to eliminate the negative potential on the tether. The results of the testing campaign and the design changes implemented to ensure a successful flight will be described.
Author
Plasma Interactions; Tethering; Electrodynamics

20030112232 NASA Langley Research Center, Hampton, VA, USA
Piezoelectric Actuator Modeling Using MSC/NASTRAN and MATLAB
Reaves, Mercedes C.; Horta, Lucas G.; October 2003; 29 pp.; In English
Contract(s)/Grant(s): 23-762-40-31
Report No.(s): NASA/TM-2003-212651; L-19005; NAS 1.15:212651; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a procedure for modeling structures containing piezoelectric actuators using MSCMASTRAN and MATLAB. The paper describes the utility and functionality of one set of validated modeling tools. The tools described herein use MSCMASTRAN to model the structure with piezoelectric actuators and a thermally induced strain to model straining of the actuators due to an applied voltage field. MATLAB scripts are used to assemble the dynamic equations and to generate frequency response functions. The application of these tools is discussed using a cantilever aluminum beam with a surface mounted piezoelectric actuator as a sample problem. Software in the form of MSCINASTRAN DMAP input commands, MATLAB scripts, and a step-by-step procedure to solve the example problem are provided. Analysis results are generated in terms of frequency response functions from deflection and strain data as a function of input voltage to the actuator.
Author
Piezoelectric Actuators; Actuators; Models; Electric Potential; Frequency Response

20030112234 NASA Marshall Space Flight Center, Huntsville, AL, USA
Density Irregularities Inside the Plasmasphere: Cluster Observations
Darrouzet, F.; Lemaire, J. F.; Decreau, P. M. E.; DeKeyser, J.; Masson, A.; Gallagher, D. L.; Santolik, O.; Trotignon, J. G.; Rauch, J. L.; LeGuirriec, E., et al.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

The electron density profiles derived from the EFW and WHISPER instruments onboard the four Cluster spacecraft reveal small-scale density irregularities inside the plasmasphere and at its outer boundary, the plasmapause. We review statistics of the plasmapause position and thickness, as well as statistics of these density structures. We focus on a particular plasmasphere crossing on 11 April 2002, with several density irregularities, as well as two plasma tails, observed by Cluster on the legs of the inbound and outbound passes. We derive the density gradient vectors from simultaneous density measurements by the four spacecraft. We determine also the normal velocity of the surface of these irregularities, assuming they are planar boundaries,

from the time delays between density structures in the four individual density profiles. These new observations yield novel insights about (1) the dimensions of plasma irregularities across and parallel to magnetic field lines, (2) the dynamics of these small-scale structures, (3) their bulk velocities, and (4) their position and distribution as a function of the magnetic local time (MLT) and the geomagnetic conditions (as determined by Kp).
Author
Density Measurement; Plasmasphere; Cluster Analysis; Electron Density Profiles; Irregularities

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20030112086 Nippon Telegraph and Telephone Public Corp., Japan
Single-Electron Devices Formed by Pattern-Dependent Oxidation: Microscopic Structural Evaluation
Nagase, M.; Horiguchi, S.; Fujiwara, A.; Ono, Y.; Yamazaki, K.; Namatsu, H.; Takahashi, Y.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 101; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

The embedded Si structure formed by pattern-dependent oxidation (PADOX) in a single-electron device (SED) is analyzed by novel microscopic methods using scanning electron microscopy (SEM) and atomic force microscopy (AFM). The surface charge imaging SEM reveals the outline of the embedded Si nanowire of the electrically measured SED. The size of the wire in the device is small enough to make a potential barrier caused by the quantum mechanical size effect. The result of the Si height in the oxidized structure estimated by AFM indicates that the huge stress induced by oxidation is applied to the narrow Si wire. The experimental results support the theoretical model of the SED fabricated by PADOX that the potential profile responsible for the SED operation is produced by two effects: the quantum mechanical size effect and the strain-induced bandgap reduction.
Author
Oxidation; Silicon; Semiconductor Devices; Nanofabrication; Electronic Equipment

20030112088 Nippon Telegraph and Telephone Public Corp., Japan
Real-time Spectro-Ellipsometric Characterization of Si/Si(1-x)Ge(x) Multiple Quantum Wells Grown on Si(100) Substrates
Akazawa, H.; NTT Technical Review, Vol. 1, No. 1; April 2003, pp. 102; In English; See also 20030112065; Copyright; Avail: Other Sources; Abstract Only

In-situ spectro-ellipsometric measurement was used to obtain the various structural parameters that characterize Si/Si(1-x)Ge(x), multiple quantum wells (MQW) grown on Si (100) substrates. The primary feature of the evolution of the ellipsometric angles in the time domain is a short-period oscillation of their signal levels resulting from the change in optical contrast when the top layer is alternately exchanged between Si/Si(1-x)Ge(x) and Si. The top layer material and the number of layer pairs at each moment of growth can be derived from the oscillation. At transparent between the whole MQW and the Si substrate superimposes itself as an envelope curve on the short-period modulation. The overall growth rate can be derived from the modulation.
Author
Quantum Wells; Semiconductor Devices

20030112212 Clarkson Univ., Potsdam, NY, USA
Improved Crystal Quality by Detached Solidification in Microgravity
Regel, Liya L.; Wilcox, William R.; [2003]; 90 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG8-1482; No Copyright; Avail: CASI; A05, Hardcopy

The goals of our work on detached solidification have been to: 1) Develop a complete understanding of all of the phenomena of detached solidification; 2) Make it possible to achieve detached solidification reproducibly; and 3) Increase crystallographic perfection through detached solidification. Specifically, we aimed in this project to: 1) Identify a system and develop methods that would allow viewing of the melt surface and convection in the melt during detached solidification in microgravity; 2) Improve understanding of the origination and evolution of detachment through experiments and theoretical treatments; and 3) Achieve detachment on earth. The project resulted in 14 publications, 15 presentations, completion of 2

Ph.D. theses, and completion of 2 M.S. theses. Two additional papers are currently being reviewed for publication. Copies of most of the papers are included as appendices.
Derived from text
Crystallography; Crystal Growth; Microgravity; Solidification

20030112244 NASA Glenn Research Center, Cleveland, OH, USA
High Electron Mobility in SiGe/Si n-MODFET Structures on Sapphire Substrates
Mueller, Carl H.; Croke, Edward T.; Alterovitz, Samuel A.; February 10, 2003; 9 pp.; In English
Contract(s)/Grant(s): WBS 274-00-01-05; Copyright; Avail: CASI; A02, Hardcopy

For the first time, SiGe/Si n-Modulation Doped Field Effect Transistors (n-MODFET) structures have been grown on sapphire substrates. Room temperature electron mobility value of 1271 square centimeters N-sec at an electron carrier density (n(sub e) = 1.33x10(exp 12) per square centimeter)) of 1.6 x 10(exp 12) per square centimeter was obtained. At 250 mK, the mobility increases to 13,313 square centimeters/V-sec (n(sub e)=1.33x10(exp 12) per square centimeter)) and Shubnikov-de Haas oscillations appear, showing excellent confinement of the two-dimensional electron gas.
Author
Modfets; Electron Mobility; Sapphire; Substrates; SOI (Semiconductors); Germanium

20030112407 NASA Marshall Space Flight Center, Huntsville, AL, USA
Notes on Interface Growth Kinetics 50 Years After Burton, Cabrera and Frank
Chernov, A. A.; [2003]; 1 pp.; In English
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Other Sources; Abstract Only

This is an overview of basic problems of crystal growth kinetics controlled by processes on the crystal interface with solution and melt. Included, also, are results on fundamental issues concerning morphological stability of crystal-solution interface that engage both interface kinetics and mass transport by diffusion and convection.
Author
Kinetics; Morphology; Melts (Crystal Growth); Crystals

20030112755 Lehigh Univ., Bethlehem, PA
Single Crystal Relaxor Ferroelectrics by Seeded Polycrystal Conversion
Harmer, Martin P.; Chan, Helen M.; Gorzkowski, Edward P.; King, Patrick T.; Rockosi, Derrick J.; Aug. 8, 2003; 279 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0340
Report No.(s): AD-A418287; CAMN-533051; AFRL-SR-AR-TR-03-0339; No Copyright; Avail: CASI; A13, Hardcopy

The group at Lehigh University has implemented the successful application of Seeded Polycrystal Conversion (SPC) to ferroelectric materials. Initial work at Lehigh established the feasibility of using the SPC process to grow single crystals of the relaxor-based ferroelectric PbMg(1/3)Nb(2/3))O(3-) 5mol%PbTiO3 (PMN-3 5PT) from seed crystals of the same composition. However, much work was needed to refine this process. Maintaining single crystal growth until full conversion of the polycrystal can only be achieved with a fundamental understanding of the factors that influence the migrating boundary. The present work addressed, in particular, the roles of liquid phase content and chemistry, matrix grain size, and porosity, as previous results have indicated these to be key variables. Some strides have been made in understanding the roles of each of the above key variables. In fact, over the past year, the Lehigh group has begun to model the effect of matrix grain size on single crystal growth. By improving this model, a better understanding of why single crystal growth slows can be achieved by pinpointing the mechanism of growth. Additionally, great progress has been made in microscopic characterization of samples as Lehigh has acquired a dual-beam focused ion beam (FIB). This instrument allows for the TEM preparation of samples across specific boundary interfaces in the PMN-PT system, previously unattainable with traditional sample preparation techniques. This will help gain a better understanding of the liquid phase chemistry and its role in the SPC process.
DTIC
Ferroelectricity; Polycrystals; Single Crystals; Crystal Growth

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20030109441 Kyoto Univ., Japan
J/Psi Production in p+p Collisions at (square root of)s=200 GeV
Sato, Hiroki; Memoirs of the Faculty of Sciences, Kyoto University. Series of Physics, Astrophysics, Geophysics and Chemistry; 2003; Volume 44, No. 1, pp. 89-193; In English; Original contains black and white illustrations; Copyright; Avail: Other Sources

Total and differential cross sections for inclusive J/psi production have been measured in (square root of)s = 200 GeV p+p collisions at Relativistic Heavy Ion Collider in Brookhaven National Laboratory. J/psi particles have been clearly identified via mu+mu- decays measured in the forward muon spectrometer covering 1.2 < y < 2.2 and via e+e- decays measured in the mid-rapidity spectrometers of the PHENIX experiment. Details of the muon channel measurement are presented in this paper based upon an 81-nb(exp -1) integrated luminosity obtained in the second run period at RHIC. Corrected with the detection efficiency, the branching fraction times rapidity-differential cross section at forward rapidity Br(J/psi (right arrow) mu+mu-) dsigma(sub J/psi) / dy(vertical line)(sub y=1.7) = 37 +/- 7 (stat.) +/- 11 (syst.) nb has been obtained. The average transverse momentum of the J/psi's, <p(sub T> = 1.66 + 0.18 (stat.) +/- 0.12 (syst.) GeV/c, is slightly higher than lower-energy results and consistent with a model expectation based on perturbative QCD. The total production cross section sigma(sub J/psi) = 3.8 +/- 0.6 (stat.) +/- 1.3 (syst.) mub has been extracted by fitting both the muon and electron channel measurements, which is related with lower-energy results by gluon distribution functions currently available. Its normalization is well reproduced by both the color-octet model and color-evaporation model. The results have established the baseline necessary for the QGP search in Au+Au collisions as well as gluon polarization measurements in polarized p+p collisions at RHIC, where the unpolarized cross sec- tions presented here will determine the absolute normalization.
Author
Quantum Chromodynamics; Muons; Particle Collisions; Ionic Collisions; Scattering Cross Sections; Gold

20030111928 Naval Postgraduate School, Monterey, CA
Effects of Thermobaricity on Coupled Ice-Mixed Layer Thermodynamics
Roth, Mathias K.; Jun. 2003; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A417572; No Copyright; Avail: CASI; A05, Hardcopy

The unique properties of the temperature and salinity profiles for polar oceans are critical for high- latitude mixed layer thermodynamics. In the Polar regions the water column is coldest and freshest at the surface where ice may be present. This density structure often leads to entrainment and affects both the mixed layer depth and the ice thickness, Thermobaricity, the combined dependence of seawater thermal expansion on temperature and pressure, magnifies the buoyancy flux associated with mixed layer convection. When thermobaricity amplifies entrainment so that the heat into the mixed layer is greater than the heat leaving the water column, the mixed layer warms and any existing ice begins to melt. Similarly, if the heat entrained is less than the heat leaving the column, the mixed layer cools and freezing occurs at the surface, In the former situation a polynya, or region of no ice surrounded by ice coverage, may form. A one-dimensional vertical model is built, and trial cases are run to show the intricate relationships that govern the heat and salt fluxes and subsequent ice thickness. The model shows the importance of thermobaricity to the air-sea-ice interactions. It also offers significant insight into how relatively constant atmospheric forcing can lead to polynya-like conditions.
DTIC
Thermodynamics; Ice Formation

20030111988 Oregon Univ., Eugene, OR
Quantum Logic Using Excitonic Quantum Dots in External Optical Microcavities
Raymer, Michael G.; Sep. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0344
Report No.(s): AD-A417802; ARO-40317.1-PH-QC; No Copyright; Avail: CASI; A01, Hardcopy

An experimental project was undertaken to develop means to achieve quantum optical strong coupling between a single GaAs quantum dot and the optical mode of a microcavity for the purpose of quantum control of dot and photon states for

quantum information processing. Good progress was made in design and fabrication of the quantum dot structure and the microcavity and initial results were obtained.
DTIC
Quantum Dots; Quantum Optics; Optical Coupling

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20030110585 Youngstown State Univ., OH, USA
Teaching General Education College Science Via the Mars Student Imaging Project
Beiersdorfer, R. E.; Valderrama, P.; Singler, C. R.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Asking and answering scientific questions using recent data acquired from the THEMIS instrument aboard the Mars Odyssey spacecraft is a great way to motivate college students enrolled in a required General Education science laboratory class.
Derived from text
Education; Students; Themis Project

20030110761 Arizona State Univ., Tempe, AZ, USA
Encouraging Student Interest in Science, Math, and Technology Using an Authentic Research Model: First Year Results from the Mars Student Imaging Project
Klug, S. L.; Christensen, P. R.; Watt, K.; Watt, S.; Valderrama, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Student Imaging Project (MSIP) provides the opportunity and pathway for educators to move students from studying science in an historical manner (i.e. text books) or passively observing scientists in action, to active participation in one of the still-remaining frontiers of science - the exploration of another planet - Mars. Dr. Phil Christensen, Principal Investigator for the THEMIS (Thermal Emission Imaging System) camera and long-time education and outreach advocate, recognized the opportunity to involve large numbers of students as actual researchers and has allocated a percentage of the THEMIS visible camera images to be targeted, acquired, processed, and analyzed by 5th grade through non-science major undergraduate college students participating in MSIP. The Mars Student Imaging Project curricula was created, written, developed, and tested by the ASU Mars Education Program staff, led by the efforts of curriculum specialist K. Watt and editor P. Valderrama. MSIP formally began beta testing the curriculum with student teams in March 2002, after the successful arrival and orbit insertion of the Mars 2001 Odyssey spacecraft and calibration of the THEMIS camera.
Author
Education; Mars (Planet); Image Analysis

20030110952 Antarctic Search for Meteorites, USA
Connecting Students to Meteorite Recovery and Research
Caldwell, Andrew; Foos, Matthew; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Through the use of technology and innovative activities, great opportunities are possible for connecting classrooms with authentic research. Students seem to have a natural curiosity and enthusiasm for meteorites. Through the Teachers Experiencing the Arctic and Antarctic Program (TEA) and the Antarctic Search for Meteorites (ANSMET), students at Douglas County High School (DCHS) have been able to be connected to meteorite recovery efforts in the field. They have also been able to gain first hand knowledge of current research being conducted on meteorites. In addition to this, students at DCHS have had opportunities to participate in field searches and in the implementation of a digital camera network that

endeavors to track bolide events in Colorado through the Denver Museum of Nature and Science (DMNS).
Derived from text
Meteorites; Education

20030111174 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA
Determining Age: An Educational Perspective on Our Place in Time
Grier, J. A.; Steel, S. J.; Dussault, M. E.; Gould, R. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We will present a poster detailing our development of a content strand called Our Place in Time . We hope to use this opportunity to introduce our current ideas for the strand, as well as to generate discussion and acquire feedback from interested scientists and educators. This strand integrates a continuum of ideas, and will be a natural focus point for interaction and collaboration with scientists and educators in solar system exploration and beyond. Eventually, the resources developed in conjunction with this strand will be useful to those educating students from K-16 and graduate students. Scientists interested in making their work more easily accessible to the media and general public will find the strand helpful in providing a big-picture context for their research.
Author
Education; Origins; Chronology; Geochronology

20030111589 Texas Univ., Dallas, TX, USA
Space Science in the Early Elementary Classroom: A New Twist on the Classic Scale Model Solar System Activity
Urquhart, M. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Very few space science activities appropriate for children in early elementary are available for classroom use. This is especially true of activities that have quality science and math content. However, the dearth of quality activities does not necessarily reflect the demand. Children as young as preschoolers often have a natural interest in space, perhaps second only to their love of dinosaurs. Educators can utilize lessons that tap into the innate passions of their students to teach a wide variety of skills and content across the curriculum. Leveraging off of natural interest is not the only reason to introduce a young child to space science concepts in a formal education setting. Young children are in the process of forming mental models, with or without instruction. Upper elementary students already have astronomy misconceptions similar to those common in adults. Early intervention through the use of well-designed activities may be able to prevent the formation of some inaccurate astronomical mental models in children.I
Author
Education; Solar System

20030111852 Norfolk State Univ., VA, USA
Technical Education Outreach in Materials Science and Technology Based on NASA's Materials Research
Jacobs, James A.; March 15, 2003; 35 pp.; In English
Contract(s)/Grant(s): NAG1-2125; No Copyright; Avail: CASI; A03, Hardcopy

The grant NAG-1 -2125, Technical Education Outreach in Materials Science and Technology, based on NASA s Materials Research, involves collaborative effort among the National Aeronautics and Space Administration s Langley Research Center (NASA-LaRC), Norfolk State University (NSU), national research centers, private industry, technical societies, colleges and universities. The collaboration aims to strengthen math, science and technology education by providing outreach related to materials science and technology (MST). The goal of the project is to transfer new developments from LaRC s Center for Excellence for Structures and Materials and other NASA materials research into technical education across the nation to provide educational outreach and strengthen technical education. To achieve this goal we are employing two main strategies: 1) development of the gateway website <MST-Online.nsu.edu> and 2) using the National Educators Workshop: Update in Engineering Materials, Science and Technology (NEW:Updates). We have also participated in a number of national projects, presented talks at technical meetings and published articles aimed at improving k-12 technical education. Through the three years of this project the NSU team developed the successful MST-Online site and continued to upgrade and update it as our limited resources permitted. Three annual NEW:Updates conducted from 2000 though 2002 overcame the challenges presented first by the September 11,2001 terrorist attacks and the slow U.S. economy and still managed to conduct very

effective workshops and expand our outreach efforts. Plans began on NEW:Update 2003 to be hosted by NASA Langley as a part of the celebration of the Centennial of Controlled Flight.
Author
Education; Research and Development; Technologies; Materials Science

20030112024 Idaho Univ., Moscow, ID, USA
Idaho Space Grant Education Outreach Opportunities
Odell, Michael; Kennedy, Teresa; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; 7 pp.; In English; See also 20030112018; Copyright; Avail: CASI; A02, Hardcopy

Idaho is the only state Space Grant Consortium to be jointly administered by a College of Engineering and College of Education. The Idaho Space Grant Consortium (ISGC) consists of members composed of all Idaho Institutions of Higher Education, Informal Education Agencies (museums, science centers and educational organizations), a research laboratory (Idaho National Engineering Environmental Laboratory), a state park (Bruneau Sand Dunes), a national monument (Craters of the Moon), and many businesses.Idaho is a Capability Enhancement State. The ISGC provides scholarships and fellowships to students in SMET and science education programs who all volunteer time in K-12 classrooms. The Idaho Space Grant Consortium (ISGC) has strong ties to the scientific, engineering and education communities which results in very unique projects and diverse outreach programs. Information regarding current ISGC programs follow.
Author
Education; Astronomy; Physics; Environmental Quality

20030112025 Montana State Univ., Bozeman, MT, USA
National Space Grant Student Satellite Program
Hiscock, William A.; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; 11 pp.; In English; See also 20030112018; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Across America, Space Grant students are learning from the ground up--literally--by designing, building, flying and operating a broad range of spacecraft. Students come with an interest in Space, but with different levels of skill, knowledge, and experience. Missions of growing complexity provide opportunities to acquire baseline skills and then to build on them. They range from the simple--building soda-can 'satellites' or small payloads for launch from small rockets or balloons--to building sophisticated satellites. We call this strategy 'crawl', 'walk', 'run' and 'fly!'. Our goal is to make aerospace history and send the first student-built satellites to Mars.Examples are briefly described.
Author
Space Programs; Education

20030112359 Purdue Univ., West Lafayette, IN, USA
Ethics Education in University Aviation Management Programs in the US, Part 2B, Statistical Analysis of Current Practice
Oderman, Dale B.; Journal of Air Transportation, Volume 8, No. 2; 2003, pp. 105-128; In English; See also 20030112355; Copyright; Avail: CASI; A03, Hardcopy

This three-part study examines how four-year universities in the U.S. with baccalaureate programs in aviation management include ethics instruction in their curricula. Part One justified the need for ethics education and developed hypotheses to evaluate the current status of ethics instruction. Part Two of the study continued with a quantitative analysis of an extensive survey of all collegiate aviation management department heads. Survey data reported in Part Two A revealed that ethics is not widely included in collegiate aviation programs at levels expected in light of current industry problems. Part Two B of the study, which follows, shows that as predicted, strong department head support for ethics instruction and active department head involvement in teaching ethics led to higher levels of planned ethics inclusion. Faculty interest was a second influential characteristic.
Author
Ethics; Aeronautics; Education

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20030111041 Hungarian Academy of Sciences, Budapest, Hungary
'Geonomy' by E. Szadeczky-Kardoss: New Auxiliary Studies Update the Poineering Book in Space and Earth Science Education in Hungary
Dudich, E.; Poka, T.; Berczi, S.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

E. Szadeczky-Kardoss, Professor of Petrology and Geochemistry of L.Eotvos University, Budapest, Hungary (1903-1984) defined the synoptic and synthesing earth science as geonomy. In his Hungarian-language book of 1974 Sz deczky-Kardoss successfully alloyed planetary science and space research results in earth sciences, with particular attention to the advances in molecular biology and submarine (ocean floor) geology. He took efforts to extend the methods of geology and its disciplines to the whole Universe, and to achieve an integrated, holistic, humanistic world view. He also emphasized the responsibility of Man, i.e. human society, for the future of the Earth, attributing high priority to education on all levels. Our multidisciplinary Sub-commission of the HAS consisting of geologists, astronomers, physicists and biologists, undertook a review and updating of this almost 30 year old book to serve, among other things, also space and earth science education in Hungary, on the occasion of the 100th anniversary of the author s birth. The resulting volume (in press) bears the title 'Geonomy after the Turn of Millennium'
Author
Earth Sciences; Education; Geochemistry; Geological Surveys; Molecular Biology

20030111705 Massachusetts Inst. of Tech., Cambridge, MA, USA
Archetypes for Organisational Safety
Marais, Karen; Leveson, Nancy G.; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 1-15; In English; See also 20030111704
Contract(s)/Grant(s): NAG2-1543; NSF CCR-00-85829; No Copyright; Avail: CASI; A03, Hardcopy

We propose a framework using system dynamics to model the dynamic behavior of organizations in accident analysis. Most current accident analysis techniques are event-based and do not adequately capture the dynamic complexity and non-linear interactions that characterize accidents in complex systems. In this paper we propose a set of system safety archetypes that model common safety culture flaws in organizations, i.e., the dynamic behaviour of organizations that often leads to accidents. As accident analysis and investigation tools, the archetypes can be used to develop dynamic models that describe the systemic and organizational factors contributing to the accident. The archetypes help clarify why safety-related decisions do not always result in the desired behavior, and how independent decisions in different parts of the organization can combine to impact safety.
Author
Systems Analysis; Organizations; Safety Factors; Dynamical Systems; Safety Management

20030111710 Maritime Labour Research Inst, Tokyo, Japan
Evaluation of Navigators' Performance Shaping Factors in Marine Incidents
Murayama, Yoshio; Yamazaki, Yusuke; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 221-228; In English; See also 20030111704; No Copyright; Avail: CASI; A02, Hardcopy

This article discusses progress in the development of an incident investigation system to improve maritime safety management. The authors designed a questionnaire about marine incidents and the conditions of navigators Performance Shaping Factors (PSF) in those incidents. The results revealed important dangerous relationships between unsafe acts and PSF, through analysis by a contingency table and stratification of the contingency table by a third factor, step by step according to cause and effect. The results showed that an unsafe delay in the recognition of danger was strongly affected by 5 factors directly, 13 factors indirectly, and some background factors. Mistakes in decision-making were affected by 5 direct factors, 19 indirect factors, and a few background factors. The frequency of these unsafe acts ranged from 11 to 40%, depending on the combinations of the factors. The particularly influential combinations of factors contributing to delays in danger recognition were Enthrallment with 5 indirect factors and Drowsiness with 5 indirect factors. Those of mistakes in

decision-making were Drowsiness with 10 in direct factors and Unexpected with 5 other factors.
Author
Navigators; Ships; Safety Management; Accident Investigation; Human Performance

20030111713 Texas A&M Univ., College Station, TX, USA
Use of Incident Data Collection from Various Sources for Industrial Safety Performance Assessments
Keren, Nir; OConnor, T. Michael; Mannan, M. Sam; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 51-67; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

Many organizations collect data on industrial incidents. These organizations differ from each other in their interests, data collection procedures, definitions, and scope, and each of them is analyzing its data to achieve its goal and to accomplish its mission. However, there were no attempts to explore the potential hidden in integrating data sources. Extensive efforts are required in order to integrate information from different data sources as well as to identify the effects of the individual aspects of data collection procedures on the quality and completeness of the data. This paper describes a methodology for incident data collection from various sources, and the opportunity that exists in a combined data mart for industrial safety performance assessment and identification of trends. Additionally, such analysis can be used to determine the areas for major reduction of losses and reduction in the number of incidents.
Author
Data Acquisition; Industrial Safety; Performance; Assessments

20030112146 NASA Marshall Space Flight Center, Huntsville, AL, USA
Enabling Sustainable Exploration through the Commercial Development of Space
Nall, Mark; Casas, Joseph; [2003]; 1 pp.; In English; 54th International Astronautical Congress, 29 Sep. - 3 Oct. 2003, Bremen, Germany; No Copyright; Avail: Other Sources; Abstract Only

The commercial development of space offers enabling benefits to space exploration. This paper examines how those benefits can be realized, and how the Space Product Development Office of the National Aeronautics and Space Administration is taking the first steps towards opening the space frontier through vital and sustainable industrial development. The Space Product Development Office manages 15 Commercial Space Centers that partner with US industry to develop opportunities for commerce in space. This partnership directly benefits NASA exploration in four primary ways. First, by actively involving traditional and non-traditional companies in commercial space activities, it seeks and encourages to the maximum extent possible the fullest commercial use of space, as directed by NASA's charter. Second, the commercial research and technologies pursued and developed in the program often have direct applicability to NASA priority mission areas. This dual use strategy for research and technology has the potential to greatly expand what the NASA scientific community can do. Third, the commercial experiment hardware developed by the Commercial Space Centers and their industrial partners is available for use by NASA researchers in support of priority NASA research. By utilizing low cost and existing commercial hardware, essential NASA research can be more readily accomplished. Fourth, by assisting industry in understanding the use of the environment of space and in helping industry enhance the tools and technologies for NASA and commercial space systems, the market for commercial space utilization and the capability for meeting the future growing market needs is being developed. These two activities taken together form the beginning of a new space economy that will enable sustainable NASA exploration of the universe.
Author
Aerospace Systems; Market Research; Space Commercialization; Space Exploration

20030112231 NASA Marshall Space Flight Center, Huntsville, AL, USA
Orbital Space Plane Cost Credibility
Creech, Steve; January 9, 2003; 1 pp.; In English; 54th International Astronautical Congress, 29 Sep. - 3 Oct. 2003, Bremen, Germany; No Copyright; Avail: Other Sources; Abstract Only

NASA's largest new start development program is the Orbital Space Plane (OSP) Program. The program is currently in the formulation stage. One of the critical issues to be resolved, prior to initiating full-scale development, is establishing cost credibility of NASA s budget estimates for development, production, and operations of the OSP. This paper will discuss the processes, tools, and methodologies that NASA, along with its industry partners, are implementing to assure cost credibility

for the OSP program. Results of benchmarking of current tools and the development of new cost estimating capabilities and approaches will be discussed.
Author
Cost Estimates; Aerospace Planes

20030112466 Virginia Air and Space Center, Hampton, VA, USA
Educator Resource Center for NASA Langley Research Center
Bridgford, Todd; Koltun, Nick R.; December 11, 2003; 6 pp.; In English
Contract(s)/Grant(s): NAG1-2255
Report No.(s): NASA/EG-2001-08-22-LARC; No Copyright; Avail: CASI; A02, Hardcopy

The goal of the ERCN is to provide expertise and facilities to help educators access and utilize science, mathematics, and technology instructional products aligned with national standards and appropriate state frameworks and based on NASA s unique mission and results. The NASA Langley s Office of Education has established the service area for this ERC to be the five states of Kentucky, North Carolina, South Carolina, Virginia and West Virginia. This educational grant activity is associated with NASA s Mission to inspire the next generation of explorers.. .as only NASA can. The communication of NASA s knowledge is the prime role of this ERC. Functioning as a dissemination system of instructional materials and support for pre-college education programs we have met the NASA Education ERCN Program's goal. The following ERCN objectives have been accomplished: Demonstrate and facilitate the use of NASA educational products and technologies in print, video and web based formats. Examples include but are not limited to NASA approved Educator s Guides with Activities based on national standards for appropriate subjects and grade levels. We have demonstrated the use videotape series in analogue format and the new digital video instructional systems along with the use of NASA TV. The promotion of web page based resources such as the new NASA Portal web and the ability to download print resources is continuously facilitated in workshops. This objective has been completed by educator contacts that include on-site visits, phone requests, postal mail requests, e-mail requests, fax requests and workshops offered.
Derived from text
Education; Digital Television; Electronic Mail; Television Systems

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20030110875 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA
Expanded Citations Database in the NASA ADS Abstract Service
Eichhorn, G.; Accomazzi, A.; Grant, C. S.; Kurtz, M. J.; Henneken, E. A.; Murray, S. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NCC5-189; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA-ADS Abstract Service provides a sophisticated search capability for the literature in Astronomy, Planetary Sciences, Physics/Geophysics, and Space Instrumentation. The ADS is funded by NASA and access to the ADS services is free to anybody worldwide without restrictions. It allows the user to search the literature by author, title, and abstract text.
Derived from text
Data Bases; NASA Programs; Bibliographies; Literature

20030110967 Alaska Univ., Fairbanks, AK, USA
The Global Impact Studies Project: A Web-based Resource for Researchers and Educators Interested in Terrestrial Cratering
Campi, R. A.; Sharpton, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Global Impact Studies Project (GISP) is an effort to consolidate current resources about terrestrial impact cratering, and make them accessible to the global community via the internet. As with many fields of scientific interest, information and current research is often disseminated and diffi-cult to collect in a timely and useful manner; in the case of GISP, this problem

is somewhat exacerbated because terrestrial impact cratering, by definition, occurs throughout the world, and researchers tend to focus on structures located in their own countries. The main goals of GISP are to collect information and research about each of the 160 impact structures identified on earth to date [Fig. 1], to compile a thor-ough and current bibliography of these impact struc-tures, and to make this information accessible to both scientists and curious laypersons via an interactive, easy-to-use website.
Author
Cratering; Information Dissemination

20030111207 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
PDS-D: The Planetary Data System Distribution Subsystem
Hughes, J. S.; Lavoie, S.; Wilf, J.; Joyner, R.; Crichton, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Planetary Data System (PDS) Distribution Subsystem (PDS-D) provides on-demand, web-based search, retrieval, and distribution of science data products from a loosely coupled collection of distributed heterogeneous data repositories that comprise the PDS archive. The development of PDS-D was initiated when it was realized that it would be cost prohibitive to use CD/DVD media to distribute the large volumes of data expected from future missions. Requirements gathering for PDS-D began at the end of 2001 and by October 2002, the subsystem supported the first release of Mars Odyssey data. [3] The development of PDS-D caused minimal impact to existing PDS resources while it maintained the geographically distributed and discipline oriented nature of the PDS.
Author
Data Bases; Planets

20030111221 Saint Thomas Univ., Houston, TX, USA
Knowledge Management and the Process of Space Exploration
Dykman, Charlene A.; Davis, Charles K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowledge Management has been a recent focus in the Information Systems literature. However, there is little consensus on what this term really means or how to operationalize it, and there is even less clarity regarding how those sharing common scientific research interests should manage knowledge. Interest in this idea is often driven by the arrival of new technology, e.g. that which is increasingly available for rapid dissemination of information or storage of large masses of data in various formats. This is obviously a backward approach to solving the problem of truly managing knowledge as a critical resource. Knowledge Management is facilitated by the technology, but knowledge must be organized, stored, cataloged, accessed, leveraged, and protected regardless of the technology. This presentation deals with definitions of Knowledge Management and the application of key concepts to the management of the knowledge base that has accumulated during decades of space exploration. In the 1970's a concept called The Invisible College became a hot topic of discussion. This college was not something that anyone set out to create. Rather, there was a loosely linked web of scientists, researchers, and scholars who were exploring ideas in various specific scholarly domains. An 'Invisible College' united a web of scholars, all interested in some specific topic or academic discipline. Prior to electronic mail, researchers and scholars formed interacting communities, linked through telephone, fax machines, conference presentations and attendance, and old fashioned land mail. Through these often-inconvenient channels, these researchers shared experiences and knowledge gained pursuing their individual research efforts. Some never met, but all who were involved in a particular body of research were aware of the players in this exchange of niche knowledge. While there was a sense of friendly competitiveness among researchers, there was also the ability to quickly learn from and build upon their shared experiences and discoveries. Often there were collaborative projects that involved several members of a given group and these project teams benefited by the synergy that was created. Various roles, such as 'boundary spanners' and 'gatekeepers' evolved. Boundary spanners were those who had a foot in more than one of the research domains. For example, an engineer who is also an astronaut would serve as a liaison, transporting information across the boundaries of specialization. In contrast, 'gatekeepers' often performed the role of assessing the potential value of the knowledge that someone wanted to bring to a particular effort. This 'Invisible College' approach (augmented by the world wide web) is, of course, still very much the way academia operates and its informal framework and conceptual approach can be seen as foundational to formalized, structured efforts to define and apply Knowledge Management principles and ideals in modern organizational contexts.
Derived from text
Space Exploration; Management Planning; Information Systems; Data Storage

20030111715 National Univ. of Ireland, Dublin, Ireland

Automating Incident Analysis: A Challenge Paper

Toolan, Fergus; Carthy, Joe; Drummond, Anne; Dunnion, John; Second Workshop on the Investigation and Reporting of Incidents and Accidents, IRIA 2003; September 2003, pp. 99-109; In English; See also 20030111704; No Copyright; Avail: CASI; A03, Hardcopy

Government regulations have made the recording of incidents a legal requirement in many organizations. This data is kept for no purpose as most organizations never examine the information held in incident management systems. This paper examines possibilities for the automated analysis of these incident collections, hoping to learn from what has occurred previously to prevent future incidents and accidents.

Author

Information Management; Data Acquisition; Accidents; Data Processing

20030111919 Naval Postgraduate School, Monterey, CA

An Introduction to Certification and Accreditation for New Accreditors

Stauffer, Natalie; Jun. 2003; 68 pp.; In English

Report No.(s): AD-A417546; No Copyright; Avail: CASI; A04, Hardcopy

The certification process can be defined as a comprehensive evaluation of all security features, both technical and nontechnical, of an information system. This process ensures that the system design and implementation meets a distinct set of prescribed security requirements. The accreditation of a system ensures that networks, applications, and operating systems that make up the system are running at an acceptable level of risk. The Designated Approving Authority (DAA) is responsible for deciding what systems to approve for accreditation, and assumes the responsibility for running the accredited system at an accepted level of risk. This analysis of the certification and accreditation process stresses the vital aspects of the process that are of special concern to the DAA. The mission drives the process, and influences the ultimate accreditation decision. The DAA must understand the fundamental aspects of the certification effort, and be able to weigh factors such as the funding, time, and other resources available for the effort, as well as understand the scope of the system as a whole. This thesis covers the vital aspects of certification and accreditation, and provides the new DAA with a guide to the process.

DTIC

Information Systems; Proving; Security; Systems Engineering

20030111993 National Academy of Sciences - National Research Council, Washington, DC, USA

The Role of Scientific and Technical Data and Information in the Public Domain. Proceedings of a Symposium Held in National Academies, Washington, DC on September 5-6, 2002

Esanu, Julie M.; Uhlir, Paul F.; Jan. 2003; 231 pp.; In English

Report No.(s): AD-A417792; No Copyright; Avail: CASI; A11, Hardcopy

The symposium was held on September 5-6, 2002, at the National Academies in Washington, D.C. The meeting brought together leading experts and managers from the public and private sectors who are involved in the creation, dissemination, and use of STI to discuss (1) the role, value, and limits of making STI available in the public domain for research and education; (2) the various legal, economic, and technological pressures on the producers of public-domain STI and the potential effects of these pressures on research and education; (3) the existing and proposed approaches for preserving the STI in the public domain or for providing 'open access' in the USA; and (4) other important issues in this area that may benefit from further analysis. The main question that was addressed by the symposium participants was, What can the S&T community itself do to address these issues within the context of managing its own data and information activities? Enlightened new approaches to managing public- domain STI may be found to be desirable or necessary, and these need to be thoroughly discussed and evaluated. The primary goal of this symposium, therefore, was to contribute to that discussion, which will be certain to continue in many other fora and contexts. The symposium was organized into four sessions, each introduced by an initial framework discussion and then followed by several invited presentations. The first session focused on the role, value, and limits of scientific and technical data and information in the public domain. This was followed in the second session by an overview of the pressures on the public domain. Session three explored the potential effects on research of a diminishing public domain, and the final session focused on responses by the research and education communities for preserving the public domain and promoting open access to various types of STI.

DTIC

Data Management; Information Transfer; Economics

20030112116 NASA Marshall Space Flight Center, Huntsville, AL, USA
The 2003 Goddard Rocket Replica Project
Farr, Rebecca A.; July 21, 2003; 18 pp.; In English; AIAA Joint Propulsion Conference, 21 Jul. 2003, Huntsville, AL, USA; No Copyright; Avail: CASI; A03, Hardcopy

A group of volunteers from Marshall Space Flight Center using information and records available,construct a working, flying replica of Robert Goddard's 1926 liquid rocket as well as accurate static display version. Document the effort for posterity.
Derived from text
Replicas; Rockets

20030112252 NASA Marshall Space Flight Center, Huntsville, AL, USA
Using the Chandra Project to Communicate with Underdeveloped Constituencies
Adams, M. L.; Elsner, R. F.; Kouveliotou, C.; Patel, S. K.; Preece, R. D.; Strong, C.; Wilson, C. A.; Woods, P. M.; [2003]; 1 pp.; In English; Meeting on Communicating Astronomy to the Public, 1-3 Oct. 2003, Washington, DC, USA; No Copyright; Avail: Other Sources; Abstract Only

We have instituted a program whose goal is to better communicate astronomy among students selected from an economically underprivileged area of Huntsville, Alabama. To achieve this goal, six local teachers were trained as astronomy teacher resource agents. These teachers were teamed with six scientists; the teams presented materials for 29 teachers, mostly from the Southeastern USA Topics included the electromagnetic spectrum, X-ray optics, gratings and spectroscopy, supernovae (and remnants), black holes, and the tools and techniques to analyze Chandra X-ray data. Beginning in September our teacher-scientist teams, in collaboration with the Huntsville Housting Authority, will present programs to specially selected students at the rate of one or two per month, until April 2004. These young people will be mentored and encouraged to develop a research project. Students, which complete a project by April 2, will be paid for their work.
Author
Astronomy; Communicating; Students; Supernovae; Electromagnetic Spectra

20030112480 National Academy of Sciences - National Research Council, Washington, DC, USA
The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium
Esanu, Julie M., Editor; Uhlir, Paul F., Editor; [2003]; 231 pp.; In English; Symposium on the Role of Scientific and Technical Data and Information in the Public Domain, 5-6 Sep. 2002, Washington, DC, USA; See also 20030112481 - 20030112508 Contract(s)/Grant(s): NLM-467-MZ-200750; 02-73708-GEN; NSF GEO-02-23581; Copyright; Avail: Other Sources

The Office of International Scientific and Technical Programs organized the Symposium on the Role of Scientific and Technical Data and Information in the Public Domain. The symposium was held on September 56,2002, at the National Academies in Washington, D.C. The meeting brought together leading experts and managers from the public and private sectors who are involved in the creation, dissemination, and use of STI to discuss (1) the role, value, and limits of making STI available in the public domain for research and education; (2) the various legal, economic, and technological pressures on the producers of public-domain STI and the potential effects of these pressures on research and education; (3) the existing and proposed approaches for preserving the STI in the public domain or for providing open access in the USA; and (4) other important issues in this area that may benefit from further analysis. The main question that was addressed by the symposium participants was, What can the S&T community itself do to address these issues within the context of managing its own data and information activities? Enlight- ened new approaches to managing public-domain STI may be found to be desirable or necessary, and these need to be thoroughly discussed and evaluated. The primary goal of this symposium, therefore, was to contribute to that discussion, which will be certain to continue in many other fora and contexts. The symposium was organized into four sessions, each introduced by an initial framework discussion and then followed by several invited presentations. The first session focused on the role, value, and limits of scientific and technical data and information in the public domain. This was followed in the second session by an overview of the pressures on the public domain. Session three explored the potential effects on research of a diminishing public domain, and the final session focused on responses by the research and education communities for preserving the public domain and promoting open access to various types of STI.
Derived from text
Conferences; Information Management

20030112481 National Academy of Sciences - National Research Council, Washington, DC, USA
Discussion Framework
Uhlir, Paul; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; January 2003; In English; See also 20030112480; Copyright; Avail: Other Sources

In the interests of clarity, I outline the effects of present trends on a sectoral basis, in keeping with the functional map of public-domain data flows presented previously.1 I begin with the government s role as primary producer of such data and then consider the implications of present trends for academia and for our broader innovation system. If a basic trend is to shift more data production and dissemination activities from government to the private sector, one should recognize at the outset that the social benefits can exceed the costs under the right set of circumstances.
Author
Intellectual Property; Information Dissemination

20030112482 Maine Univ., ME, USA
Emerging Models for Maintaining Scientific Data in the Public Domain
Onsrud, Harlan; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 180-186; In English; See also 20030112480; Copyright; Avail: Other Sources

This paper presents a discussion on various models for maintaining scientific data in the public domain, and the legal issues surrounding the sharing of such data and information.
Derived from text
Science; Legal Liability; Data Management; Information Dissemination

20030112483 National Academy of Sciences - National Research Council, Washington, DC, USA
The Role, Value, and Limits of Scientific and Technical Data and Information in the Public Domain: Discussion Framework
Uhlir, Paul; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 3-9; In English; See also 20030112480; Copyright; Avail: Other Sources

The main goal in this opening presentation is to coarsely map out the scope and nature of the public domain that has served the American scientific enterprise so well for many years. We divide the producers of scientific data into three sectors, namely, government agencies (primarily but not exclusively federal), academic and other nonprofit research institutions, and private-sector commercial enterprises. Figure 1- 1 presents a conceptual framework for analysis of this information regime, as well as a useful summary of the relative rights across the spectrum of information producers in all three sectors. Because of time constraints, I will focus only on the scope of the public domain in government and academia.
Derived from text
Information Dissemination; Intellectual Property

20030112484 Duke Univ., Durham, NC, USA
The Genius of Intellectual Property and the Need for the Public Domain
Boyle, James; Jenkins, Jennifer; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 10-14; In English; See also 20030112480; Copyright; Avail: Other Sources

I will start by talking about the genius of the intellectual property system and about what this system is supposed to do. Then I will turn to a broad, overall vision of recent expansions of intellectual property protection and talk a bit about the available conceptual tools, both economic and noneconomic, for thinking about appropriate limits on intellectual property protections. I will conclude with some suggestions about an appropriate larger framework for conducting the inquiry around which this symposium is built.
Author
Intellectual Property; Information Dissemination

20030112485 California Univ., Berkeley, CA, USA
Intellectual Property: When Is It the Best Incentive Mechanism for S and T Data and Information?
Scotchmer, Suzanne; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 15-18; In English; See also 20030112480; Copyright; Avail: Other Sources

Intellectual property has invaded the academy, especially in the sciences. Along with others, economists have been thinking about this invasion, and the proper roles of the public and private sectors in the conduct of science. In particular, the focus has been on the question of whether the invasion of intellectual property is either inevitable or appropriate. As I tried to focus my thoughts on how to summarize economic thinking on this topic, and reviewed conversations with colleagues, it seemed to me that instead of trying to explain, as a positive matter, how economists view the relationship between the public and private domain, I should comment on the justifications I hear for intellectual property that I view as wrong. So I have

unofficially retitled this talk, Why Intellectual Property: Four Wrong Answers.
Author
Intellectual Property; Information Dissemination

20030112486 Agency for International Development, USA
Scientific Knowledge as a Global Public Good: Contributions to Innovation and the Economy
Dalrymple, Dana; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 35-51; In English; See also 20030112480; Copyright; Avail: Other Sources

Three main topics will be taken up, in varying proportion: (1) principal concepts, (2) provision and use, and (3) implementation. The focus will be on scientific knowledge at the international level, particularly with respect to developing countries. My perspective is that of an agricultural economist and sometime historian. My approach involves a rather wide-ranging review of literature blended with long personal experience in international agricultural research. Others might well follow quite different routes and illustrate different dimensions. I encourage them to do so.
Author
Information Dissemination; Intellectual Property

20030112487 Columbia Univ., NY, USA
The Role, Value and Limits of S and T Data and Information in the Public Domain for Biomedical Research
Brandt-Rauf, Sherry; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 65-70; In English; See also 20030112480
Contract(s)/Grant(s): NSF BIR-91-12290; Copyright; Avail: Other Sources

Scientific research is set back when individual researchers withhold information in order to compete against each other. However, in practice, no scientist can afford the time and resources to share all of his or her data with all colleagues. No scientist can afford to withhold all of his or her information either, since that would bring the scientist's career to a standstill. Sharing and withholding information are therefore at two ends of a spectrum in information flow among scientists. In order to understand the reasons for sharing and withholding information in the scientific community, the presenter argues that it is necessary to view scientific data as data streams instead of 'discrete and atomistic input or output'. Scientists often communicate information through informal channels, cooperate by sending personnel or samples as a subsitute for information exchange, and sometimes delay publication when they feel their data isn't ready.
CASI
Scientists; Data Flow Analysis; Information Flow; Biomedical Data

20030112488 Georgetown Univ., Washington, DC, USA
The Challenge of Digital Rights Management Technologies
Cohen, Julie; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 109-116; In English; See also 20030112480; Copyright; Avail: Other Sources

I am going to discuss the challenge of digital rights management (DRM) technologies for the public domain. First I will address the technologies themselves, some of the functions that they can be used to implement, and some of the implications of those functions. Then, I will address the Digital Millennium Copyright Act (DMCA), a law designed to provide DRM technologies with an extra layer of legal protection, and discuss the implications of that extra layer of legal protection.
Author
Copyrights; Information Dissemination

20030112489 Chicago Univ., Chicago, IL, USA
Fundamental Research and Education
Berry, R. Stephen; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 125-128; In English; See also 20030112480; Copyright; Avail: Other Sources

Historically, the scientific community and the publishing community in the broad sense-that is, the private publishers, the professional societies, and government through its own publications-always had a symbiotic relationship, as long as paper publishing was the sole outlet for the distribution and archiving of this information. That all changed with the Internet, which provided a faster, cheaper, and more efficient way for the scientific community to distribute and share its information. I think probably the sharpest example of that is the online e-print archive that Paul Ginsparg started in the area of high-energy physics. When that technological development happened, the relationship changed. It was no longer that comfortable symbiotic

relationship; many scientists wanted to make use of the new medium. Many publishers, including some professional societies, did not want to use the Internet as a principal mode of distribution. In fact, many publishers saw the use of electronic distribution not as a new way to provide a different kind of added value, but as a threat to the way that they make their living. Author

Research; Education; Intellectual Property; Electronic Publishing; Scientists

20030112490 National Weather Service, USA

Conflicting International Public Sector Information Policies and their Effects on the Public Domain and the Economy

Weiss, Peter; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 129-132; In English; See also 20030112480; Copyright; Avail: Other Sources

The concept of government commercialization and the idea of the entrepreneurial bureaucrat -which I claim is an oxymoron-do not succeed in the face of economic realities and under open competition policies. My paper documents a number of instances of anticompetitive practices by European government agencies. In sum, the research to date strongly suggests that open govemment information policies foster significant but not easily quantifiable economic benefits to society. Hence, the necessary impetus for adopting open information policies worldwide may turn on further economic research to better quantify the benefits of open and unrestricted public-sector data. That economic research should prove relevant not only to the question of governmental policies, but also to the larger questions about the value of the so-called public domain to society overall.

Derived from text

Commercialization; Information Dissemination

20030112491 Florida Univ., FL, USA

Academics as a Natural Haven for Open Science and Public-Domain Resources: How Far Can We Stray?

Lewis, Tracy; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 165-168; In English; See also 20030112480; Copyright; Avail: Other Sources

The rationale for the point of view that academic institutions are regarded as a safe haven or safe harbor for open science is discussed. This paper also addresses the issue of how the academic sector tries to accomodate both private and public sponsors of research.

CASI

Education; Science; Research and Development; Conferences

20030112492 Harvard Univ., MA, USA

New Legal Approaches in the Private Sector

Zittrain, Jonathan; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 169-174; In English; See also 20030112480; Copyright; Avail: Other Sources

In this presentation I hope to shed light on the current state of the public domain, especially with respect to technical and scientific data, and then describe several approaches that tend to eschew the public domain in its legal sense in favor of a rights regime that more subtly allocates power between author and downstream users. When we talk about access and the public domain generally, what do we mean? It might be useful to discuss them in light of scientific and technical data that have occupied a large part of this symposium.

Author

Conferences; Law (Jurisprudence); Information Dissemination; Education

20030112493 Massachusetts Inst. of Tech., MA, USA

The Role of the Research University in Strengthening the Intellectual Commons: The OpenCourseWare and DSpace Initiatives at MIT

Wolpert, Ann; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 187-189; In English; See also 20030112480; Copyright; Avail: Other Sources

The challenging environment that has been described during the course of this symposium has the potential to profoundly affect research universities. The economists among us understand that markets are not normally passive in the face of changing economic forces, and research universities do not have the luxury of standing passively by as intellectual property laws and norms change. Research universities are mission-driven, not-for-profit enterprises. They may host technology licensing offices, but their primary mission is education and non-profit research. Those outside the academy sometimes talk about the research

university community as though it were some kind of monolithic industry. In truth, not only is there considerable variation among research universities, there is also a distinct lack of uniformity within institutions. This paper discusses the role that research universities such as MIT play in the value chain of new knowledge creation in science and technology.
Derived from text
Intellectual Property; Research and Development; Universities; Conferences

20030112494 NASA, Washington, DC, USA
The Single Nucleotide Polymorphism Consortium
Morgan, Michael; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 194-197; In English; See also 20030112480; Copyright; Avail: Other Sources

I want to discuss both the Single Nucleotide Polymorphism (SNP) Consortium and the Human Genome Project. I am afraid most of my presentation will be thin on law and possibly too high on rhetoric. Having been engaged in a personal and direct way with these issues as a trained scientist, I find it quite difficult to be always as objective as I ought to be.
Author
Information Dissemination; Genome; Intellectual Property

20030112495 Stanford Univ., USA
The Economic Logic of 'Open Science' and the Balance between Private Property Rights and the Public Domain in Scientific Data and Information: A Primer
David, Paul; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 19-34; In English; See also 20030112480; Copyright; Avail: Other Sources

High access charges imposed by holders of monopoly rights in intellectual property have overall conse- quences for the conduct of science that are particularly damaging to programs of exploratory research that are recognized to be vital for the long-term progress of knowledge-driven economies. Like non-cooperative behaviors among researchers in regard to the sharing of access to raw data-steams and information, and systematic under- provision of the documentation and annotation required to create reliably accurate and up-to-date public database resources, lack of restraint in privatizing the public domain in data and information can significantly degrade the effectiveness of the entire research system. Considered at the macro-level, open science and commercially ori- ented research and development (R&D) based on proprietary information constitute complementary sub-systems. The public policy problem, consequently, is to keep the two sub-systems in proper balance by public funding of open science research, and by checking excessive incursions of claims to private property rights over material that would otherwise remain in the public domain of scientific data and information.
Author
Intellectual Property; Economics

20030112497 Wisconsin Univ., WI, USA
Earth and Environmental Sciences
Bretherton, Francis; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 60-64; In English; See also 20030112480; Copyright; Avail: Other Sources

The structure of a tree provides a analogy for information flow in the environmental sciences. Data is gathered by instruments in the field, which are at the roots of the tree. This data is processed along the trunk of the tree, and emerges as core products where the branches of the tree diverge from the trunk. These core information products are distributed to users, which are the leaves on the tree. Information flows up the tree, and user requirements flow from the leaves back to the roots.
CASI
Earth Sciences; Information Flow; Multisensor Fusion

20030112499 LION Bioscience, Inc., USA
Opportunities for Commercial Exploitation of Networked Science and Technology Public-Domain Information Resources
Potenzone, Rudolph; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 52-55; In English; See also 20030112480; Copyright; Avail: Other Sources

Information resources are vitally important to every project, and it does not matter as you work on your project where relevant data come from. In fact, it is hard to predict where the best data will be found for any particular project. Even at the time the new data are generated, it is not certain what those data will be used for. How often do you find a bit of information

or data that are in the most obscure place, not related to the topic you are studying, but in fact are relevant to the new project that you are working on? The availability of data is ultimately important to the ability to generate good science. What happens to these good data once they are generated? The reality is that most data never enter a database that is available publicly, whether it is a fee-based database or a free database. Data are often locked in papers, reports, or lab notebooks. Maybe they get published and are available in a peer-reviewed journal or are archived electronically. However, by and large, those data are not accessible and are not able to be found because they actually have never been brought into a database. In particular, if the data have a particular commercial interest, and the pharmaceutical industry has been quite aggressive about this, they may find their way into a commercial database and become quite accessible. Otherwise, it really depends on someone s personal initiative either to get funding to create a database through one of the government sources of funding or finding some support so that the information can be put into a form that is actually accessible. I will describe two different scenarios for the pharmaceutical industry.
Derived from text
Information Dissemination; Intellectual Property

20030112500 Duke Univ., Durham, NC, USA
Pressures on the Public Domain: Discussion Framework
Reichman, Jerome; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 73-86; In English; See also 20030112480; Copyright; Avail: Other Sources

The digital revolution has made investors acutely aware of the heightened value that collections of data and information may acquire in the new information economy. Attention has logically focused on the incentive and protective structures for generating and disseminating digital information products, especially online. Although most of the legal and economic initiatives have been focused on-and driven by-the entertainment sector, software, and large publishing concerns, significant focus has been devoted to the possibility that commoditization of even public-sector and public-domain data would stimulate substantial investments by providing new means of recovering the costs of production. Moreover, investors have increasingly understood the economic potential that awaits those who capture and market data and information as raw materials or inputs into the upstream stages of the innovation process. What follows focuses first on pressures to commoditize data in the public sector and then on legal and technological measures that endow database producers with new proprietary rights and with novel means of exploiting the facts and data that copyright law had traditionally left in the public domain. These pressures arise both from within the research community itself and from forces extraneous to it. How that community responds to these pressures will over time determine the future metes and bounds of the information commons that support scientific endeavors. If, as we have reason to fear, current trends will greatly diminish the amount of data available in the public domain, this decrease could initially compromise the scientific community's ability to fully exploit the promise of the digital revolution. Moreover, if these pressures continue unabated and become institutionalized at the international level, they could disrupt the flow of upstream data to both basic and applied science and undermine the ability of academia and the private sector to convert cumulative data streams into innovative products and services. The pressures discussed here also pose serious conflicts between the norms of public science and the norms of private industry. We contend that failure to resolve these conflicts and to properly balance the interests at stake in preserving an effective information commons could eventually undermine the national system of innovation.
Author
Intellectual Property; Digital Data; Commodities

20030112501 Yeshiva Univ., New York, NY, USA
Legal Pressures in Intellectual Property Law
Hughes, Justin; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 95-98; In English; See also 20030112480; Copyright; Avail: Other Sources

Almost everything that I am going to present will be blindingly obvious. I see my job as synthesizing some of what has been talked about previously and to look at some overall trends. The reason we are here is because we like what science and technology produce. There has been a lot more spending by governments in research and development (R&D) and even faster growth in R&D spending by private entities in the postwar era. Why are we doing that? Because we buy the products and services that come at the end of that process and we have been buying a lot of them. R&D has been a source of economic growth. Governments like it because it creates wealth, and people who have more money are happier voters and it feeds back on itself. It is a virtuous cycle. We have a robust system of innovation. We are coming to the end of a decade when it seemed like that growth was never going to end. I am going to go through some of these overall trends, and then I will look at biomedical research as a particular sector of interest. I will spend most of my time talking about genomics because genomics

is a poster child, representing an area where intellectual property and the public domain are intersecting, colliding, and causing conflict constantly, and quite conspicuously. The amount of funding going into biomedical research has increased by three to four orders of magnitude in real dollars since World War II. That is an unbelievable amount of growth in five decades. The scale of effort, the number of people doing it, the amount of money, and the commitment of social resources have all mushroomed in a relatively short period. It has happened in both the public and the private sectors, led by government funding, at least in the case of life sciences, and it has been followed with a time lag of several years by investment in the private sector. The R&D growth in both public and private sectors has led to conflict. The Human Genome Project is especially good at generating conflict. When it does so, it usually is on the front pages of Time, Newsweek, The New York Times, and The Washington Post. You all have heard the stories I am going to recount. I am just going to try to tease out some of the structures underneath the surface.
Derived from text
Intellectual Property; Research and Development; Law (Jurisprudence)

20030112502 Duke Univ., Durham, NC, USA
The Urge to Commercialize: Interactions between Public and Private Research Development
Cook-Deegan, Robert; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 87-94; In English; See also 20030112480; Copyright; Avail: Other Sources

The R&D growth in both public and private sectors has led to conflict. The Human Genome Project is especially good at generating conflict. When it does so, it usually is on the front pages of Time, Newsweek, The New York Times, and The Washington Post. You all have heard the stories I am going to recount. I am just going to try to tease out some of the structures underneath the surface. What drives the growth of R&D--in science, in academia, in government, and in industry? The practice of generating new knowledge has become more capital intensive. Research costs a lot of money, and it takes a lot of people. The scale and the complexity have increased. We need machines to generate the data. We need computers to keep track of data. This has been increasing on a large scale since World War I1 in almost every discipline.Public and private sectors are pursuing similar lines of research, and we have a natural experiment that has been going on now for almost a decade, the outcome of which we do not really know. We can say that the academic sector has been a more important part of this story than it has been in most other technologies, such as informatics and computing, although universities were important there too. But it is not possible to compare whether more public good will come from the HGS and Incyte s private sequencing, Celera s quasi-public sequencing, or the strong public-domain policies under the Human Genome Project and Mammalian Gene Collection. We may never know, as products, services, and discoveries are apt to draw from many streams.
Derived from text
Information Dissemination; Copyrights

20030112503 Maurer (Stephen), Berkeley, CA, USA
Designing Public-Private Transactions that Foster Innovation
Maurer, Stephen; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 175-179; In English; See also 20030112480; Copyright; Avail: Other Sources

Most university technology licenses are extremely conventional. The university selects one partner and gives it an exclusive patent license. The partner-who now has a monopoly in the university s technology-promises to pay royalties. However, this exclusive licensing model is only one possible transaction. Many alternative business models are possible and some have already been tried. We need to figure out which of these new ideas are wise and which would be utter disasters. I will start by reminding you that patents have important drawbacks for society and that it is often preferable to leave discoveries unprotected-that is, putting them into the public domain. I will then look at why universities focus so heavily on exclusive licenses. Finally, I will discuss 10 alternative licensing models that can often do a better job of spreading knowledge.
Author
Universities; Technologies; Intellectual Property; Licensing

20030112504 Illinois Univ., Urbana-Champaign, IL, USA
The Role, Value and Limits of S and T Data and Information in the Public Domain for Education
Bruce, Bertram; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 56-59; In English; See also 20030112480; Copyright; Avail: Other Sources

I want to focus on education, which I define broadly to include learning in K-12 schools and universities, informal learning, as well as learning in the workplace. I want to make an argument that attention to the role of the public domain in

education is not only important for education, but also can give us a better understanding of what the public domain means and how to think about it in a larger society. I am going to group my comments into four areas. The first is to lay out a context for thinking about education and its relation to information today. The second is to describe Biology Workbench, a tool that has been used increasingly in K-12 and college education. Third is a classroom example to show some of the things that students are doing with this tool. Finally, I will address some of the implications.
Author
Education; Information Dissemination

20030112505 Center for Strategic and International Studies, Washington, DC, USA
Legal Pressures in National Security Restrictions
Heyman, David; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 104-108; In English; See also 20030112480; Copyright; Avail: Other Sources

I will address the new national security restrictions and the pressures that they may impose on the public domain. The key questions to address today are what information can we create and share with the world and what information cannot be openly shared, in light of the increased threat environment? I want to start by reading to you from a government directive that attempts to answer this question in part. It was issued in December 2001 and provides regulations on publications. It says that no publication is allowed to have the following, contents that: insult or slander other people ; publicize pornography, gambling and violence, or instigate crimes ; leak state secrets, endanger national security, or damage national interests ; endanger social ethics and outstanding national cultural traditions ; disrupt public order and undermine social stability ; or publicize cults and superstitions. This document is from the People s Republic of China s Regulations on Management of Publications, issued December 31, 2001. I bring it to our attention because clearly the question as to what information can and should reasonably be controlled is really open for interpretation-some of the regulations in China seem quite reasonable, some are questionable, and some are beyond the pale. What is important here is that there is a line, which at some point we cross, as you probably did while listening to me. It is a line that contemplates legitimate restrictions on traditional public-domain information. I believe if our policies go to one extreme of that line, we risk national and economic security, and if our policies go to the other extreme, we risk freedom. Our job today and in the future is to clarify that line and shine a light on it so that reasonable people can make reasonable policy. I am going to focus on federal investments in science and technology and the contributions these investments make to creating and disseminating public-domain information and, ultimately, to improving the security and well-being of our nation.
Author
Information Dissemination; Security

20030112506 Utah Univ., Salt Lake City, UT, USA
Legal Pressures on the Public Domain: Licensing Practices
Poulter, Susan R.; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 99-103; In English; See also 20030112480; Copyright; Avail: Other Sources

Licensing practices are indeed a significant pressure on the public domain; they have the potential to become the vehicle for restricting access to and use of public information that trumps other existing and proposed forms of protection, such as copyright and database protection. The term licensing in the context of electronic publishing means contracting for various activities involving the access and use of articles or the information in the articles. It includes licensing an article for publication (which can also occur through the conveyance of copyright, as has been typical in scientific publishing) and licensing the subscriber to access and read (and print) a copy. By way of comparison, paper copies of journals, including the accompanying scientific data, are typically sold outright; the electronic forms of journals more typically are licensed, however. There are pressures on the public domain at the level of access to articles and the underlying data and on the uses that can be made of scientific and technical information once accessed. Access to articles (and the data they contain) requires subscription, and few would question the need for a mechanism to recoup the costs of electronic publishing. The primary issues are reasonableness of the subscription price and the scope and duration of the license. A more significant issue, in my view, is whether the subscriber (user) has the right to use the data; that is, the right to extract, reanalyze, repeat, build upon, and extend the work. These rights typically have been available to any reader of paper publications, subject only to the limits of patent law. As other speakers have noted, however, the online environment facilitates technologically enforceable restrictions on access and acquiescence to contract terms that could restrict further use of the data. Moreover, these terms usually will not be negotiated in the usual sense of the word because of the unequal bargaining power of subscriber and publisher. Will licensing provisions that restrict further use of data be upheld? Will such contracts become commonplace? For

the remainder of this discussion, I will talk about the applicable legal principles and then will highlight some developments in scientific publishing that may indicate which way the wind is blowing.
Derived from text
Electronic Publishing; Licensing; Intellectual Property; Law (Jurisprudence)

20030112507 Cornell Univ., NY, USA
Potential Effects of a Diminishing Public Domain in Biomedical Research Data
Hilgartner, Stephen; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 133-138; In English; See also 20030112480; Copyright; Avail: Other Sources

The central question that I want to examine is what might happen to research systems if the public domain diminishes. I will confine my attention to small science biomedical research, which does not include areas like large clinical trials, which arguably are a form of big science, given their many collaborators and complex organizational structures (e.g., GUSTO I11 Investigators, 1997). I will focus on areas such as molecular biology, crystallography, structural biology, and cell biology. In these fields, academic research is usually conducted on a benchtop scale by small research groups, and there are many independent laboratories working and often directly competing. In these particular scientific cultures, it is understood that the scientist who runs the laboratory-the lab head as he or she is called-is the only person who can speak for the lab. Other people, such as postdocs, can only speak with special authorization from that person (Knorr Cetina, 1999). So this kind of science features a culture of autonomous, independent, highly entrepreneurial operators who work to build a research enterprise, might expect in this cultural setting in science, based on what we know from ethnographic studies about the social practices that regulate access to data in these areas of science. produce findings, get grants, keep a lab going, and so forth. I want to speculate about what kinds of changes you might expect in this cultural setting in science, based on what we know from ethnographic studies about the social practices that regulate access to data in these areas of science.
Author
Information Dissemination; Intellectual Property

20030112508 Duke Univ., Durham, NC, USA
Responses by the Research and Education Communities in Preserving the Public Domain and Promoting Open Access: Discussion Framework, 4
Reichman, Jerome; The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium; [2003], pp. 141-160; In English; See also 20030112480; Copyright; Avail: Other Sources

The presentations of this symposium described the growing efforts under way to privatize and commercialize scientific and technical information that was heretofore freely available from the public domain or on an 'open-access' basis. If these pressures continue unabated, they will result in the disruption of long-established scientific research practices and in the loss of new research opportunities that digital networks and related technologies make possible. We do not expect these negative synergies to occur all at once, however, but rather to manifest themselves incrementally, and the lost opportunity costs they are certain to engender will be difficult to discern. Particularly problematic is the uncertainty regarding the specific type of database protection that Congress may enact and any exceptions favoring scientific research and education that such a law might contain. As we have tried to demonstrate, however, the economic pressures to privatize and commercialize upstream data resources will continue to grow in any event. Moreover, legal means of implementing these pressures already exist, regardless of the adoption of a sui generis database right. Therefore, given enough economic pressure, that which could be done to promote strategic gains will likely be done by some combination of legal and technical means. If one accepts this premise, then the enactment of some future database law could make it easier to impose restrictions on access to and use of scientific data than at present, but the absence of a database law or the enactment of a lower protectionist version would not necessarily avoid the imposition of similar restrictions by other means. In such an environment, the existing elements of risk or threat to the sharing norms of public science can only increase, unless the scientific community adopts countervailing measures. We, accordingly, foresee a transitional period in which the negative trends identified above will challenge the cooperative traditions of science and the public institutions that have reinforced those traditions in the past, with uncertain results. In this period, a new equilibrium will emerge as the scientific community becomes progressively more conflicted between their private interests and their communal needs for data and technical information as a public resource. This transitional period provides a window of opportunity that should be used to analyze the potential effects of a shrinking public domain and to take steps to preserve the functional integrity of the research commons.
Author
Intellectual Property; Law (Jurisprudence); Commercialization; Research

20030112687 Kentucky Univ., Lexington, KY, USA
Detecting Reference Errors Before Publication
De Jong, Marla J.; Jan. 2003; 7 pp.; In English
Report No.(s): AD-A418052; CI02-1296; No Copyright; Avail: CASI; A02, Hardcopy

When conducting research, the author has become increasingly frustrated by citation and quotation errors. In a recently published book chapter, its author summarized a research study but cited a paper from a completely different study. This same author made citation errors within the reference list and obviously gleaned data from a secondary source without reading the original paper. As a result, the author questioned the accuracy of the entire chapter. Reference errors are not innocuous. Reference and quotation errors prolong the time needed to find a reference, damage an author's reputation, weaken a journal's credibility, disrespect the primary paper's author(s), and undermine clinical and research nursing literature. Furthermore, authors promulgate errors when they copy an inaccurate citation without verifying its content with the primary source. Investigators have confirmed the author's observations that reference errors are prevalent in nursing literature. Foreman and Kirchhoff (1987) were the first nurses to study the accuracy of reference citations. Using the lead article from the final 1983 issue of 65 clinical journal and 47 non-clinical journals, these investigators evaluated randomly selected references for accuracy. Reference errors occurred in 38.4% of the clinical journals and in 21. 3% of the non-clinical journals. Schulmeister (1998) evaluated 60 published papers from three nursing journals and reported that 32% of 180 references contained citation errors. In a similar study of 262 references that were cited in three nursing research journals, Taylor (1998) reported an overall citation error rate of 45.8%. More recently, Lok, Chan, and Martinson (2001) reported that 43% of 550 references from 11 nursing journals contained citation errors. As a manuscript reviewer, the author now uses databases such as CINAHL or MEDLINE to check references. Seven strategies are presented to help nurse editors and reviewers detect errors before publication.
DTIC
Sources; Errors; Periodicals; Literature

20030112697 University of Southern California, Marina del Rey, CA
TeraWorld: Efficiently Accessing and Integrating Worldwide Geographic Data
Knnoblock, Craig A.; Shahabi, Cyrus; Aug. 26, 2003; 8 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0270
Report No.(s): AD-A418071; AFRL-SR-AR-TR-03-0383; No Copyright; Avail: CASI; A02, Hardcopy

Geographic information such as satellite imagery, maps, and vector data play a critical role in military planning and intelligence. This type of information is being collected at an ever-increasing rate as new technology is developed, new commercial satellites are launched, and more and more information is being made available on the Internet. Unfortunately, the ability to efficiently access and integrate this type of data has not kept up with the availability of the information. In this project we purchased the hardware to build a multi-terabyte, worldwide geographic information system. The resulting system allows us to conduct research on a large-scale geographic information system, provide a significant advance in the military capabilities with respect to access to geographic data, and further the educational mission of the University by providing both research and teaching opportunities in the area of geographic information systems and information integration.
DTIC
Information Retrieval; Geographic Information Systems

20030112718 Pavia Univ., Italy
Mapping and Analyzing Acoustic Surveys' Results: A GIS Approach
Manghi, Michele; Pavan, Gianni; Fossati, Claudio; Priano, Marco; Jan. 2001; 3 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0709; N00014-02-1-0333
Report No.(s): AD-A418162; No Copyright; Avail: CASI; A01, Hardcopy

C.I.B.R.A. is a research group whose main interest is in the study of underwater sounds related to marine mammals and in the development of acoustic detection and analysis technologies. The 'acoustic' aspect in wide area studies, critical habitat identification and population distribution has become more and more popular. According to our experience it is a difficult task to integrate, in one scheme, acoustic evidences with other data sets like remote sensing or seasonal fluctuations models, and scientists often fail to provide one general clear picture of the study area. Nowadays, more than expanding scientific knowledge about acoustic communication and echolocation in marine mammals, researchers' interest is shifting to more comprehensive research topics. The methodology used to consolidate on a GIS acoustic data, historical data and measured or modeled parameters is hereafter described.
DTIC
Data Management; Sound Detecting and Ranging; Underwater Acoustics; Geographic Information Systems

20030112726 Naval Postgraduate School, Monterey, CA
Data Warehousing at the Marine Corps Institute
Vuillemot, Andrew J.; Sep. 2003; 103 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418307; No Copyright; Avail: CASI; A06, Hardcopy

This thesis is a case study on the value added of an implementation of a data warehouse at the Marine Corps Institute (MCI). Data Warehousing at an environment such as MCI can solve a myriad of strategic questions. The database which MCI possesses, the Marine Corps Institute Automated Information System (MCIAIS), contains a staggering amount of data, waiting to be mined and turned into knowledge for high- level decision makers. The actual value of the data warehouse to the organization is evaluated using the Knowledge Value Added (KVA) methodology. Many methodologies exist that attempt to measure the value added due to information Technology. KVA allows description of all process outputs, including those generated from IT, in common units. This allows allocation of revenue to IT in proportion to contributions to process outputs at the subcorporate level, which MCI is at. This thesis looks at warehouses, ways of measuring value of IT, MCI's organization and core functionality, its current data environment, the implementation of the warehouse, and the value that is added through that implementation.
DTIC
Data Bases; Information Systems; Data Management

20030112798 Naval Postgraduate School, Monterey, CA
Manpower Requirements Database for the Greek Navy
Sergis, Kyriakos N.; Sep. 2003; 341 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418238; No Copyright; Avail: CASI; A15, Hardcopy

The Greek Navy is trying to create a Web-enabled Data Base system, which will enhance and facilitate the process of assigning duties (jobs) to its officers. This study provides a prototype of implementing the job-to-officers assignment process by creating a manpower Data Base accessed via the Internet. This prototype is based on the 3-tier architecture, having both the Web and Data Base design and implementation. Behind the scenes, is a multi-criteria decision algorithm that takes the officers' credentials and the officers' and commands' preferences into account and then it determines the best distribution of the officers to the available jobs. This thesis and the supporting research will strive to develop the requirements and a working prototype web site for the detailer and reduce both manpower and time required to complete the assignment process conducted by the Greek Navy's Department of Personnel.
DTIC
Data Bases; Manpower; Algorithms

20030112805 Defense Technical Information Center, Fort Belvoir, VA
Current Awareness Bibliography (CAB) on Diskette. System/Subsystem Specification (Final)
Jacobson, Carol; Jan. 29, 1991; 63 pp.; In English
Report No.(s): AD-A418251; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this document is to define a high- level specification for the CAB on diskette system. This document is derived from the system functional requirements as specified in the CAB on Diskette (CAB) Functional Description (FD), DTIC/TR-88/11. The contents of this System Specification supersede the previous System Specification, DTIC/TR-89/3, which required revision based on the need to upgrade hardware and software components to accommodate the Windows 3.0 operating environment. Upon DTIC approval, the System Specification will serve as the baseline document for the development of the CAB on Diskette prototype. The System Specification is a technical document prepared for ADP personnel and assumes, at minimum, a familiarity with programming in a windows environment. The System Specification defines the system segments, allocates component modules to the appropriate segments, and provides high- level descriptions of functions that need to be developed. The SS also identifies required modifications to the Mainframe segment functions that are resident on the UNISYS 2200 series computers. These functions extract and format CAB data for distribution in hardcopy form or for distribution on diskette.
DTIC
Information Transfer; Bibliographies

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20030111972 Massachusetts Inst. of Tech., MA, USA
Cost Incentives for Airline Mergers? - An Examination on the Cost Impact of US Airline Mergers and Acquisitions
Fan, Terence; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001, pp. 1-13; In English; See also 20030111971; Copyright; Avail: CASI; A03, Hardcopy

In view of the renewed public interest on consolidations in the airline industry, this paper examines the cost impact of airline mergers and acquisitions, and differentiates between the potential gains in economies of scale and density of the merged carrier and the cost reduction opportunities brought about through operationally integrating the carriers involved. The cost and operational data is drawn from major carriers in the U.S. domestic market from 1982 to 1999, including twelve operational integration events. In addition to confirming the significant economies of network density in the airline industry, operational integration of formerly independent carriers appears to correlate with a reduction in the non-fuel total operating cost in the same year. This competitive advantage, however, fades in magnitude and significance over time, implying that the merged carriers must exploit their increased network density to cement the cost reduction.
Author
Airline Operations; Cost Incentives

20030111973 Bloomsburg Univ., Bloomsburg, PA, USA
Airport Privatization: An Empirical Analysis of Financial and Operational Efficiency
Haririan, Mehdi; Vasigh, Bijan; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001; 26 pp.; In English; See also 20030111971; Copyright; Avail: CASI; A03, Hardcopy

Airport privatization is becoming an international trend as officials try for ways to improve capacity, reduce cost, and meet the challenges of a growing industry. Although in the U.S. almost all of the airports used by commercial air carriers are owned and operated by the public sector, the recent trend towards airport privatization, especially in Western Europe, Asia, and Latin America has stimulated new thinking in this regard both from the U.S. government as well as businesses. Despite the best efforts of policymakers acting under the Federal Aviation Administration (FAA's) Pilot Program on Private Ownership of Airports, as outlined in the 1997 FAA Re-authorization Act, nearly all of the privatization activity has occurred outside of the US. As the privatization trend in the airport industry continues, airport managers are facing an increased pressure to find more cost-efficient ways of running their airports. Implementing improvement standards will become a necessity. Moreover, there is an increasing economic pressure on local governments to privatize airports. Airport privatizatioii has gerieratcd significant interest in Congress and the aviation community in recent years. Vasigh and Hamzaee (1998) emphasize the benefits of privatization of airports in other countries. The primary purpose of this paper is to compare efficiency of privatized and government owned airports. While we recognize that ultimately decisions on all conditions intist reflect numerous policy judgnicnts, prii utiration for tho airports should hc based or1 significant quantitativc analysis of factors at issue, rather than anecdotal evidence.
Author
Airports; Financial Management

20030111975 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel
Airline Competition: The Case of Israel's Domestic Duopoly
Goodovitch, Tomer; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001, pp. 1-14; In English; See also 20030111971; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

In this paper we examine the dynamic pattern of conduct, using time-series and firm-specific data for a competitive, duopolistic, domestic Israeli airline route. The results suggest that after a short competitive struggle, both the incumbent airline and the new entrant found that in the short-haul market, passengers are more sensitive to frequency than to price. In our case, passengers continued to change their preferences, choosing to use the services of the new entrant over the incumbent airline, regardless of the former s pricing policy. After two years the companies found their balanced positions and market niches, and for a while, passengers benefited from cheaper service and more frequent flights. As a result, the total number of passengers increased by 70%. Prices leveled off at 94% of original prices. The market profit margins decreased as a result of higher levels of service indicated by a decrease in the incumbent s average load factors from 72% to 69%. Initially the effect of the new

entrant s penetration was a decrease in its load factors to as low as 45%, but it was able to average a 67% load factor by the third year of operation. The paper suggests that even in cases of limited numbers of competitors, such as in a duopoly, the government should prefer deregulation over a regulated environment. We also concluded that the theory of competitive threat is valid, as the differences between a competitive and monopolistic environment are relatively small.
Author
Air Transportation; Commercial Aircraft; Competition

20030111976 Toulouse Business School, Toulouse, France
Non-Financial Indicators of Airline Distress: A Conceptual Approach
Gudmundsson, Sveinn Vidar; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001; 16 pp.; In English; See also 20030111971; Copyright; Avail: CASI; A03, Hardcopy

When comparing financial ratios across countries substantial differences are encountered in the financial environment of airlines that can be difficult to reconcile in the construction of a multi country failure or distress prediction model. To use non-financial performance ratios some of these problems are circumvented, and previous studies have shown that such models are by no means performing less well than financial based models. Thus, in this study a logistic regression model of airline distress prediction is constructed using five year data [1994 - 19981 from major airlines world-wide. The findings demonstrated fairly good model having 90.3 percent overall prediction accuracy. These findings in conjunction with other research in this field supports that models based on non-financial ratios show good prediction traits comparable to financial based models, yet providing more explanatory power.
Author
Airline Operations; Predictions; Revenue

20030111977 National Univ. of Singapore, Singapore
Impact of Frequent Flyer Program on the Demand for Air Travel
Chin, Anthony T. H.; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001, pp. 1-29; In English; See also 20030111971; Copyright; Avail: CASI; A03, Hardcopy

As the global airline market inches towards liberalization the forces of competition has lead to intense and constant realignments of loyalties between airlines, various forms of partnerships arrangements and cooperative schemes such as code sharing agreements resulting in competitive fares, changes in frequency of services and other attributes which are aimed at capturing market share and increasing profits. Frequent Flyer Programs or FFPs is one such innovation introduced to induce and capture loyalty of travelers. FFPs offer free travel and upgrades as incentives to fly with an airline and is the most popular and successful marketing strategy devised to build customer loyalty and sell the high priced seats. The introduction of FFPs grew by 50% in less than half a decade (Bhagwanani 2000). There are at least 100 airlines without FFPs but have forged FFP links with one or more operators, particularly signing with at least one major airline partner. There are to date over 700 such FFP links. One way of ascertaining the impact of an airline's FFP on market-share is to examine the effect of FFP on airline specific demand and choice. The following sections examine the literature on the demand for air travel and an empirical analysis of the impact of FFPs (own and other airlines) on the demand for Singapore Airlines (SIA).
Author
Commercial Aircraft; Incentives

20030111978 Tilburg Univ., Netherlands
The Effects of Dual Carrier Designation and Partial Liberalization: The Case of Canada
Clougherty, Joseph A.; Dresner, Martin; Oum, Tae Hoon; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001, pp. 1-27; In English; See also 20030111971; Copyright; Avail: CASI; A03, Hardcopy

This paper assesses the impact on air traffic of Canada s policy of allowing two Canadian flag carriers (dual-designation) to operate in select Canadian international markets. The secondary objective is to assess the effect of Canada s partially liberalized bilateral air services agreements. Using panel data covering Canada s 33 bilateral markets over the 1982-1994 period, we find the following results: (a) Dual designation/operation of Canadian carriers in a country-pair market increases total traffic volumes in the market as well as increasing the combined passenger volume and market share of Canadian carriers, and (b) Canada s partially liberalized bilateral air services agreements have significantly increased air traffic in those country-pair markets. Two policy implications follow from this research. First, Air Canada s recent merger with Canadian Airlines is expected to have a significant negative impact on total traffic volumes as well as on Canadian carrier traffic volumes

and market shares on the country-pair markets both Air Canada and Canadian served previously. Second, not only the U.S. style full liberal bilaterals or open skies, but also partial liberalization of bilateral markets Canada adopted appears to generate consumer welfare benefits.
Author
Commercial Aircraft; Air Traffic; Marketing

20030112022 Nebraska Univ., Omaha, NE, USA
NASA Spaceport Research: Opportunities for Space Grant and EPSCoR Involvement
Bowen, Brent; ONeil, Patrick; Box, Richard; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; 9 pp.; In English; See also 20030112018; Copyright; Avail: CASI; A02, Hardcopy

Over the last decade, the high cost of space programs has led to a significant decrease in space exploration and supporting programs. Current launch and recovery systems are too expensive to operate and maintain. In 1994, Congress passed the National Space Transportation Policy, which called on the National Aeronautics and Space Administration (NASA) to pursue technology development and demonstration efforts to support fbture government and private sector decisions on the development of operational second- and third-generation reusable launch vehicles. In response to the congressional mandate, NASA has undertaken a strategic initiative to expand future space exploration by encouraging commercialization and privatization of spaceport and launch knctions (Goldin, 2001). To support the development of revolutionary new technologies, NASA initiated the Integrated Space Transportation Plan (ISTP) managed by a partnership consisting of NASA, industry, the Department of Defense and academia (Vanneri, 2001). To build a new national space transportation system, NASA is pursuing commercialization and privatization of spaceport functions. In support of this new strategy, NASA Kennedy Space Center formed the Advanced Spaceport Technology Working Group (ASTWG) in 2001 (ASTWG, 2002). ASTWG is a partnership comprising NASA, industry, the Department of Defense, academia, and state and federal agencies.
Derived from text
Commercialization; Space Transportation System; NASA Programs; Space Exploration

20030112361 Mitre Corp., USA
Demand for Air Travel in the USA: Bottom-Up Econometric Estimation and Implications for Forecasts by Origin and Destination Pairs
Bhadra, Dipasis; Journal of Air Transportation, Volume 8, No. 2; 2003, pp. 19-56; In English; 6th Air Transport Research Society Conference, 14-16 Jul. 2002, Seattle, WA, USA; See also 20030112355; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

In this paper, we examine the relationship between origin and destination (O&D) travel and local area characteristics. By combining data from the Bureau of Transportation Safety of the U.S. Department of Transportation (BTSRJSDOT) on O&D travel with that of local area economic and demographic activities supplied by the Bureau of Economic Analysis of the Department of Commerce (BEADOC), we specify a semi-log linear demand relationship for O&D travel. The resultant dataset has more than 50,000 observations. Using a limited information maximum likelihood estimation procedure, we estimate demand for air travel in 11 market segments within the contiguous national airspace system (NAS), defined by non-stop distance traveled between O&D pairs. Our results confirm that local area income and demographyaffect travel positively for most of the markets. However, the levels of travel tend to peter out and eventually go down as the intensity of economic activities increases. We further find that shorter distance travel tends to be relatively more fare- inelastic than that for longer distances. Average fare tends to affect passenger travel negatively for all distances. Large hubs are important for passenger travel; so are the higher market share of established airlines and the presence of Southwest airlines in the O&D market. We then discuss approaches using our methodology for deriving bottom-up forecasts. These forecasts have distinct characteristics that make it more useful for analyzing flow features, such as passenger and aircraft flows within the NAS, determining and prioritizing infrastructure investment, and determining workload of Federal Aviation Administration (FAA) personnel at centers. Results from our forecasts can be easily complemented with those produced by the terminal area forecasts (TAF) and similar forecasts derived from top-down approaches.
Author
Air Transportation; Economic Analysis

20030112778 NASA Glenn Research Center, Cleveland, OH, USA
Process-based Cost Estimation for Ramjet/Scramjet Engines
Singh, Brijendra; Torres, Felix; Nesman, Miles; Reynolds, John; [2003]; 73 pp.; In English; 2003 Joint ISPA/SCEA Conference, 17-20 Jun. 2003, Orlando, FL, USA
Contract(s)/Grant(s): NAS3-01140; No Copyright; Avail: CASI; A04, Hardcopy

Process-based cost estimation plays a key role in effecting cultural change that integrates distributed science, technology and engineering teams to rapidly create innovative and affordable products. Working together, NASA Glenn Research Center and Boeing Canoga Park have developed a methodology of process-based cost estimation bridging the methodologies of high-level parametric models and detailed bottoms-up estimation. The NASA GRC/Boeing CP process-based cost model provides a probabilistic structure of layered cost drivers. High-level inputs characterize mission requirements, system performance, and relevant economic factors. Design alternatives are extracted from a standard, product-specific work breakdown structure to pre-load lower-level cost driver inputs and generate the cost-risk analysis. As product design progresses and matures the lower level more detailed cost drivers can be re-accessed and the projected variation of input values narrowed, thereby generating a progressively more accurate estimate of cost-risk. Incorporated into the process-based cost model are techniques for decision analysis, specifically, the analytic hierarchy process (AHP) and functional utility analysis. Design alternatives may then be evaluated not just on cost-risk, but also user defined performance and schedule criteria. This implementation of full-trade study support contributes significantly to the realization of the integrated development environment. The process-based cost estimation model generates development and manufacturing cost estimates. The development team plans to expand the manufacturing process base from approximately 80 manufacturing processes to over 250 processes. Operation and support cost modeling is also envisioned. Process-based estimation considers the materials, resources, and processes in establishing cost-risk and rather depending on weight as an input, actually estimates weight along with cost and schedule.
Author
Cost Analysis; Cost Estimates; Mathematical Models; Financial Management

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

20030111979 Dworkin (Michael L.) and Associates, San Francisco, CA, USA
Defense of Air Carriers and Air Agencies in FAA Enforcement Proceedings: Damage Control Before the Case Arises
Dworkin, Michael L.; The Conference Proceedings of the 2001 Air Transport Research Society (ATRS) of the WCTR Society, Volume 1; July 2001, pp. 1-19; In English; See also 20030111971; Copyright; Avail: CASI; A03, Hardcopy

Aviation, and particularly the air carrier industry, is safe because those involved in it strive to make it so as a matter of professional responsibility, dedication and pride--not because the FAA suspends certificates or imposes civil penalties. Unfortunately professional responsibility, dedication and pride will not immunize carriers, air agencies' and certain other certificate holders2 (hereinafter collectively referred to as organizational certificate holders) from the prospects of having to defend themselves in enforcement actions (and in some cases criminal proceedings) arising from alleged violations of Federal Aviation Regulations (FAR s), accepted industry practices, standards of care otherwise imposed by law or from aviation incidents and accidents.. While the industry is safe, it is not perfect. Neither aircraft nor aircraft equipment are fail-safe. Likewise, there is the human element.The FAR S impose strict liability. While many of them appear to be specific and clear, many others are not. There are ambiguities, and even apparent conflicts between FAR provisions. There are also the Stealth FAR s I--the FAA s policies, interpretations, internal orders, handbooks, notices and guidelines, as well as case precedents, which are not so easily found or widely known, and which can change from time to time, essentially without notice. Moreover, they can vary, not only from FAA Region to FAA Region, and from District Office to District Office, but from inspector to inspector.How the certificate holder responds to a potential violation is critical. It may be determinative as to whether or not, gnd what type of, enforcement action will be taken and how severe it may be. In essence, the best defense should start immediately upon learning of the potential violation, not after the FAA issues a letter of investigation; not after the FAA initiates a proposed enforcement action; not at the informal conference; and not during the pendency and conduct of the hearing or any appeals thereafter. Thus, this presentation will focus on certain actions that can and should be taken by the organizational certificate holder and/or its aviation counsel to mitigate the likelihood and severity of FAA action.
Author
Air Transportation; Aircraft Accidents

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20030111868 International Trade Administration, Washington, DC, USA
Global Positioning System: Market Projections and Trends in the Newest Global Information Utility
Sep. 1998; In English
Report No.(s): PB2004-101055; No Copyright; Avail: National Technical Information Service (NTIS)

The Global Positioning System (GPS) is a constellation of satellites that broadcast signals that can be used to derive precise timing, location, and velocity information. The derived information (time, position, and velocity) may be combined with other systems such as communications devices, computers, and software to perform a variety of tasks. With appropriate equipment, ranging from small, hand-held receivers to large, rack-mounted electronics, anyone can utilize the Global Positioning System (GPS) signal, anywhere in the world, at any time. GPS was originally developed for the U.S. military and came to wider public awareness as a result of the 1991 Gulf War. Today, it continues to be a 'dual-use' resource serving allied forces and a growing number of civilian users worldwide. In March 1996, President Clinton issued the first comprehensive statement of GPS policy in which the USA formally committed itself to providing civil GPS signals free of charge to the world.
NTIS
Global Positioning System; Space Commercialization

20030111961
Low-cost, Drift-free DGPS Locomotive Navigation System. High Speed Rail IDEA Program
Mueller, K. T.; Aug. 2003; 36 pp.; In English
Report No.(s): PB2004-100130; No Copyright; Avail: CASI; A03, Hardcopy

This project developed a high-speed rail train navigation system to accurately determine train location, including on which of two or more parallel tracks a locomotive is located. The system includes a three-receiver, three-antenna GPS heading reference system and parallel-track resolution software. The system also includes a heading rate sensor and a Doppler radar system to determine position, velocity, and heading when GPS satellite coverage is interrupted. Tasks in this concept exploration project included the developed and evaluation of the system software, including a parallel track resolution algorithm. Field tests with the GPS attitude system mounted on the test locomotive were conducted on BNSF.
NTIS
Global Positioning System; Rail Transportation; Surface Navigation

20030112106 NASA Langley Research Center, Hampton, VA, USA
Base Passive Porosity for Vehicle Drag Reduction
Bauer, Steven X. S., Inventor; Wood, Richard M., Inventor; September 09, 2003; 13 pp.; In English
Patent Info.: Filed 13 Sep. 2001; US-Patent-6,616,218-B2; US-Patent-Appl-SN-951857; NASA-Case-LAR-16348-1; No Copyright; Avail: CASI; A03, Hardcopy

A device for controlling drag on a ground vehicle. The device consists of a porous skin or skins mounted on the trailing surface and/or aft portions of the ground vehicle. The porous skin is separated from the vehicle surface by a distance of at least the thickness of the porous skin. Alternately, the trailing surface, sides, and/or top surfaces of the ground vehicle may be porous. The device minimizes the strength of the separation in the base and wake regions of the ground vehicle, thus reducing drag.
Author
Drag Reduction; Surface Vehicles; Porous Plates; Porous Boundary Layer Control

20030112786 NASA Stennis Space Center, Bay Saint Louis, MS, USA
NASA's Agricultural Program: A USDA/Grower Partnership
McKellip, Rodney; Thomas, Michael; April 24, 2002; 19 pp.; In English; II International Precision Agriculture Seminar, 12-14 Jun. 2002, Vicosa, Brazil; Original contains color illustrations
Report No.(s): SE-2002-04-00040-SSC; No Copyright; Avail: CASI; A03, Hardcopy

Ag20/20 is a partnership between USDA, NASA, and four national commodity associations. It is driven by the information needs of U.S. farmers. Ag20/20 is focused on utilization of earth science and remote sensing for decision-making

and oriented toward economically viable operational solutions. Its purpose is to accelerate the use of remote sensing and other geospatial technologies on the farm to: 1) Increase the production efficiency of the American farmer; 2) Reduce crop production risks; 3) Improve environmental stewardship tools for agricultural production.
Derived from text
Technology Utilization; Aerospace Technology Transfer; Agriculture; Government/Industry Relations; Earth Sciences; Remote Sensing

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20030111454 California Univ., Santa Cruz, CA, USA
Automated Development of Feature Extraction Tools for Planetary Science Image Datasets
Plesko, C.; Brumby, S.; Asphaug, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is more image data available to planetary scientists now than at any time in history. The problem now is how to best make use of it. It is impractical to analyze such large datasets manually, while development of handwritten feature extraction tools is expensive and laborious. This project explores the use of machine learning techniques to develop feature extraction algorithms for the Mars Orbiter Camera (MOC) narrow angle dataset using the Los Alamos GENIE machine learning software. GENIE, the GENetic Image Exploitation package, uses a genetic algorithm to assemble feature extraction algorithms from low-level image operators. Each algorithm is evaluated against user-provided training data, and the most accurate ones are allowed to 'reproduce' to build the next generation. The algorithm population evolves until it converges to a solution or specified level of accuracy.
Derived from text
Extraction; Pattern Recognition; Genetics; Education; Machine Learning

20030112122 NASA Marshall Space Flight Center, Huntsville, AL, USA
Overview of Space Transportation and Propulsion at NASA
Sackheim, Robert L.; [2003]; 54 pp.; In English; 5th International Symposium on Liquid Space Propulsion, 27-30 Oct. 2003, Chattanooga, TN, USA; No Copyright; Avail: CASI; A04, Hardcopy

Topics considered include: 1. Scientific discovery: The search for the life beyond Earth. Understanding our Planet. Understanding our Universe. Exploration of the Planets and beyond. 2. The ultimate high ground for national security: Intelligence, communications, rapid response, GPS. 3. Space-based commerce: Communications and Earth observing.
Derived from text
Universe; Planets; Space Transportation

20030112139 NASA Glenn Research Center, Cleveland, OH, USA
NASA Microgravity Combustion Science Research Plans for the ISS
Sutliff, Thomas J.; May 04, 2003; 2 pp.; In English; 2nd International Symposium on Physical Sciences in Space/Spacebound 2003, 4-8 May 2003, Toronto, Ontario, Canada
Contract(s)/Grant(s): WBS 22-400-35-80-01; No Copyright; Avail: CASI; A01, Hardcopy

A peer-reviewed research program in Microgravity Combustion Science has been chartered by the Physical Sciences Research Division of the NASA Office of Biological and Physical Research. The scope of these investigations address both fundamental combustion phenomena and applied combustion research topics of interest to NASA. From this pool of research, flight investigations are selected which benefit from access to a microgravity environment. Fundamental research provides insights to develop accurate simulations of complex combustion processes and allows developers to improve the efficiency of combustion devices, to reduce the production of harmful emissions, and to reduce the incidence of accidental uncontrolled combustion (fires, explosions). Through its spacecraft fire safety program, applied research is conducted to decrease risks to humans living and working in space. The Microgravity Combustion Science program implements a structured flight research process utilizing the International Space Station (ISS) and two of its premier facilities- the Combustion Integrated Rack of the Fluids and Combustion Facility and the Microgravity Science Glovebox - to conduct space-based research investigations. This

paper reviews the current plans for Microgravity Combustion Science research on the International Space Station from 2003 through 2012.
Author
Microgravity; International Space Station; Combustion Physics; Combustion Chambers

20030112226 Massachusetts Inst. of Tech., Cambridge, MA, USA
[Development Of 25-Year Imp 8 Bow Shock Crossing 'List, Ingestion Of This List To Cdaweb, & Enhancement'
Merka, J.; Szabo, A.; Narock, T. W.; King, J. H.; Paularena, K. I.; Richardson, J. D.; [2003]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-9622; No Copyright; Avail: Other Sources; Abstract Only

The MIT portion of this project was to use the plasma data from IMP 8 to identify bow shock crossings for construction of a bow shock data base. In collaboration with Goddard, we determined which shock parameters would be included in the catalog and developed a set of flags for characterizing the data. IMP 8 data from 1973-2001 were surveyed for bow shock crossings; the crossings apparent in the plasma data were compared to a list of crossing chosen in the magnetometer data by Goddard. Differences were reconciled to produce a single list. The data were then provided to the NSSDC for archiving. All the work ascribed to MIT in the proposal was completed.
Author
Bow Waves; Catalogs (Publications); Shock Waves; Explorer 50 Satellite

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ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20030109435 NASA Marshall Space Flight Center, Huntsville, AL, USA
XTE JO111.2-73 17: An X-Ray Binary in the SMC
Coe, M. J.; Haigh, N. J.; Wilson, C. A.; Negueruela, I.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

The observed characteristics of the nebulosity surrounding the SMC High Mas X-ray Binary XTE J0111.2-7316 are examined in the context of three possible nebular types: SNR, bowshock and HII region. Observational evidence is presented which appears to support the interpretation that the nebulosity surrounding XTE JO111.2-7316 is an HII region. The source therefore appears to be a normal SMC BeXRB embedded in a locally enhanced ISM which it has photoionised to create an HII region.
Author
H Ii Regions; X Ray Binaries; Shock Waves

20030110719 Florida Gulf Coast Univ., Fort Myers, FL, USA
LISAA - Low Inclination Search for Approaching Asteroids
Fauerbach, M.; Lucas, M. P.; Mon, M. J.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The majority of the asteroid tracking and search projects are located in the northern hemisphere. The recently completed Evelyn L. Egan Observatory on the campus of Florida Gulf Coast University is located at 26.5 North latitude, ideally situated to observe a large portion of the southern celestial sphere. This location can provide valuable observations of low declination NEOs that can t be reached by more northerly observers. Approximately 80% of the minor planets have inclinations less than 20 to the ecliptic plane, the main objective of the LISAA project will be to observe the area of sky within 20 south of the ecliptic plane. Contrary to popular belief, born from the fact that South Florida is only a few feet above sea level, South Florida offers many clear and steady nights in an observing season that spans roughly October through May. This eight-month span would be the typical main observing interval of the LISAA project each year. The Egan Observatory s automated 16 Ritchey-Chretien telescope equipped with an Apogee AP7ap CCD camera will be employed to take stereo-paired images covering 0.1deg2 of sky in an effort to detect previously unknown NEOs and to recover recent NEO discoveries from other search programs for follow-up astrometric observations. Furthermore, photometric studies using BVRI filters will provide

valuable information about the rotational and compositional properties of some of the brighter Near Earth Objects.
Author
Near Earth Objects; Asteroid Detection

20030110759 Vatican Observatory, Vatican City State (Holy See)
Does 146 Lucina Have a Satellite? An Astrometric Approach
Kikwaya, J.-B.; Thuillot, W.; Rocher, P.; Martins, R. Vieira; Arlot, J.-E.; Angeli, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are applying an astrometric method to detect new asteroidal satellites based upon the reflex effect of the primary object due to the orbital motion of a possible satellite. We propose to apply a spectral analysis to detect this signal.
Author
Spectrum Analysis; Asteroids

20030110878 Florida Gulf Coast Univ., Fort Myers, FL, USA
Increasing Public Outreach in Astronomy Through Digital Imaging Technology
Fauerbach, M.; Lucas, M. P.; Mon, M. J.; Schonberg, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are drawbacks to the traditional public astronomy event; only one person at a time can look through a telescope. Due to the large crowds which can assemble during public events and astronomy classes, it is customary to have to wait in line for rather short glimpses of celestial objects. To compound this problem , small children often have difficulties looking through only one eye, and the eyepiece location makes viewing uncomfortable or sometimes even impossible - for disabled or elderly people. The goal of this project is to alleviate these difficulties through the use of inexpensive, readily available digital imaging technology. By using such equipment we strive to simplify the wide dissemination and replication of the techniques discussed.The goal of this project was to discover a way to accommodate a large and diverse audience for an astronomical event, while also, engaging them in Science, Technology, Engineering, and Mathematics (STEM) research and education. This task was accomplished using readily available and inexpensive digital technology.
Author
Astronomy; Education; Imaging Techniques

20030111325 Florida Inst. of Tech., Indian Harbour Beach, FL, USA
The Occultation of 14 Piscium by Asteroid (51) Nemausa - September 11, 1983
Povenmire, H.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On January 22, 1858, A. Laurent discovered a bright asteroid, (51) Nemausa, at Nimes, France. The class of this asteroid is S or silicate. The albedo is estimated at 0.062. The diameter was estimated at 156 km. On September 11, 1983, at about 7:45 UT, (51) Nemausa was predicted to occult the star 14 Piscium over the southeastern USA under favorable conditions.
Author
Asteroid Detection; Photometers

20030111339 Florida Inst. of Tech., Indian Harbour Beach, FL, USA
Newly Discovered Meteor Radiants
Povenmire, K. I.; Povenmire, H.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since August 1975, an active campaign of double station photographic and image-intensified videography has been undertaken from the Cape Canaveral area. The area of the sky concentrated on was the constellation Pegasus. The primary purpose was for data gathering of the newly discovered Upsilon Pegasid meteor shower. One of the secondary discoveries was the identification of five active radiants which are not found in an extensive literature search. The reason for this is that the zenith hourly rate (ZHR) falls far below what the visual observer would notice. However, when the results of many years of photographic data is reduced, it is apparent that these radiants consistently produce meteors on a low level for many days each summer and continue to do so every year. Usually the rates are measured in meteors per night rather than meteors per hour.

The names applied to these radiants are from the nearest naked eye star to the radiant.
Author
Meteoroids; Imaging Techniques

20030111572 State Univ. of New York, Plattsburgh, NY, USA
Mass and Size Frequency Distribution of the Impact Debris from Disruption of Chondritic Meteorites
VanVeghten, T. W.; Flynn, G. J.; Durda, D. D.; Hart, S.; Asphaug, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since direct observation of the collision of asteroids in space is not always convenient for earthbound observers, we have undertaken simulations of these collisions using the NASA Ames Vertical Gun Range (AVGR). To simulate the collision of asteroids in space, and aluminum projectiles with velocities ranging from approx.1 to approx.6 km/sec were fired at 70g to approx.200 g fragments of chondritic meteorites. The target meteorite was placed in an evacuated chamber at the AVGR. Detectors, usually four, were set up around the target meteorite. These detectors consisted of aerogel and aluminum foil of varying thickness. The aerogel's purpose was to catch debris after the collision, and the aluminum foil.s purpose was to show the size of the debris particles through the size of the holes in the aluminum foil. Outside the chamber, a camera was set up to record high-speed film of the collision. This camera recorded at either 500 frames per second or 1000 frames per second. Three different types of targets were used for these tests. The first were actual meteorites, which varied in mineralogical composition, density, and porosity. The second type of target was a Hawaiian basalt, consisting of olivine phenocrysts in a porous matrix, which we thought might be similar to the chondritic meteorites, thus providing data for comparison. The final type was made out of Styrofoam. The Styrofoam was thought to simulate very low-density asteroids and comets.
Author
Asteroid Collisions; Simulation

20030111615 Kobe Univ., Japan
A Planetesimal Accretion Zone in a Circumbinary Disk
Moriwaki, K.; Nakagawa, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Among more than 100 extrasolar planets discovered, a few are confirmed to be in a binary system. However, most stars in the galaxy are in binary or multistellar systems; hence, they are considered to have been born as such systems, probably together with some planets. It is, therefore, expected that the number of planets discovered orbiting binary systems will increase. The extrasolar planets orbiting a binary system have been divided into two categories. The first is referred to the satellite type or S-type such as 16 Cyg B, 55 Cnc, tau Boo. These planets orbit one of the binary stars. The second is referred to the planetary type or P-type such as MACHO-97-BLG 41 lens system. The planets of this type orbit outside both of the binary stars. From the viewpoint of celestial mechanics, we examined a zone where planetesimals can accrete to form the P-type planet. Recently, a quite suitable example has been found the planet orbiting the MACHO-97-BLG-41 lens system. Bennett et al. reported gravitational microlensing evidence for a planet orbiting a binary system in the event MACHO-97-BLG-41 observed in 1997 by Alcock et al.. In general, P-type planets may become dynamically unstable according to conditions. The stability of MACHO-97-BLG-41 lens system has already been investigated. The next concern is how P-type planets are formed. In order to form P-type planets, a circumbinary disk as in GG Tau must be formed first. Even if the planetesimals have once been formed in such a circumbinary disk, the gravitational perturbations from the binary system excite eccentricities of the planetesimals. The excited eccentricities may prevent planetesimals from accreting. Fist,we estimate the condition of planetesimal eccentricity with which accretion can occur. Second, we perform long-term numerical integrations in order to see the pumped-up planetesimal eccentricities. From the numerical results, we find a zone fulfilling the above condition finally.
Author
Extrasolar Planets; Protoplanets; Binary Stars; Accretion Disks; Planetary Systems

20030111743 NASA Marshall Space Flight Center, Huntsville, AL, USA
JD 7: The Sun and the Heliosphere as an Integrated System
Suess, Steven T.; Poletto, Giannina; Highlights of Astronomy; 2003; Volume 13; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

As knowledge of the Sun and the heliosphere grows, it is becoming not only possible but preferable to view the global structure, the interaction with the local interstellar medium, and changes over a solar cycle as the behavior of an integrated system. This consideration motivated Joint Discussion 7, which was meant both to summarize the state of art at the time of IAU XXVand to solicit interest in this kind of approach. The Joint Discussion was arranged in four sections, two on processes that, beginning from the Sun s interior, model and shape the heliosphere (From the Transition Region to the Corona and beyond and From the Sun to the interstellar Medium), one on elemental abundances and particles in the corona and the heliosphere (Energetic Particles, Energetic Neutral Atoms and Composition) and one on forthcoming solar and heliospheric space missions. In the following we give a brief summary of the contributions presented at the JD in each section. An ext.cnded discussion of the topics cov- ered by JD is expected to appear in a comprehensive book on the Sun and the Heliosphere which will be edited by us and printed by Kluwer in year 2004. Posters which were exhibited as part of the Joint Discussion are listed at the end of this summary.
Derived from text
Sun; Heliosphere; Energetic Particles; Interstellar Matter; Abundance

20030111745 Amsterdam Univ., Netherlands, NASA Marshall Space Flight Center, Huntsville, AL, USA
A Diagnostic Tool for Dark GRBs
Kouveliotou, Chryssa; Rol, Evert; Wijers, Ralph A. M. J.; Kaper, Lex; vandenHeuvel, Edward P. J.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We have made a comprehensive overview of the optical/near-infrared (IR) upper limits for gamma-ray bursts that have an X-ray afterglow. We have extrapolated the X-ray afterglows to optical wavelengths and compared these results with their upper limits in optical. We find a small sample of only three bursts for which the upper limits are not compatible with their X-ray afterglow properties. This sparse sample does not allow us to conclusively determine the cause of this optical/near-IR deficit. Extinction in the host galaxy is a likely cause, but high redshifts and different afterglow mechanisms might also explain the deficit. We note that the three bursts appear to have higher than average gamma-ray peak fluxes. Furthermore, in a magnitude versus time diagram these bursts are clearly separated from the majority of bursts with a detected optical/near-IR afterglow. Two afterglows fall in this region with dark bursts, one of which is highly reddened. Detection of such bursts will shed some light on the dark burst issue, and the work we present here provides a useful tool for the detection (or non detection to good upper limits) of such bursts.
Derived from text
Gamma Ray Bursts; X Ray Optics; Afterglows; Near Infrared Radiation

20030111747 Universities Space Research Association, Huntsville, AL, USA
Changes in the X-ray Emission from the Magnetar Candidate 1E 2259+586 during its 2002 Outburst
Woods, P. M.; Kaspi, V. M.; Thompson, C.; Gavriil, F. P.; Marshall, H. L.; Chakrabarty, D.; Flanagan, K.; Heyl, J.; Hernquist, L.; [2003]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

An outburst of more thm 80 individual bursts, similar to those see^ from Soft Gamma Repeaters (SGRs), was detected from the Anomalous X-ray Pulsar (AXP) 1E 2259+586 in 2002 June. Coincident with this burst activity were gross changes in the pulsed flux, persistent flux, energy spectrum, pulse profile and spin down of the underlying X-ray source. We present Rossa X-ray Tirnsng Explorer and X-ray Multi-Mirror Mission observations of 1E 2259+586 that show the evolution of the aforementioned source parameters during and following this episode and identify recovery time scales for each. Specifically, we observe an X-ray flux increase (pulsed and phase-averaged) by more than an order of magnitude having two distinct components. The first component is linked to the burst activity and decays within approx. 2 days during which the energy spectrum is considerably harder than during the quiescent state of the source. The second component decays over the year following the glitch according to a power law in time with an exponent -0.22+/-0.01. The pulsed fraction decreased initially to approx. 15% RMS, but recovered rapidly to the pre-outburst level of approx. 2 3 % within the first three days.
Author
Emission; X Ray Sources; Gamma Ray Bursts; Pulsars

20030111901 Johns Hopkins Univ., Baltimore, MD, USA
A Proposal to Investigate Outstanding Problems in Astronomy
Ford, Holland; January 2003; 28 pp.; In English
Contract(s)/Grant(s): NAG5-7697; No Copyright; Avail: CASI; A03, Hardcopy

During the past year the ACS science team has concentrated on analyzing ACS observations, writing papers, and

disseminating our results to the astronomy community at conferences and workshops around the world. We also have put considerable effort in getting our results to the public via public lectures and through press releases. Taking a very broad view of our program, we are investigating the evolution of galaxies and clusters of galaxies from their birth, approximately one billion years after the beginning of the Universe, to the present. We have found and characterized a population of galaxies that are no more than 1.4 billion years old. These may well be the Universe s first generation of infant galaxies. Looking at the Universe 500,000 years later, we see what appears to be a cluster of galaxies just beginning to form (a proto-cluster) around a luminous radio galaxy. Moving forward in time and closer to the present, we are studying clusters of galaxies that are less than half the age of the Universe. Our observations and analysis lead us to the important conclusion that the elliptical galaxies in these clusters must have had their last significant star formation some three billion years earlier, which is about the time when the proto-cluster was forming. Coming still closer to home, we are observing nearby massive clusters of galaxies that are approximately 12 billion years old. The gravity from these large aggregates of dark and luminous matter is so strong it warps space-time itself, and makes the cluster act as a cosmic telescope that magnifies the distant galaxies behind the cluster. We used the magnified (or lensed) galaxies to map the distribution of the dominant matter within the clusters, which is the so-called dark matter (the matter is invisible, and its nature is unknown). We also are using these cosmic telescopes to study the distant lensed galaxies that would otherwise be too small and too faint to be seen even by Hubble and the ACS.
Derived from text
Galactic Evolution; Galactic Clusters; Elliptical Galaxies; Dark Matter; Radio Galaxies; Star Formation

20030112410 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Stacking Searches for Greater Than 100 MeV Gamma Ray Emission from Radio Galaxies and Seyfert Galaxies
Cillis, A. N.; Hartman, R. C.; Bertsch, D. L.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

The EGRET telescope on CGRO detected more than sixty sources of high-energy gamma radiation associated with active galactic nuclei (AGN). All but one of those belong to the blazar subclass; the only exception is the nearby radio galaxy Centaurus A. Since there is no obvious reason other than proximity to expect Cen A to be the only non-blazar AGN emitting in high-energy gamma rays, we have utilized the 'stacking' technique to search for >100-MeV emission from two non-blazar AGN subclasses, radio galaxies and Seyfert galaxies. Maps of gamma-ray counts, exposure, and diffuse background have been created, then co-added in varying numbers based on sorts by redshift, 5-GHZ flux density, and optical brightness, and finally tested for gamma-ray emission. No detection significance greater than 2σ has been found for any subclass, sorting parameter, or number of objects co-added. Monte Carlo simulations have also been performed, to validate the technique and estimate the significance of the results.
Author
Radio Galaxies; Seyfert Galaxies; Gamma Ray Astronomy; Gamma Rays; Active Galactic Nuclei

20030112446 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Community Plan for Far-Infared/Submillimeter Space Astronomy
Leisawitz, David; Oegerle, William, Technical Monitor; [2003]; 37 pp.; In English; Workshop on New Concepts for Far-Infrared/Submillimeter Space Astronomy, 7-8 Mar. 2002, College Park, MD, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The consensus of attendees at the Second Workshop on New Concepts for Far-Infrared/Submillimeter Space Astronomy is that the Single Aperture Far-IR telescope (SAFIR), a cooled spaceborne observatory, is important for the future of far-infrared astronomy. This paper describes the specifications and capabilities of SAFIR, possible designs for SAFIR, and suggests a development strategy for the technology necessary for the telescope.
CASI
Far Infrared Radiation; Infrared Astronomy; Astronomical Observatories; Spaceborne Telescopes; Development; Project Planning

20030112795 Naval Postgraduate School, Monterey, CA
Analysis of the NASA Shuttle Hypervelocity Impact Database
Stucky, Michael S.; Sep. 2003; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418233; No Copyright; Avail: CASI; A05, Hardcopy

A statistical analysis of the NASA Space Shuttle Hypervelocity Impact Database to find correlations between meteoroid and orbital debris (M/OD) impacts on the shuttle orbiter fleet and specific mission parameters; Inclination, Altitude, Duration and Year, M/OD impact data, regardless of location, particle type or mission was examined first, followed by the subcategories

of Window data, Radiator data, Reinforced Carbon-Carbon (RCC) data, and Flexible Reusable Surface Insulation (FRSI) data, In an effort to characterize and evaluate the meteoroid and orbital debris (M/OD) environment in low earth orbit, post-flight surveys of the shuttle orbiters are conducted to identify damage caused by hypervelocity impacts from M/OD, Survey analysis determines whether the impactor was a naturally occurring meteoroid or man-made orbital debris, as well as the impactor's size and impact velocity, From the post-flight survey data, calculations on the number of impacts from specific particle diameters or specific particle materials are made and compared to mission parameters to help engineers design spacecraft for better mission efficiency by reducing the effects of M/OD impacts This thesis analyzes the NASA Space Shuttle Hypervelocity Impact Database, using regression analysis software, to find correlations between M/OD impacts on the shuttle orbiter fleet and mission parameters to draw conclusions on what is influencing vehicle damage.
DTIC
Data Bases; Hypervelocity Impact; Meteoroids; Low Earth Orbits; Carbon-Carbon Composites

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20030110625 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Migration of Asteroidal Dust
Ipatov, S. I.; Mather, J. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Using the Bulirsh Stoer method of integration, we investigated the migration of dust particles under the gravitational influence of all planets, radiation pressure, Poynting Robertson drag and solar wind drag for equal to 0.01, 0.05, 0.1, 0.25, and 0.4. For silicate particles such values of correspond to diameters equal to about 40, 9, 4, 2, and 1 microns, respectively [1]. The relative error per integration step was taken to be less than 10sup-8. Initial orbits of the particles were close to the orbits of the first numbered mainbelt asteroids.
Author
Numerical Analysis; Dust; Orbits

20030110748 Australian National Univ., Canberra, Australia
Initial 182Hf/180Hf and W-Isotopic Systematics of the Early Solar System
Ireland, T. r.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 182Hf- 182W decay scheme has a number of attributes that make it a highly useful chronometer for early solar system processes. Both Hf and W are refractory and thus are not susceptible to perturbations caused by high-temperature processing in the early solar system. The half-life of 9 million years is close to the possible lifetime of the solar nebula allowing suitable time-points to be determined. Hf and W have quite different geochemical affinities, Hf is lithophile while W is significantly more siderophile, and hence Hf-W systematics might be used for constraining the timing of planetary core formation. It is this latter aspect that has attracted great interest in cosmochemistry [1- 5]. The presence of a 182W deficit in iron meteorites (relative to bulk chondrite meteorites) suggests that Fe meteorites formed, that is Hf was fractionated away from W, prior to the complete decay of 182Hf t o 182W (half life of 9 Ma). The deficit provides strong evidence of the presence of 182Hf in the early solar system, although determining the 182Hf/180Hf from this data requires a cosmochemical model relating W isotopic compositions with Hf/W ratios.
Author
Solar System; Hafnium Isotopes; Tungsten Isotopes; Meteoritic Composition

20030110866 California Univ., Los Angeles, CA, USA
CO Self Shielding in the Outer Solar Nebula: An Astrochemical Explanation for the Oxygen Isotope Slope-1 Line
Young, E. D.; Lyons, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In a recent paper, R.N. Clayton made the suggestion that self shielding by CO in the early solar nebula could have been the origin of the anomalous array of O-18/O-16 and O-17/O-16 in primitive solar system materials (the slope-1 line on a plot of delta O-17 vs. delta O-18). The efficacy of the photodissociation of CO as a means for producing slope-1 lines in oxygen

three-isotope space is underscored by the STIS detection of slope-1 oxygen isotope ratios in interstellar CO. A major component of the CO self shielding hypothesis is that the starting materials for all solids in the early solar nebula were rich in O-16, with isotopic compositions comparable to the most O-16-rich CAI minerals. An alternative, proposed by Yurimoto and Kuramoto, is that the anomalous oxygen isotopic signal was produced by CO self shielding in the parent molecular cloud. Derived from text

Carbon Monoxide; Solar Nebula; Oxygen 18; Photodissociation; Isotope Ratios

20030110902 Carnegie Institution of Washington, Washington, DC, USA

Making CAIs and Chondrules from CI Dust in a Canonical Nebula

Alexander, C. M. OD.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Astrophysical models suggest that at 2-3 AU, ambient midplane pressures would have been 10(exp -4) bars or less. Transient events, such as the passage of shock waves, may have increased midplane pressures by roughly an order of magnitude. Thus, at 2-3 AU 10(exp -3) bars is a likely upper limit for chondrule and CAI formation. To explain both the elemental and isotopic compositions of chondrules and CAIs, recent studies have suggested that they may have formed at significantly higher pressures than this. If correct, this suggests that chondrules and CAIs must have formed much closer to the Sun (<<1 AU) where midplane pressures would have been higher. This would have profound implications for our understanding of nebular evolution. In addition, CAIs may have formed from high temperature equilibrium condensates rather than solar composition material. However, neither study considered the effect of gas-melt exchange during formation. Upon heating, chondrules and CAIs would have experienced some evaporation. Unless the vapor generated by this evaporation was immediately removed from the system, it will have interacted with the chondrules/CAIs, possibly significantly modifying the isotopic fractionations that develop. Here, a kinetic code for modeling silicate-metal evaporation-condensation is used to explore whether, when gas-melt exchange is taken into account, chondrules and CAIs could have formed under more canonical nebular conditions from solar composition material.

Author

Astronomical Models; Meteoritic Composition; Chondrule; Solar Nebula

20030110953 Universidad Nacional Autonoma de Mexico, Mexico City, Mexico

Survivability of Fullerenes Under Gamma-Irradiation in the Interstellar Medium

Basiuk, V. A.; Albarran, G.; Basiuk, E. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): CONACYT-36317-E; CONACYT-33752-E; DGAPA-IN102900; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Although the presence of fullerenes in the interstellar medium remains a subject for considerable discussion and waits for an unambiguous experimental confirmation, it is generally assumed that the large spherical carbon clusters can be generated within circumstellar envelopes of mass-losing carbon-rich stars. The detection of fullerenes in carbonaceous chondrites, in the geological strata of the Cretaceous-Tertiary and the Permian-Triassic boundary layers, associated with bolide impacts, can be considered as an indirect evidence of their formation in circumstellar envelopes. Besides that, the presence of fullerene species in the extraterrestrial samples found on Earth implies that these compounds are able to survive very long passages through diverse space environments. Some of them (especially those in close proximity to the stars where the fullerenes can be produced) are characterized by strong ionizing radiation. One can expect that any kind of radiation (UV, proton, gamma-irradiation, etc.) decomposes the newly formed fullerene (as any other carbon-containing) molecules, thus rising a question on the fate of fullerenes in harsh radiation environments. In other words, the existence of the large spherical carbon clusters must finally depend on competition between the rates of their formation and radiation decomposition. Despite fullerene chemistry as a whole remains a subject for numerous studies, there is an obvious lack of experimental data in this area. We tried to roughly estimate the capability of C60, the most common member of fullerene family, to withstand prolonged gamma-irradiation. We exposed C60 to very high irradiation doses exceeding 6 MGy, and analyzed the irradiated samples by high-performance liquid chromatography (HPLC) and infrared (IR) spectroscopy.

Author

Fullerenes; Gamma Rays; Radiation Effects; Interstellar Matter; Decomposition

20030110962 Museum fuer Naturkunde, Berlin, Germany

Visible and Near-Infrared Reflectance Spectra of Rumuruti

Berlin, J.; Lingermann, C. M.; Stoeffler, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Visible and near-infrared (VNIR) reflectance spectra of meteorites help us to constrain genetic relationships to potential parent asteroids. We present measurements in the range of 0.5-2.5 m for Rumuruti after which a new chondrite group was named in 1994. Rumuruti is the only fall among the R chondrites and as an unweathered meteorite it is ideal for reflectance spectroscopy. R-chondrites have highly oxidized mineral assemblages and contain, with decreasing abundance, olivine, plagioclase, Carich pyroxene, low-Ca pyroxene, minor phases such as pyrrhotite, pentlandite, chromian spinel, and traces of metallic FeNi. Most R-chondrites are light/dark structured regolith breccias consisting of highly recrystallized fragments as well as unequilibrated lithologies and contain solar-wind-implanted rare gases. As of today, there is only one VNIR-reflectance measurement on Rumuruti powder.

Derived from text

Breccia; Asteroids; Meteoritic Composition; Mineral Deposits; Spectral Reflectance; Near Infrared Radiation

20030111033 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Fluorescent Aerogel for Capture and Identification of Interplanetary and Interstellar Dust

Dominguez, Gerardo; Westphal, Andrew J.; Phillips, Mark L. F.; Jones, Steven M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NAG5-10411; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Aerogels are extremely low-density solids whose superiority as capturing media for hypervelocity (v > 0.5 km/s) grains has been well established. A prominent example is the use of silica aerogel as the collecting medium for cometary and interstellar grains on NASA s Stardust mission. Aerogel collectors have been deployed in low-earth orbit, but severe background from anthropogenic orbital debris has so far prevented the identification of more than a handful of interplanetary particles. No interstellar particles have been identified so far. Since they are on hyperbolic orbits, extraterrestrial particles are faster than orbital debris, so could in principle be identified on that basis, but existing aerogels give little information on impact velocity. With this in mind, we have developed a novel calorimetric aerogel which passively records the kinetic energy of captured hypervelocity particles.

Derived from text

Fluorescence; Aerogels; Calorimeters; Low Earth Orbits; Interplanetary Dust; Cosmic Dust

20030111038 Carnegie Institution of Washington, Washington, DC, USA

An Interstellar Origin for the Beryllium 10 in CAIs

Desch, S. J.; Srinivasan, G.; Connolly, Harold C., Jr.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Excesses of 10B have been correlated with beryllium content in calcium-aluminum-rich inclusions (CAIs), showing that the objects incorporated the shortlived radionuclide 10Be when they formed [15]. The canonical 10Be / 9Be ratio has been taken to be 9 times 10(sup)minus 4 [1].Of the 16 CAIs and three hibonite residues [6] measured to date, all are within a factor of 2 of this value, and only one CAI [5] exceeds this value significantly. We also adopt this canonical ratio, although an initial ratio twice as large is suggested by some of the data [3,5].

Author

Beryllium 10; Inclusions

20030111132 Washington Univ., Saint Louis, MO, USA

Complementary Carbon, Nitrogen and Oxygen Isotopic Imaging of Interplanetary Dust Particles: Presolar Grains and an Indication of a Carbon Isotopic Anomaly

Floss, C.; Stadermann, F. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Interplanetary dust particles (IDPs) are composed of a variety of primitive materials and are the repositories of various

isotopic anomalies. They are well known to exhibit enrichments of deuterium (D) and (15)N, although the two types of isotopic anomalies do not appear to be directly correlated. The enrichments are generally thought to be carried by organic compounds, but C isotopic measurements of IDPs have thus far shown no clear evidence for anomalous C compositions. Recently, silicate grains with extremely anomalous O isotopic compositions, indicating a presolar origin, have also been reported from IDPs. We are carrying out complementary isotopic imaging measurements (c.f., H, C, N, O) on a suite of IDPs using the NanoSIMS at Washington University. This work is part of a larger effort to survey the isotopic microdistributions of IDPs and Renazzo matrix, in order to compare and clarify the origins of such anomalies in both types of primitive materials. Here we focus on the C, N and O isotopic systematics of two unusual IDPs.
Author
Interplanetary Dust; Carbon Isotopes; Nitrogen Isotopes; Oxygen Isotopes; Imaging Techniques; Anomalies; Isotope Ratios

20030111200 NASA Ames Research Center, Moffett Field, CA, USA
Creation and Distribution of CAIs in the Protoplanetary Nebula
Cuzzi, J. N.; Davis, S. S.; Dobrovolskis, A. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

CaAl rich refractory mineral inclusions (CAIs) found at 1 - 10% mass fraction in primitive chondrites appear to be several million years older than the dominant (chondrule) components in the same parent bodies. A prevalent concern is that it is difficult to retain CAIs for this long against gas-drag-induced radial drift into the sun. We assess a hot inner (turbulent) nebula context for CAI formation, using analytical models of nebula evolution and particle diffusion. We show that outward radial diffusion in a weakly turbulent nebula can prevent significant numbers of CAI-size particles from being lost into the sun for times of 1 - 3 x 10(exp 6) years. To match the CAI abundances quantitatively, we advocate an enhancement of the inner hot nebula in silicate-forming material, due to rapid inward migration of very primitive, silicate and carbon rich, meter-sized objects. 'Combustion' of the carbon into CO would make the CAI formation environment more reduced than solar, as certain observations imply. Abundant CO might also play a role in mass-independent chemical fractionation of oxygen isotopes as seen in CAIs and associated primitive, high-temperature condensates.
Author
Refractories; Calcium Compounds; Aluminum Compounds; Solar Nebula; Solar System Evolution

20030111263 Panjab Univ., Chandigarh, India
Contributions of Short-lived Nuclides by Wolf-Rayet Stars and Supernovae 1b/c to the Early Solar System
Sahijpal, S.; Soni, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Wide range of stellar as well as irradiation nucleosynthetic scenarios have been proposed to understand the presence of several short-lived nuclides (t = 5Ma) in the early solar system. In order to infer their most plausible source(s) and the extent of distribution in the nebula, detailed isotopic and dynamical constraints have to be worked out for all possible scenarios. In an ongoing effort to impose isotopic constraints on the various stellar nucleosynthetic sources, an attempt is made here to access the role of a single massive (60M) Wolf-Rayet (WR) star and supernovae type 1b/c (SN1b/c). We have also attempted a detailed study of a single massive 60M WR star evolved through SN1b/c.
Derived from text
Irradiation; Nuclides; Solar System; Wolf-Rayet Stars

20030111332 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Autonomous Sciencecraft Experiment (ASE) Test Operations in 2003
Chien, S.; Davies, A. G.; Baker, V.; Castano, B.; Cichy, B.; Doggett, T.; Dohm, J. M.; Greeley, R.; Sherwood, R.; Williams, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NASA has identified the development of an autonomously operating spacecraft as a necessity for an expanded program of missions exploring the Solar System. The Autonomous Sciencecraft Experiment (ASE) has been selected for flight demonstration by NASA s New Millennium Program (NMP) as part of the Space Technology 6 (ST6) mission. ASE is scheduled to fly on the US Air Force Research Laboratory (AFRL) Techsat-21 constellation in 2006. Tech- Sat-21 consists of three satellites flying in a variable-geometry formation in Earth orbit. Each satellite is equipped with X-band Synthetic

Aperture Radar, yielding high spatial resolution images (approx. 3 m) of the Earth s surface. The constellation will fly at an altitude of 550 km, in a 35.4 inclination circular orbit, yielding exact repeat-track observations every 13 days. Prior to full deployment, elements of the versatile ASE spacecraft command and control software, image formation software and science processing software will be utilized and tested on two very different platforms in 2003: AirSAR and EO-1 (described below). Advantages of Autonomous Operations: ASE will demonstrate advanced autonomous science data acquisition, processing, and product downlink prioritization, as well as autonomous spacecraft command and control, and fault detection. The advantages of spacecraft autonomy are to future missions include: (a) making the best use of reduced downlink; (b) the overcoming of communication delays through decisionmaking in situ, enabling fast reaction to dynamic events; (c) an increase of science content per byte of returned data; and (d) an avoidance of return of null (no-change/no feature) datasets: if there is no change detectable between two scenes of the same target, there is no need to return the second dataset.
Derived from text
Automatic Control; Autonomy; Data Acquisition; Solar System

20030111349 NASA Johnson Space Center, Houston, TX, USA
Far-IR Spectroscopy of Interplanetary Dust, Circumstellar Silicate Analogs, and Aerogel: A Prelude to Stardust Samples
Keller, L. P.; Flynn, G. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-4843; RTOP 344-31-40-07; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Infrared (IR) spectroscopy is the primary means of mineralogical analysis of materials outside our solar system. The identity and properties of circumstellar grains are inferred from spectral comparisons between astronomical observations and laboratory data from natural and synthetic materials. The Infrared Space Observatory (ISO) obtained IR spectra from numerous astrophysical objects over a wide spectral range (out to 50/cm) where crystalline silicates and other phases have distinct features. The next generation of IR observatories will provide higher sensitivity and better wavelength resolution to extend these measurements to even longer wavelengths. Interplanetary dust particles (IDPs) are particularly important comparison materials because some IDPs contain carbonaceous material with non-solar D/H and (15)N/(14)N ratios and silicates with non-solar O-isotopic ratios, demonstrating that these IDPs contain preserved interstellar material. Here, we report on micro-Fourier transform (FT) IR spectrometry of IDPs, circumstellar silicate analogs, and silicates in aerogel that encompass much of the spectral range covered by ISO. The aerogel measurements are important because samples of comet dust collected in aerogel will be returned to Earth for analysis by the STARDUST mission in January of 2006.
Author
Infrared Spectroscopy; Interplanetary Dust; Fourier Transformation; Silicates

20030111364 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Be-B Isotope Systematics in CV and CM Hibonites: Implications for Solar Energetic Particle Production of Short-lived Nuclides in Early Solar System
Marhas, K. K.; Goswami, J. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fossil records of the now-extinct short-lived nuclide 10Be have been found in early solar system objects that either host other short-lived nuclides, such as, Al-26 and Ca-41, or are devoid of them. The presence of Be-10 in several Murchison hibonites devoid of detectable radiogenic Mg-26 (initial Al-26/Al-27 less than 2 x 10(exp -6) and K-41 (initial Ca-41/Ca-40 less than 3 x 10(exp -9)) was considered as an indicator for separate sources for these nuclides. A stellar source is proposed for Al-26 and Ca-41, while interactions of solar energetic particles (SEP) with nebular material appears to be the most plausible source of Be-10, which is not a product of stellar nucleosynthesis. A limit on the SEP irradiation of the solar nebula was placed based on these observations. We present here new results on Be-B isotope systematics in a couple of CV and CM hibonite and evaluate the contribution from SEP production towards the inventory of the short-lived nuclides in the early solar system.
Derived from text
Aluminum Isotopes; Beryllium Isotopes; Calcium Isotopes; Solar Physics

20030111462 Kyushu Univ., Fukuoka, Japan
Supernova Nucleosynthesis and Application to the Isotopic Ratios of Individual Presolar Grains from Supernovae
Yoshida, T.; Hashimoto, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Presolar grains found in primitive meteorites have large isotopic heterogeneities of orders of magnitude. Because of the large heterogeneities, presolar grains are thought to have traces of the nucleosynthesis before they were formed. Silicon carbide (SiC), low density graphite, and silicon nitride are believed to be formed in the ejecta of type II supernovae. Their isotopic ratios are characterized by excesses of C-12, N-15, and Si-28, and the traces of extinct Al-26. Some of the grains have the traces of extinct Ti-44 which were considered to be produced through the explosive nucleosynthesis of type II supernovae. Quantitative comparison of distributions of the isotopic ratios of SiC X grains and low density graphite grains with possible ranges of the isotopic ratios in supernova ejecta has been carried out using the supernova nucleosynthesis models. It is found that the large scale mixing between the outer carbon-rich He-layer and inner Si-rich layer is required in order to reproduce the characteristics of the isotopic ratios. In the present study, we will investigate isotopic ratios of presolar grains from supernovae by considering the characteristics of individual grains rather than their distribution. It is important to clarify how many kinds of isotopic ratios of a grain is reproduced by an appropriate mixing in the supernova ejecta. We pursue both the calculation of the stellar evolution and that of the supernova explosion of a massive star. The calculation of the detailed nucleosynthesis is carried out by the post-processing using the thermal evolution and explosion profiles. Then, we compare the isotopic ratios of eleven SiC X grains and four low density graphite grains included the traces of extinct Ti-44 with the mixture of the supernova ejecta having various mixing ratios. The isotopic ratios adopted in this study are C-12/C13, N14/N-15, Al-26/Al-27, Si-29/Si-28, Si-30/Si-28, and Ti-44/Ti-48. Finally, we clarify how many kinds of the isotopic ratios of each grain are reproduced using the above mixing model.
Derived from text
Supernovae; Supernova Remnants; Nuclear Fusion; Isotope Ratios; Stellar Composition

20030111498 Clemson Univ., SC, USA
Injection of Hf-182 into the Early Solar Nebula
Meyer, B. S.; Clayton, D. D.; The, L.-S.; ElEid, M. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the major goals of cosmochemistry is to reconcile the inferred abundances of the roughly ten well-established extinct radioactivities with appropriate models of Galactic chemical evolution and Solar-System formation. It is certainly expected that short-lived species were present in the early Solar System due to ongoing Galactic nucleosynthesis. The difficulty is that the abundances inferred from the meteorites do not match those expectations. For example, the meteoritic abundance of (26)Al is approx. 10(exp 4) times higher and the abundance of (129)I is approx. 10(exp 2) times lower than the values expected from ongoing nucleosynthesis, while (53)Mn is in line with those expectations. Meyer and Clayton developed a general picture based on these notions for the ten short-lived radioactivities (26)Al, (36)Cl, (41)Ca, (53)Mn, (60)Fe, (107)Pd, (146)Sm, (182)Hf, and (244)Pu. In that picture, (53)Mn and (146)Sm are understood as (at least in significant measure) products of Type Ia supernovae, which maintain a steady supply of these isotopes. The low abundance of the r-process products (107)Pd, (129)I, and (244)Pu is due to the separation time between the last r-process event contributing to the solar system and the birth of the Sun. The high abundance of (26)Al, (36)Cl, (41)Ca, and (60)Fe relative to expectations from ongoing Galactic nucleosynthesis is due to additional formation of this isotope shortly before meteorite formation, either by injection from a nearby supernova or AGB star that tiggered collapse of the solar cloud or by irradiations from energetic particles from the early Sun. Meyer and Clayton favored injection of the last four isotopes from the outer layers of an exploding massive star. (182)Hf was the difficult isotope to reconcile in this picture because, although an r-process species, its abundance is in agreement with a steady-state supply in the interstellar medium. Injection along with (26)Al and (41)Ca was proposed to account for its relatively high abundance.
Author
Abundance; Astronomical Models; Solar Nebula; Solar System Evolution; Hafnium Isotopes

20030111552 Planetary Science Inst., Tucson, AZ, USA
Planetesimal Formation in Two Dimensions: Putting an Edge on the Solar System
Weidenschilling, S. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

I have produced a numerical model for the evolution of particles in the solar nebula without these simplifying assumptions. It computes the vertical and radial distribution of particles and the evolution of their size distribution as functions of (Z, R, t), considering individual and collective motions and detailed collisional physics. This code is an extension of the 1-D model, which computed the vertical distribution of particles undergoing coagulation and settling at a single value of R. The 2-D code performs similar calculations in a series of radial zones, transferring particles between them at rates proportional

to their radial drift rates. It includes collective effects on a particle layer due to shear-induced turbulence where appropriate, effects of the layer's self-gravity on its vertical structure, and gravitational stirring of large (> km-sized) bodies. The starting condition is a population of um-sized grains, uniformly distributed in the gas, which is assumed to have a power-law radial surface density gradient. The size distribution is modeled by a series of logarithmic diameter bins, extending over 12 orders of magnitude up to sizes approximately 103 km.
Author
Solar Nebula; Mathematical Models

20030111648 Clemson Univ., SC, USA
Presolar Galactic Merger Spawned SiC Grain Mainstream
Clayton, Donald D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-11871.; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The mainstream SiC grains have presented unsolved puzzles. Whereas their origin in AGB carbon stars seems correct, based on C isotopes and s-process trace elements, the Si isotopes present two dominating puzzles that are quite extreme in the picture that chemical evolution of the Galaxy has generated the SiC mainstream correlation line. The first is that most of the donor AGB stars appear to have evolved in higher-metallicity regions of the Galaxy than has the sun; and the second is that the correlation line (29) vs. (30) has slope m= 4/3 rather than unity, the slope expected if the solar Si composition reflects that of the local interstellar medium when the sun was born. In this work I present a new dynamics-based interpretation of these puzzles and discuss associated features that are thrown into a new light by it.
Author
Silicon Carbides; Stellar Evolution

20030111658 Arizona Univ., Tucson, AZ, USA
The Supernova Trigger and Meteoritic Components
Cameron, A. G. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

I discuss the observable e ects in primitive solar system material when the supernova in question is the one that triggered the collapse of a molecular cloud core to form the primitive solar nebula.
Derived from text
Supernovae; Solar Nebula; Meteorites

20030111680 Washington Univ., Saint Louis, MO, USA
The I-Xe Age of Orgueil Magnetite: New Results
Pravdivtseva, O. V.; Hohenberg, C. M.; Meshik, A. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-9442; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

I-Xe ages of Murchison and Orgueil magnetites were reported to be the oldest [1] and interpreted as the condensation time of the solar nebula. More recent measurements, conducted on a highly magnetic separate from Orgueil (but not pure magnetite), gave much younger I-Xe ages [2]. We have since performed new studies on two pure separates of Orgueil magnetite, confirming the later closing time of the I-Xe system in this mineral phase. In the previous work of Lewis and Anders [1] special attention was paid to the purity of the analyzed material. It was shown, that the trapped Xe resided mostly in hydrated silicates and the radiogenic 129Xe in magnetite [3]. Therefore, Orgueil was finely ground and stirred with a saturated LiCl solution for 8 days at 60 C to remove the silicate-magnetite intergrowth. Although this procedure yields magnetic fractions that are at least 90% pure [1], it could potentially contaminate the magnetite with iodine and produce noncorrelated 128Xe and spurious I-Xe ages. To avoid this possibility, in our first work with Orgueil we deliberately omitted separation in LiCl solution. Instead, the meteorite was ground into a fine powder and the highly magnetic fraction was separated with a hand magnet and was confirmed to be largely magnetite [2]. The new work, reported here, was done in order to confirm our previous results and investigate the effects of the LiCl treatment on the I-Xe system in magnetite.
Author
Magnetite; Solar Nebula; Chronology

20030111914 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Solar System Test of Gravitational Theories
Shapiro, Irwin I.; November 2003; 3 pp.; In English
Contract(s)/Grant(s): NAG5-11455
Report No.(s): Rept-2; No Copyright; Avail: CASI; A01, Hardcopy

We are engaged in testing gravitational theory, mainly using observations of objects in the solar system and mainly on the interplanetary scale. Our goal is either to detect departures from the standard model (general relativity) - if any exist within the level of sensitivity of our data - or to place tighter bounds on such departures. For this project, we have analyzed a combination of observational data with our model of the solar system, including primarily planetary radar ranging, lunar laser ranging, and spacecraft tracking, but also including both pulsar timing and pulsar VLBI measurements. In the past year, we have included new data in the analysis, primarily tracking data from the Mars Pathfinder mission. Although these data are relatively few in number, they extend the time span of high-precision tracking on the surface of Mars from six years to over 20. As a result, the statistical standard deviation of our estimate of Mars precession rate has nearly halved, and the rest of the parameters in our solar-system model have experienced a corresponding, albeit smaller, improvement (about 20% for t,he relevant asteroid masses, 10% for the semimajor axis of Mars orbit, and smaller amounts for most other parameters). In the coming year, we plan to continue adding data to our set, as available. Ne 2 expect to use these data and improved models to obtain estimates of the gravitational- theory parameters and to publish these results.
Derived from text
Gravitation Theory; Time Measurement; Standard Deviation; Solar System

20030111956 NASA Marshall Space Flight Center, Huntsville, AL, USA
Chandra Observations of Supernova Remnants and Neutron Stars: An Overview
Weisskopf, Martin C.; [2002]; 1 pp.; In English; 34th Joint Committee on Space Research Scientific (COSPAR)Scientific Assembly, 10-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Other Sources; Abstract Only

We present a brief overview of Chandra observations of supernova remnants and neutron stars, with emphasis on neutron stars in supernova remnants. The Chandra images demonstrate the importance of angular resolution in separating the neutron star emission from the surrounding nebulosity.
Author
Supernova Remnants; Neutron Stars; X Ray Astrophysics Facility

20030112288 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Charting the Winds that Change the Universe, II The Single Aperture Far Infrared Observatory (SAFIR)
Leisawitz, David; [2003]; 10 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy

The Single Aperture Far Infrared Observatory (SAFIR) will study the birth and evolution of stars and planetary systems so young that they are invisible to optical and near-infrared telescopes such as NGST. Not only does the far-infrared radiation penetrate the obscuring dust clouds that surround these systems, but the protoplanetary disks also emit much of their radiation in the far infrared. Furthermore, the dust reprocesses much of the optical emission from the newly forming stars into this wavelength band. Similarly, the obscured central regions of galaxies, which harbor massive black holes and huge bursts of star formation, can be seen and analyzed in the far infrared. SAFIR will have the sensitivity to see the first dusty galaxies in the universe. For studies of both star-forming regions in our galaxy and dusty galaxies at high redshifts, SAFIR will be essential in tying together information that NGST will obtain on these systems at shorter wavelengths and that ALMA will obtain at longer wavelengths.
Author
Dust; Stellar Evolution; Planetary Systems; Telescopes; Star Formation

20030112528 NASA Marshall Space Flight Center, Huntsville, AL, USA
On the Nature of the Bright Short-Period X-ray Source in the Circinus Galaxy Field
Weisskopf, Martin C.; Tennant, Allyn F.; Wu, Kinwah; Swartz, Douglas A.; Ghosh, Kajal K.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

The spectrum and light curve of the bright X-ray source CG X-1 in the field of the Circinus galaxy are re-examined. Previous analyses have concluded that the source is an accreting black hole of mass approx. greater than 50 solar masses although it was noted that the light curve resembles that of an AM Her system. Here we show that the short period and an

assumed main sequence companion constrain the mass of the companion to less than 1 solar mass. Further a possible eclipse seen during one of the Chandra observations and a subsequent XMM-Newton observation constrains the mass of the compact object to less than 60 solar masses. If such a system lies in the Circinus galaxy, then the accreting object must either radiate anisotropically or strongly violate the Eddington limit. Even if the emission is beamed, then the companion star which intercepts this flux during eclipse will be driven out of thermal equilibrium and evaporate within approx. 10(exp 3) yr. We find that the observations cannot rule out an AM Her system in the Milky Way and that such a system can account for the variations seen in the light curve.
Author
X Ray Astronomy; X Ray Sources; Black Holes (Astronomy); X Ray Spectra; Light Curve

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20030110578 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXIV
2003; ISSN 0161-5297; In English; Lunar and Planetary Science XXXIV, 17-21 Mar. 2003, Houston, TX, USA; See also 20030110579 - 20030111683; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1156; Copyright; Avail: CASI; C01, CD-ROM

The 34th Lunar and Planetary Science Conference was held March 17-21, 2003. Topics included planetary exploration, crater research on Mars, Earth, Moon, and other planets or satellites, imaging techniques and image analysis, age determination, albedo studies, petrographic studies, isotope composition studies, instrument design, sampling methods, landform analysis, asteroids, impact analysis, impact melts, and related research.
CASI
Conferences; Craters; Image Analysis; Planetary Geology

20030110579 Massachusetts Univ., Amherst, MA, USA
Double-ringed Circular Grabens and Thickness of Cover Material in Utopia Planitia, Mars
Buczkowski, D. L.; Cooke, M. L.; McGill, G. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A number of hypotheses for the origin of the giant martian polygons of Utopia and Acidalia Planitiae have been proposed, from the cooling of lava to frost wedging to the desiccation of wet sediments. However, these giant polygons are 1-2 orders of magnitude larger than the largest polygonal structures found on Earth, and none of the familiar processes can be scaled up to martian dimensions. Two models for polygon origin attempt to explain the scale of the martian polygons by postulating drape folding of a compacting cover material, either sedimentary or volcanic, over an uneven, buried surface. The drape folding would produce bending stresses in the surface layers that increase the probability of fracturing over drape anticlines and suppress the probability of fracturing over drape synclines. In addition to bending, overall shrink-age of the cover material would provide the additional horizontal extensional strain needed to produce the observed polygonal troughs.
Derived from text
Polygons; Mars Surface; Lava; Volcanoes

20030110580 Centre de Recherches Petrographiques et Geochimiques, Nancy, France
Cometary Organic Macromolecules in Interplanetary Dust Particles?
Aleon, J.; Arpigny, C.; Robert, F.; Jehin, E.; Manfroid, J.; Hutsemekers, D.; Zucconi, J.-M.; Schulz, R.; Stuewe, J. A.; Sangely, L., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many interplanetary dust particles (IDPs) show both large deuterium excesses and nitrogen-15 excesses. It has been shown that the largest D-excesses are related to several organic macromolecules with various C/H ratios indicating various components of various aliphaticities and aromaticities. In two particles with well-individualized organic components, part of the largest (15)N excesses are also associated to these D-rich organic phases. An interstellar origin of these phases has been

postulated. Here we report determinations of the nitrogen concentration of these phases and comparison of their global properties (C/H; D/H; (15)N/(14)N ratios and [N]) with a summary of cometary observations including recent measurements of N isotopes in the CN radical.
Author
Interplanetary Dust; Macromolecules; Deuterium; Nitrogen Isotopes; Isotope Ratios; Comets

20030110581 Northwestern Univ., Evanston, IL, USA
A Comparison of Topography and Shaded Relief of the Beethoven Quadrangle of Mercury
Andre, S. L.; Robinson, M. S.; Watters, T. R.; Cook, A. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Significant differences exist between a digital elevation model (DEM) of the Beethoven quadrangle of Mercury, derived from Mariner 10 stereo images [1,2], the shaded relief map [3], and the image mosaic of the region. The images of the Beethoven quadrangle, located in the equatorial region (25 N to 25 S, 72 W to 144 W) of Mercury, were acquired at high sun angles by Mariner 10 [4]. The DEM reveals numerous impact craters not identified in the shaded relief map, particularly in areas mapped as smooth plains.
Author
Mercury Surface; Topography; Relief Maps; Digital Elevation Models; Planetary Mapping

20030110582 California Univ., Los Angeles, CA, USA
Estimations of Lunar Elastic Thickness from Admittance Computations
Asmar, S. W.; Schubert, G.; Nimmo, F.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The admittance function, calculated from the gravity and topography data in the spectral domain, can be used to compute the elastic thickness of a terrestrial planet, the effective thickness of the part of the lithosphere that can support elastic stresses over long time scales. The general form of the transfer function is given by an equation where k is the wavenumber, g is the gravitational acceleration at the surface, rho(sub c) is the density of the crust, rho (sub w) the density of the overlying fluid, rho(sub m) the density of the upper mantle, E Young's modulus and sigma Poisson's ratio for the elastic layer of thickness T(sub 0), z the height of the surface where the gravity measurements are made, t(sub c) the mean crustal thickness, a is the radius of the planet and rho(sub p) its mean radius. This equation is modified to account for sphericity if the region of interest is comparable in the size to the planetary radius.
Author
Lunar Mantle; Thickness; Elastic Properties; Lunar Crust

20030110583 California Univ., Santa Cruz, CA, USA
Meteoroid Bombardment and Blast Experiments on Asteroids
Asphaug, E.; Colwell, J.; Dissly, R.; Kanizay, K.; Petr, V.; Scheeres, D. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

From the accretion of planetesimals 4.6 billion years ago to the spallation of meteorites from their parent bodies, the impact process has left no bit of planetary matter untouched. The in situ analysis of simple blast experiments on asteroids can therefore provide a foundation for understanding accretion and the delivery of meteorites - topics central to the origin of planets - and can bring resolution to a fundamental debate regarding the basic mechanics of meteoroid bombardment and regolith behavior on small bodies.
Author
Meteoroids; Impact Tests; Asteroids; Experimentation

20030110584 Arizona Univ., Tucson, AZ, USA
Cycloids and Wedges: Global Patterns from Tidal Stress on Europa
Bart, G. D.; Greenberg, R.; Hoppa, G. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have computed diurnal cracking patterns on a global scale. Cycloids form along concentric circles about the suband

anti-jovian points on Europa. Over the rest of the globe, the cycloids form linear bands wrapping around the body of Europa from one concentric circular region to the other. Along the boundaries between these regions, diurnal tidal variations allow cracks to form highly curved or boxy shapes. Diurnal features are strongly dependent on the model input parameters. The variable inputs for my model are the tension required to initiate a crack, the tension below which the crack will stop forming, the speed of the crack propagation, and the initial direction in which the crack begins propagating, either east or west of the north/south line. One interesting result is that weaker ice (low starting and stopping tension values) tends to increase the size of chaotic boundary region and cause more boxy shapes to form.
Derived from text
Crack Propagation; Europa; Cycloids; Tides; Structural Properties (Geology)

20030110586 Muenster Univ., Germany
Mineralogy of the Neuschwanstein (EL6) Chondrite: First Results
Bischoff, A.; Zipfel, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A brilliant fireball was seen by many eye-witnesses in Austria and Germany on April 6, 2002, 20:20 h (UT). The associated meteorite fall was well documented by the European Fireball Network (EN). Based on the EN photographs the meteoroid orbit and the impact area were calculated by Spurny et al., which finally led to the recovery of a single stone of 1.75 kg in July 14, 2002. Being found close to the famous castle in Bavaria (position: 10 48.5' E; 47 31.5' N), the meteorite was named Neuschwanstein.
Author
Meteorites; Mineralogy; Meteoritic Composition

20030110587 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA
The Influence of Abrasion on Martian Dust Grains: Evidence from a Study of Antigorite Grains
Bishop, Janice L.; Drief, Ahmed; Dyar, M. Darby; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-12687; NAG5-3871; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Grinding was shown to greatly affect the structure and a number of properties of antigorite grains in a study by Drief and Nieto. Grinding is likely to influence the structure of most clay mineral grains and has been shown recently to influence the structure of kaolinite. The antigorite structure includes curved waves of layered silicate as shown by D dony et al.. Our study was performed in order to characterize in detail changes in the mineral grains resulting from grinding and to assess the influence of physical processes on clay minerals on the surface of Mars. This project includes a combination of SEM, reflectance spectroscopy and Moessbauer spectroscopy.
Derived from text
Abrasion; Dust; Clays; Mars Surface

20030110588 New Mexico Univ., Albuquerque, NM, USA
Uranium-Lead Isotopic Systematics of the Martian Meteorite Zagami
Borg, L. E.; Edmunson, J. E.; Asmerom, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A two gram aliquot of Zagami (A23.15) was obtained from the Meteorite Museum at the University of New Mexico. This fragment is from the coarse grained portion of the meteorite and is adjacent to A23.12b1 which was dated by the Rb-Sr and Sm-Nd methods by Nyquist et al.. The fragment was sonicated for ~20 minutes in quartz distilled water before being crushed. A small fragment was broken off and set aside for whole rock analysis. The remainder was crushed using a sapphire mortar and pestle and sieved at 75, 100, 200, and 325 mesh. The mineral fractions were derived from the 75-100 mesh size fractions using a Frantz isodynamic separator and hand-picking. The maskelynite and Mgpyroxene fractions were visually estimated to be >99.9% pure. The whole rock sample was finely crushed and then leached with 0.5M acetic acid at 25 C for 10 minutes prior to dissolution. The mineral fractions were leached with both 0.5M acetic acid and 1N HCl at 25 C for 10 minutes prior to dissolution. The mineral leachate data presented below are from the 1N HCl solutions. The concentrations of Sr and Nd

were determined on small aliquots of the mineral fractions by mass spectrometry in order to determine the abundances of Sr and Nd to insure the proper spike/sample ratios.
Derived from text
Uranium; Achondrites; Meteorites; Isotopes; Sapphire

20030110589 Naturhistorisches Museum, Vienna, Austria
Barringerite from the Santa Catharina Ungrouped Iron Meteorite
Brandstaetter, F.; Nazarov, M. A.; Kurat, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Barringerite, (Fe,Ni)2P, is a rare higher phosphide, which has been reported only from the Ollague (Imilac) pallasite, the lunar meteorite Y 793274, some CM chondrites, and the oxidation zone of a Cu-Ni sulfide deposit in China. Phase diagrams predict that barringerite can not stably co-exist with Fe,Ni metal and should react with the latter to produce schreibersite. In fact, barringerite has never been observed to co-exist directly with Fe,Ni metal, except for a recently described occurrence in the Onello iron. In this contribution we report on the forbidden barringerite-metal association in the Santa Catharina iron meteorite.
Derived from text
Iron Meteorites; Chondrites; Oxidation; Phase Diagrams; Schreibersite

20030110590 Bern Univ., Bern, Switzerland
The Ingredients of the 'Subsolar' Noble Gas Component
Busemann, H.; Eugster, O.; Baur, H.; Wieler, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On the basis of several experiments on separates of the EH5 chondrite St. Mark s, we will argue that the 'subsolar' noble gas component is a mixture of solar-like, Q- and terrestrial noble gases. The subsolar noble gas component has been found, in particular, in E chondrites but also in other meteorite classes (e.g. aubrites, CO or CH chondrites [3-5]). This component is elementally and isotopically intermediate between the common meteoritic 'Q-gas' and solar composition. Experiments have never established a well-defined subsolar endmember. South Oman (EH4/5) is used as reference for subsolar element ratios [1,7]. The isotopic ratios follow the elemental trend, being intermediate between Q and solar, or even roughly solar.
Derived from text
Rare Gases; Isotopes; Achondrites; Chondrites

20030110591 Alaska Univ., Fairbanks, AK, USA
Description and Hypotheses for Linear Features, Northwest Acidalia Planitia, Mars
Calef, F. J., III; Sharpton, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most dark linear features on Mars have been cataloged as dust devil trails [1]. While some of these features are unquestionably the result of dust devils, many others, such as those shown in Fig. 1, appear to be related to a different physical process [2]. We have conducted a quantitative and descriptive analysis of enigmatic dark linear features (LF after [2]) located within a large region of the Northern Hemisphere. Our initial results indicate that these features are not produced by dust devils and may be associated with seasonal phase changes of near-surface reservoirs of ground volatiles.
Author
Mars Surface; Image Analysis

20030110592 Smithsonian Institution, Washington, DC, USA
New High-Resolution 70-cm Wavelength Radar Images of the Moon
Campbell, B. A.; Campbell, D. B.; Nolan, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Radar maps of the lunar nearside at 70-cm wavelength currently have a spatial resolution of 3-5 km, and have been used to identify differences in regolith physical and chemical properties [e.g., 1-3]. Data at such long wavelengths are of particular

interest due to their penetration depth of 5-10 m in even lossy lunar materials. Using the Arecibo Observatory 430 MHz radar system, we are collecting new images of the lunar surface with spatial resolution of ~300 m. These data will be used to study age and chemistryrelated differences among the mare deposits, regional differences in scattering properties in the highlands, and areas of possible permanent shadow at the lunar poles.
Author
Lunar Surface; Image Analysis; Radar Imagery

20030110593 Blackhawk Geosciences, Inc., Golden, CO, USA
Seismic Triggering Mechanisms of Large-Scale Landslides, Valles Marineris
Caruso, Paul A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Large-scale landslides in Valles Marineris wallrock are analyzed in order to determine what triggering mechanisms caused the landslides. These landslides occur in the locality of large faults, and therefore it is hypothesized that the landslides are the result of marsquakes triggering slope instability. This work confirms that landslides occur where the seismic hazard map forecasts highest seismic slide potential.
Author
Seismology; Planetary Quakes; Mars Surface; Landslides

20030110594 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Pristine Impact Crater Populations of Mars
Chauhan, R. V.; Plaut, J. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study focused on obtaining size frequency distributions of pristine crater populations from various terrains of Mars. Images from the Viking Orbiter (VO), Mars Orbital Camera (MOC), and Thermal Emission Imaging System (THEMIS) were utilized for this study. The results may aid in providing information about crater production functions and resurfacing events on Mars.
Derived from text
Planetary Geology; Mars Craters; Mars Surface; Populations; Terrain

20030110595 Carnegie Institution of Washington, Washington, DC, USA
Global Dispersal of Dust Following Impact Cratering Events on Mars
Cho, J. Y.-K.; Stewart, S. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hypervelocity impacts on Mars inject dust and vapors into the stratosphere. If fine dust and water vapor (derived from the projectile or surface) are globally distributed, impact events could drive transient climate change on Mars. Recent work on small impact events (less than 100 m projectiles) find that the mass of dust stirred into the troposphere may be equivalent to global dust storms. For km-sized impactors, significant amounts of dust may be delivered to the stratosphere. Here, using a simple atmospheric dynamics model, we investigate the global dispersion of dust injected into the stratosphere following large impacts to study the spreading rates, dispersal extent, and the potential for climatic effects.
Derived from text
Dispersing; Dust Storms; Cratering; Impact; Mars Craters

20030110596 Lockheed Martin Astronautics, Denver, CO, USA
Sterilized Sample Return: Breaking Through the Mars Science Barriers
Clark, B. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For over three decades, a wide variety of science advisory committees have strongly endorsed the critical importance of Mars Sample Return (MSR). During and prior to this time, MSR mission implementations have been under serious analysis by JPL and NASA Centers (LaRC, JSC), through both internal and contracted studies. NASA currently has no approved date

for the first Mars surface sample return, but studies are underway. It is now becoming apparent that MSR is needed in a timely manner to prevent stagnation of martian science due to lack of critical data.
Author
Mars Sample Return Missions; Mars Surface Samples; Mission Planning; Sterilization

20030110597 Winnipeg Univ., Manitoba, Canada
Dark Asteroids: Insights into Surface Composition from Coal Spectra
Cloutis, E. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Dark asteroids, including Centaurs and Kuiper Belt objects display a range of spectral slopes with few, if any, discernible absorption bands. The reflectance spectra of a series of coal samples have been measured in order to provide insights into the possible mechanisms responsible for the variety of slopes, and lack of organic absorption bands, seen in the spectra of these objects.
Derived from text
Asteroids; Absorption Spectra; Kuiper Belt

20030110598 Observatoire de Midi-Pyrenees, Toulouse, France
Experimental Investigation of the Potential Wavelength Dependence of Hapke Parameters in the Visible and Near Infrared Range
Cord, A. M.; Pinet, P. C.; Daydou, Y.; Chevrel, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The semi-empirical model developed by Hapke is widely used to analyze reflectance data from planetary surfaces. It requires the knowledge of six parameters to calculate the bidirectional reflectance. Its application relies on some physical quantities characterizing the optical properties of the materials under examination: the phase function, the opposition effect, and the roughness. All the parameters involved in this model, except the single scattering albedo, are generally considered to be independent of the wavelength. However, Shepard and Campbell made the hypothesis that the value of Hapke s parameters may differ for the same surface at different wavelengths and suggested that the full Hapke model could be fitted to observations of a single surface observed in multiple wavelengths. The purpose of this study is to explore this approach. We have a particular interest in looking at the potential spectral dependence of each parameter.
Derived from text
Bidirectional Reflectance; Planetary Surfaces; Optical Properties; Wavelengths

20030110599 New Mexico Museum of Natural History and Science, Albuquerque, NM, USA
Spring Deposits on Mars: Physical Processes from Terrestrial Analogs
Crumpler, L. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An important first step in the current Mars exploration strategy is the detection of sites where there is evidence for past or present near-surface water on Mars. This study evaluates the large-scale morphology of spring deposits and the physical processes of their formation, growth, and evolution in terms that relate to (1) their identification in image data, (2) their formation, evolution, and preservation in the environment of Mars, and (3) their potential as sites of long-term or late stage shallow groundwater emergence at the surface of Mars.
Author
Mars Surface; Planetary Geology; Morphology; Springs (Water); Deposits

20030110600 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Lava Flows on Io: Modelling Cooling After Solidification
Davies, A. G.; Matson, D. L.; Veeder, G. J.; Johnson, T. V.; Blaney, D. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have modeled the cooling of lava bodies on Io after solidification of the lava, a process that has been little explored

since Carr (1986). With recent estimates of lava flow thicknesses on Io ranging from 1 m to 10 m, the modeling of thermal emission from active volcanism must take into account the cooling behaviour after the solidification of the lava, which we model using a finite-element model. Once a lava body is fully solidified, the surface temperature decreases faster, as heat loss is no longer buffered by release of latent heat. This is significant as observed surface temperature is often the only clue available to determine lava surface age. We also find that cooling from the base of the lava is an important process that accelerates the solidification of a flow and therefore subsequent cooling. It is necessary to constrain the cooling process in order to better understand temperature-area relationships on Io's surface and to carry out stochastic modelling of lava flow emplacement.
Author
Io; Fluid Flow; Volcanic Eruptions; Lava; Cooling; Solidification

20030110601 Rutgers Univ., Piscataway, NJ, USA
Comparison of Synchrotron MicroXANES Determination of Fe(3+)/Sigma Fe with Moessbauer Values for Clean Mineral Separates of Pyroxene from Martian Meteorites
Delaney, J. S.; Dyar, M. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-12148; NAG5-9528; NAG5-10424; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The oxidation state of Fe in Martian meteorites is a parameter of great interest and the ability to determine this value in micrometer scale samples is important. Intense, tunable x-ray sources at large synchrotron storage rings are being exploited to examine the Fe K-absorption edge with energy resolution of approx. 1-1.5eV in spots of 10x15 microns on thin sections of a wide variety of materials including several Martian meteorites. Synchrotron microXANES (SmX) spectroscopy is the technique that provides the most flexible capability for investigating Fe(3+)/Sigma Fe. Variation of Fe(3+)/Sigma Fe is manifested as a function of the energy of the pre-edge to the Fe absorption edge produced by the sample. SmX is at present the only technique that can be used with conventional polished thin sections. Data for a broad spectrum of minerals have been produced and indicate that SmX can be used with a large variety of samples types.
Author
Spectroscopy; Synchrotrons; SNC Meteorites; Iron; Pyroxenes

20030110602 Academy of Sciences (USSR), Moscow, USSR
Dhofar 304, 305, 306 and 307: New Lunar Highland Meteorites from Oman
Demidova, Svetlana I.; Nazarov, Mikhail A.; Taylor, Lawrence A.; Patchen, Allan; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): RFBR-02-05-64981; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several lunar highland meteorites were found in the Dhofar region of Oman. Here we report the first data on the petrography and mineralogy of four new lunar stones, Dhofar 304, 305, 306 and 307. Dh-304 was found close to Dh-025 and 301, whereas Dh-305, 306 and 307 were recovered nearby Dh-081, 280, 302 and 303. The new meteorites are moderately weathered, impact-melt breccias. No KREEP or mare components are present in the rocks. Dh-304 may be paired with Dh-025 and 301. Dh-305, 306, and 307 are probably paired with Dh-302 and 303, but Dh-302 and 305 could represent different meteorite falls. However, these meteorites are definitely not related to Dh 081 and 280.
Author
Petrography; Mineralogy; Meteorites; Lunar Rocks

20030110603 American Museum of Natural History, New York, NY, USA
Pyroxene Chondrules from Olivine-depleted, Dust-enriched Systems
Ebel, D. S.; Engler, A.; Kurat, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The principal solid precursor components of chondrules are nebular condensates and/or presolar interstellar grains. In either case, the precursors are most likely dominated by forsterite (Mg2SiO4), iron-nickel metal, Ca-aluminate phases, and a C-rich component. It is reasonable to explore the consequences of enriching a solar gas in these components, on local scales

in the early nebula, in ratios which yield CI chondritic abundances of rock-forming elements, in considering the formation of meteorite components (i.e.-chondrules).
Derived from text
Pyroxenes; Chondrule; Cosmic Dust; Interstellar Matter; Meteoritic Composition

20030110604 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Near-Infrared (NIR) Global Multispectral Map of the Moon from Clementine
Eliason, E. M.; Lee, E. M.; Becker, T. L.; Weller, L. A.; Isbell, C. E.; Staid, M. I.; Gaddis, L. R.; McEwen, A. S.; Robinson, M. S.; Duxbury, T., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In May and June of 1994, the NASA/DoD Clementine Mission acquired global, 11- band, multispectral observations of the lunar surface using the ultraviolet-visible (UVVIS) and near-infrared (NIR) camera systems. The global 5-band UVVIS Digital Image Model (DIM) of the Moon at 100 m/pixel was released to the Planetary Data System (PDS) in 2000. The corresponding NIR DIM has been compiled by the U.S. Geological Survey for distribution to the lunar science community. The recently released NIR DIM has six spectral bands (1100, 1250, 1500, 2000, 2600, and 2780 nm) and is delivered in 996 quads at 100 m/pixel (303 pixels/degree). The NIR data were radiometrically corrected, geometrically controlled, and photometrically normalized to form seamless, uniformly illuminated mosaics of the lunar surface.
Author
Lunar Surface; Mapping; Clementine Spacecraft; Near Infrared Radiation; Lunar Maps; Infrared Imagery; Multispectral Photography

20030110607 NASA Johnson Space Center, Houston, TX, USA
Microbial Fossils Detected in Desert Varnish
Flood, B. E.; Allen, C.; Longazo, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars Global Surveyor Thermal Emission Spectrometer data indicate regions with significant levels of hematite (_Fe2O3). Fe-oxides, like hematite, can form as aqueous mineral precipitates and as such may preserve microscopic fossils or other biosignatures. Several potential terrestrial analogues to martian hematite like hydrothermal vents have preserved microfossils. Microbial fossilization in Fe-oxides is often a function of biomineralization. For example, goethite (FeO2H) encrustation of fungal mycelia from the mid-Tertiary preserved fungal morphologies such that their genera could be determined.
Derived from text
Iron Oxides; Fossils; Thermal Emission; Calcification; Hydroxides; Hematite

20030110608 NASA Johnson Space Center, Houston, TX, USA
A Preliminary Assessment of the Organic Content of Interplanetary Dust Particles
Flynn, G. J.; Keller, L. P.; Wirick, S.; Jacobsen, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Interplanetary dust particles (IDPs) collected from the Earth's stratosphere by NASA have been shown to contain significant quantities of organic matter. Anders suggested that organic matter contributed by IDPs to the surface of the Earth may have been important for the origin of life. As part of our ongoing effort to characterize the organic carbon in IDPs, we have now compared the absorption strengths of organic features in IDPs to their strengths in meteorites and standards to estimate the concentration of each organic functional group in IDPs.
Derived from text
Interplanetary Dust; Organic Materials; Absorption Spectra; Meteorites

20030110609 State Univ. of New York, Plattsburgh, NY, USA
Chemical and Mineralogical Analysis of an Extraterrestrial Particle in Aerogel
Flynn, G. J.; Lanzirotti, A.; Westphal, A. J.; Dominguez, G.; Snead, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA Stardust mission is expected to collect in low-density, silica aerogel more than 1,000 dust particles >10 m in

size from the dust coma surrounding Comet Wild-2. It is planned that Stardust will return these samples to Earth early in 2006. Removal of each particle from the aerogel increases the possibility of contamination or loss, thus we are developing a facility to perform in-situ chemical and mineralogical classification of particles while they are still in the aerogel. To do this, we are enhancing the x-ray-microprobe on Beamline X26A of the National Synchrotron Light Source (Brookhaven National Laboratory) to perform a variety of in-situ analyses on the Stardust returned samples.
Derived from text
Aerogels; Chemical Analysis; Wild 2 Comet; Mineralogy; Dust; Silicon Dioxide

20030110610 Collegium Budapest/Inst. for Advanced Study, Budapest, Hungary
Evidence for Water by Mars Odyssey is Compatible with a Biogenic DDS-Formation Process
Ganti, T.; Horvath, A.; Berczi, S.; Gesztesi, A.; Szathmary, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The neutron measurements of the Mars Odyssey spacecraft provided evidence for some form of water in the upper layer of the surface of the Southern Polar Region of Mars. This is compatible with the prediction of a presumably existing supply of water in our model of DDS (Dark Dune Spots) formation, where the MSOs (Mars Surface Organisms) are covered by seasonal water ice. Hypothetical MSOs are thought to melt the ice above them, which initiates the characteristic morphogenesis of DDSs. Concomitant melting of water frost in the uppermost layer of the soil may contribute to the observed traces of liquid water.
Author
Mars Surface; Organisms; Water; Biological Evolution

20030110611 Tokyo Univ., Hongo, Japan
Survival of a Protoatmosphere Through the Stage of Giant Impacts
Genda, H.; Abe, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this study, we re-examine the relations between the ground motion and the amount of the lost protoatmosphere for various types of protoatmospheres, and estimate the loss fraction of the protoatmosphere by the giant impacts.
Author
Protoplanets; Planetary Atmospheres

20030110614 Hawaii Univ., Honolulu, HI, USA
Northwest Africa 1110: A New Olivine-Phyric Shergottite Possibly Paired with Northwest Africa 1068
Goodrich, C. A.; vanNiekerk, D.; Morgan, M. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Northwest Africa (NWA) 1110 is a 118g olivine-phyric shergottite found in 2001 (at least 40g of additional small fragments have now been found) and tentatively paired with NWA 1068. We have made 8 sequential thin sections from a 1.25g piece* of NWA 1110, and are studying them by petrographic methods.
Derived from text
Fragments; Olivine; Shergottites

20030110615 National Air and Space Museum, Washington, DC, USA
Hypsometric Analyses of Martian Basins
Grant, J. A.; Fortezzo, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hypsometric analyses of Martian basins in varying settings and lunar basins in the Orientale Basin annulus confirm HI values in the range expected for fluvially-eroded terrestrial basins. Perhaps indicative of the source of water causing erosion of Mars valleys, the similarity and range of Martian and lunar values also suggests the distribution of relief in basins created

by impact vs. tectonics requires minimal fluvial modification for efficient drainage.
Derived from text
Hypsography; Mars (Planet); Mars Surface; Structural Basins

20030110616 Colorado Univ., Boulder, CO, USA
A Parochial View of Groundwater Flow on Mars
Grimm, R. E.; Harrison, K. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Groundwater on Mars has been considered to have participated in global flow with the presence of a northern ocean an inevitable consequence of early hydraulic and thermal conditions [1,2]. In contrast, we present evidence that an ocean is not hydrogeologically required and that groundwater flow was regional in scale at most.
Author
Ground Water; Mars (Planet)

20030110617 NASA Johnson Space Center, Houston, TX, USA
Thermal Emission Spectra of Altered Tephras and Constraints on the Composition of Martian Dust
Hamilton, Victoria E.; Morris, Richard V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have begun to create a comprehensive set of thermal infrared (TIR, approx. 1650-200/cm, approx. 6-50 microns) spectra of palagonitic and hydrothermally altered soils that exhibit a range of mineralogical and chemical compositions for use in analyzing MGS TES data. Palagonite, a phyllosilicate-poor hydrolytically altered tephra, has been suggested as a possible component of the martian soil/dust based on visible and near infrared (VNIR) spectral similarities with martian dusty regions. The chemistry and crystallinity of altered tephras are highly variable depending on the parent material and local environmental conditions, and are important indicators of alteration processes.
Derived from text
Thermal Emission; Chemical Composition; Emission Spectra; Dust; Mars Surface

20030110618 Colorado Univ., Boulder, CO, USA
Rheological Constraints on Martian Landslides
Harrison, K. H.; Grimm, R. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The rheology of landslide material is an important influence on its final configuration. Given a particular runout path and initial mass configuration, it is largely the rheology that determines key features such as runout length and final deposit thickness and slope. We present numerical models of long runout martian landslides with the aim of measuring the suitability of a range of rheologies.
Derived from text
Landslides; Mars (Planet)

20030110621 Pecs Univ., Pecs, Hungary
New Gas Sensing Device to the Hunveyor-2 University Lander of the Pecs University, Hungary
Hegyi, S.; Kovacs, B.; Keresztesi, M.; Gimesi, L.; Halasz, A.; Berczi, Sz.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During the last 4 years experiments were developed on the planetary lander Hunveyor-2 and they were successfully used in the planetary science education: construction, experiment planning, informatics and robotics. Our new optical sensor device was constructed for the sensing of ammonia, the life-building block unit on planetary surfaces such as Mars or Europa.
Derived from text
Gas Analysis; Optical Measuring Instruments; Ammonia; Experiment Design; Construction; Robotics

20030110622 Cologne Univ., Germany

Evidence for Fractional Condensation and Flash Reheating from Volatile Rich Objects in CH-Chondrites

Hezel, D. C.; Brenker, F. E.; Palme, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: CH-carbonaceous chondrites have excess FeNi-metal and are strongly depleted in moderately volatile and volatile elements (Mn, Na, Zn, Se), but have CI refractory element/Mg ratios. In contrast to other carbonaceous chondrites, CHs have high modal abundances of chondrules (approx.70 vol.%) with a mean diameter of 70-90 m, FeNi-metals (approx.20 vol.%) and very low fractions of matrix (approx.5 vol.%), heavily altered by terrestrial weathering. Chondrules, however, show no signs of weathering. The low FeO-content in silicates and the high Cr-concentrations in metal reflect reducing conditions during formation. Rare SiO2-rich components contain abundant free silica. Some zoned metal grains have preserved the signatures of nebular condensation.

Derived from text

Carbonaceous Chondrites; Heating; Meteoritic Composition; Plasma Control; Heliotrons; Iron Oxides

20030110623 Washington Univ., Saint Louis, MO, USA

I-Xe Ages and Trapped Xe Compositions

Hohenberg, C. M.; Pravdivtseva, O. V.; Meshik, A. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): NAG5-9442; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

I-Xe isochrons are mixing lines between a single trapped and a single iodine derived component. The slope of this line establishes initial iodine and hence the I-Xe age. One end of the isochron is fixed by the composition of the trapped Xe component, which should be representative of the Xe that was present in the early solar system (Q-Xe or OC-Xe). Because the I/Xe ratio in the solar nebular was ~1, and the I-129/I-127 was about 10-4, the Xe-129 in trapped Xe cannot evolve appreciably with decay of I-129. While it may be possible for Xe in a closed system with elevated I/Xe ratios to evolve producing trapped components with higher Xe-129/Xe-132 ratios, trapped Xe compositions with lower (sub-planetary) Xe-129/Xe-132 ratios seem implausible.

Derived from text

Xenon 129; Radioactive Isotopes; Iodine Isotopes; Iodine

20030110624 Arizona State Univ., Tempe, AZ, USA

Oxygen Isotopic Compositions of Fayalite in the Kaba CV3 Carbonaceous Chondrite

Hua, X.; Huss, G. R.; Tachibana, S.; Sharp, T. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Fe-rich olivine end-member, fayalite (Fa100), occurs in the matrix, chondrules, CAIs, silicate aggregates, and dark inclusions in the oxidized Kaba and Mokoia CV3 chondrites, where it is associated with magnetite and troilite. To help constrain the origin of the fayalite, we measured O-isotope compositions of fayalite (Fa98-100) from two petrographic settings of the Kaba meteorite using the ion probe at ASU.

Author

Carbonaceous Chondrites; Meteoritic Composition; Fayalite; Oxygen Isotopes

20030110626 Washington Univ., Seattle, WA, USA

Olivine Diogenite NWA 1459: Plumbing the Depths of 4 Vesta

Irving, A. J.; Kuehner, S. M.; Rumble, D., III; Hupe, A. C.; Hupe, G. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A 49 gram complete stone found near Iriqui, Morocco in March 2002 can be classified an olivine diogenite. The interior of the sample provisional number NWA 1459) is dark yellow-green with minor orange staining (from terrestrial weathering metal), and the exterior is coated by a thin, weathered fusion crust with protruding large (up to 4 mm), subhedral chromite grains .

Author

Meteoritic Composition; Olivine

20030110627 Academy of Sciences (USSR), Moscow, USSR

Sayh Al Uhaymir 085, CV3 Chondrite: Mineralogical Links with CK Chondrites

Ivanova, Marina A.; Nazarov, Michail A.; Clayton, Robert N.; Mayeda, Toshiko K.; Taylor, Lawrence A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Sayh al Uhaymir 085 is similar to CV3 carbonaceous chondrites of the oxidized subgroup, and it has some peculiarities and characteristics of CK chondrites. We report on the petrography, mineral chemistry, and oxygen isotopic compositions of Sayh al Uhaymir 085, and discuss its peculiarities and origin.

Author

Carbonaceous Chondrites; Mineralogy; Petrography; Minerals; Meteoritic Composition

20030110629 New Mexico Univ., Albuquerque, NM, USA

Milton: A New, Unique Pallasite

Jones, R. H.; Wasson, J. T.; Larson, T.; Sharp, Z. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-9463; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Milton pallasite was found in Missouri, U.S.A. in October, 2000. It consists of a single stone that originally weighed approximately 2040 g. The chemistry of the olivine and metal phases, plus the oxygen isotope ratios of the olivines, differ significantly from other pallasites, making Milton unique. Unfortunately, the meteorite is heavily fractured and weathered.

Derived from text

Olivine; Oxygen Isotopes; Stony-Iron Meteorites

20030110632 Geological Survey, Flagstaff, AZ, USA

High-Resolution Topomapping of Candidate MER Landing Sites with MOC: New Results and Error Analyses

Kirk, R. L.; Howington-Kraus, E.; Redding, B.; Galuszka, D.; Hare, T.; Archinal, B. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This abstract describes the continuation of work initially reported last year on topographic mapping and roughness analysis of candidate Mars Exploration Rover (MER) landing sites using high-resolution images from the Mars Global Surveyor Mars Orbiter Camera Narrow-Angle subsystem (MGS MOC-NA; [2]). The main goal of this work at present is to contribute to assessments of whether the MER spacecraft could land safely at each site. To this end our data suggest that the sites now being considered are much more likely to be safe than several sites reported on previously [1] and since eliminated. Topographic data for the sites that are ultimately selected will also be useful in planning mission operations and analyzing the scientific return from the rovers, however, and it is likely that the topographic models we report on here will be augmented by more extensive coverage in the coming year.

Author

Mars Landing Sites; Topography

20030110633 California Univ., Santa Cruz, CA, USA

Wave Energy on Mars and Earth: Considering Lacustrine Erosion

Kraal, E. R.; Asphaug, E. I.; Lorenz, R. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many researchers have identified lacustrine features on Mars; this interpretation has important implications for the climate history of Mars and selection of future landing sites. It is, however, unclear if wave conditions on the Martian surface would be adequate to produce lacustrine features. Wave spectrums have been considered on Titan, but not on Mars. This paper outlines a quantitative assessment of wave energy available for lacustrine erosion on Mars and finds that time averaged wave energy on Mars might be similar to time averaged wave energy on Earth.

Derived from text

Erosion; Mars Surface; Planetary Geology; Earth Surface

20030110635 University of Central Michigan, Mount Pleasant, MI, USA

Could Some Craters on Mars Have Acid Water Origins?

LaClair, D. A.; Benison, K. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Physical sedimentology experiments using a 39 percent concentration of sulfuric acid have produced three distinct features, which are similar to features seen on Mars. However, these sedimentary features could not be created using pure water in the laboratory. These three features include deeply incised, narrow channels, cracks that run parallel to the flow direction, and circular depressions that are concentrated along the toes of alluvial fans. These circular depressions, which form syndepositionally, are likely produced by the release of trapped air or possibly by gases escaping to the surface. They closely resemble impact crater features, though they are on a significantly smaller scale.

Author

Mars Surface; Mars Craters; Sedimentary Rocks; Planetary Geology

20030110636 Academy of Sciences (USSR), Moscow, USSR

REE and Some Other Trace Element Distributions of Mineral Constituents in Enstatite Meteorites

Lavrentjeva, Z. A.; Lyul, A. Yu; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The enstatite meteorites are the most reduced natural assemblages. They may be the meteorites that formed nearest the Sun. Based on data of the trace element contents in Fe,Ni-phase of E chondrites, it was shown that this phase was not undergone the magmatic differentiation. The main process controlling the composition of Fe,Ni-phase of E chondrites was sulfurization of the metal in protoplanetary nebula. Some differences in the elemental distribution in Fe,Ni-phase of E chondrites are due to the metal-silicate fractionation while the metamorphism and chondrule formation did not influence significantly on composition of Fe,Ni-phase.

Derived from text

Chondrites; Chondrule; Enstatite; Meteoritic Composition; Silicates

20030110637 Eidgenoessische Technische Hochschule, Zurich, Switzerland

Production Rates and Production Rate Ratios for Cosmogenic Kr Isotopes in H-Chondrites Based on Chlorine-36/Argon-36 Ages

Leya, Ingo; Wieler, Rainer; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present the Kr-81-Kr derived exposure ages for H-chondrites which were recently investigated for their Cl-36-Ar-36 ages. After demonstrating that our 81Kr-Kr ages are reliable and reproducible we find hints that Kr-81/Kr-83 and Kr-78/Kr-83 might depend on the relative concentrations on the target elements Rb, Sr, Y, Zr, and Nb. In addition, the Kr-81-Kr ages for the large L-chondrite Gold Basin indicate that the Kr-81-Kr method might fail for large meteoroids.

Derived from text

Krypton Isotopes; Argon Isotopes; Chondrites; Radioactive Isotopes; Cosmology; Meteoritic Composition

20030110638 Academy of Sciences (USSR), Moscow, USSR

NWA 1235: A Phlogopite-bearing Enstatite Meteorite

Lorenz, C.; Kurat, G.; Brandstaetter, F.; Nazarov, M. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NWA 1235 (found in 2000) is a patchily weathered (W2-W3) enstatite rock weighing 80 g. No chondrules or relics thereof are present. It has a coarse-grained hypidiomorphic texture, which is, however, finer relative to that of aubrites. Mineral chemistry and metal-silicate relationships suggest that the rock was formed from an enstatite meteorite source under more oxidized conditions than other enstatite meteorites. A unique features of the meteorite are the unusual composition of troilite and exotic sulfides, presence of a wide set of microinclusions in enstatite and the occurrence of fluorphlogopite.

Author

Meteoritic Composition; Enstatite; Mineralogy; Meteoritic Microstructures

20030110639 GeoForschungsZentrum, Potsdam, Germany

Hydrocarbons and Aqueous Fluids in Cretaceous Sediments of the ICDP-Chicxulub Drill Core Yax-1

Lueders, V.; Horsfield, B.; Kenkmann, T.; Mingram, B.; Wittmann, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): DFG-KE732/8; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The ICDP-Chicxulub drill core Yaxcopoil-1 (Yax-1) penetrated through 600 m of carbonate and sulfate sediments which have very probably a Cretaceous age. The sequence, in particular the interval at 1300-1510 m, contain numerous layers rich in organic matter. Fissures and fault zones show alteration parageneses with trapped fluid inclusions.

Derived from text

Hydrocarbons; Organic Materials; Lunar Core

20030110640 NASA Johnson Space Center, Houston, TX, USA

A New Antibody for Category 1 Biomarker Detection

Maule, J.; Steele, A.; Toporski, J.; McKay, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At least two questions arise in developing a life-detection strategy: What do we look for and what will positive detection tell us? Unfortunately, many 'biomarkers' are not conclusive markers of biology. For example, sugars, amino acids, polycyclic aromatic hydrocarbons (PAH) and certain bacteria-like morphologies can all be produced non-biologically. Inferences of life following the detection of several inconclusive biomarkers in one sample will always be questioned. Although DNA, RNA and proteins are excellent markers of biology, and preserved on Earth for several millions of years, their survival over longer periods of time is low. Ideally, we should target biomarkers which are both stable over time and formed exclusively from biological processes, i.e. a 'category 1' biomarker under the new classification system of Mckay. We have used antibodies to detect category 1 and other biomarkers in rock samples. Extraction takes a few minutes and analysis a few hours. We have presented use of new antibodies to detect hopanes and have shown proof of operation during martian gravity.

Derived from text

Biomarkers; Mars (Planet); Life Detectors; Antibodies

20030110641 National Museum of Natural History, Washington, DC, USA

Vesicular Eucrites: Where and How Did They Form and Why are They So Rare?

McCoy, T. J.; Wilson, L.; Benedix, G. K.; Ketcham, R. A.; Wadhwa, M.; Davis, A. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Vesicular basalts are notable for their rarity in the world s meteorite collections. McCoy et al. studied four such samples - the eucrites Ibitira and PCA 91007 and the angrites D'Orbigny and Sahara 99555 - performing computed tomographic scanning and simple vesicle rise time calculations in an effort to understand the conditions under which angrites and eucrites formed. Vesicles in angrites are large and evenly distributed, with calculated rise times of minutes requiring rapid cooling. In contrast, vesicles in eucrites are substantially smaller, leading to rise times of hours, and with a complex distribution suggesting coalescence. A number of questions remain unanswered, including the relationship between vesicle-enriched and -depleted zones and the role of coalescence. On a broader scale, the formation location (lava flows vs. shallow dikes vs. deep intrusives), timing, and nature of the gas that formed the vesicles are all open questions. In this abstract, we address these questions.

Derived from text

Basalt; Meteoritic Composition; Rock Intrusions; Fluid Flow; Lava

20030110642 Colorado Univ., Boulder, CO, USA

Theory of Ground Ice on Mars and Implications to the Neutron Leakage Flux

Mellon, M. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this work we present new calculations of the geographic and depth distribution of ground ice on Mars and draw

comparisons with the inferred distribution of ice from Mars Odyssey Neutron Spectrometer observations.
Derived from text
Ice; Mars Surface; Hydrological Cycle

20030110643 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
Beagle-2 Landing Site Atlas
Michael, G. G.; Chicarro, A. F.; Rodionova, J. F.; Shevchenko, V. V.; Iluhina, J.; Kozlova, E. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Beagle-2 lander of the Mars Express mission will come to rest on the surface of Isidis Planitia in late December 2003 to carry out a range of geochemistry and exobiology experiments. We are compiling an atlas of the presently available data products pertinent to the landing site at 11.6N 90.75E, which is intended for distribution both as a printed and an electronic resource. The atlas will include Viking and MOCWA image mosaics, and a catalogue of high-resolution images from MOC and THEMIS with location maps. There will be various MOLA topography-based products: colour-scaled, contoured, and shaded maps, slope, and detrended relief. Simulated camera panoramas from various potential landing locations may assist in determining the spacecraft s position. Other maps, both raw, and in composites with image mosaics, will cover TES thermal inertia and spectroscopy, and Odyssey gamma and neutron spectroscopy. Maps at the scale of the Isidis context will additionally cover geology, temperature cycles, and atmospheric circulation.
Derived from text
Landing Sites; Mars Missions; Mars Surface; Exobiology; Atmospheric Circulation; Geochemistry

20030110645 Pescara Univ., Pescara, Italy
A Thermodynamical Model of the Icy Crust of Europa
Mitri, G.; Geissler, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A fundamental question concerning Europa's ice shell is whether the rigid lithosphere visible at the surface is underlain by a layer of warm, convecting ice. The heat produced by tidal friction in Europa s silicate interior might be shed by simple conduction through a passive, relatively thin ice shell directly overlying a subsurface sea, or transported equally well through a much thicker ice shell consisting of an actively convecting sublayer that efficiently delivers heat to a somewhat thinner upper conductive layer. While both of these configurations are plausible, they have very different implications for the thermal history of Europa, the formation of surface features and the prospects for future exploration.
Derived from text
Europa; Crusts; Ice; Friction; Tides

20030110646 American Museum of Natural History, New York, NY, USA
Unambiguous Voids in Allende Chondrules and Refractory Inclusions
Murray, J.; Bosenberg, J. S.; Ebel, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578 Contract(s)/Grant(s): W-31-109-eng-38; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two very large chondrules constituting a compound pair, and one large type B1 CAI were separated from Allende using dental tools, and analyzed on the GSE-CARS APS beam line at Argonne National Laboratory in Illinois. Images from 30 to 40 KeV xrays were collected on CCD, at spatial resolutions of 12.92 (BB1), 9.55 (BB2), and 10.24 m/pixel (AC1), and reprocessed to obtain density structures of the targets. This method allowed us to scan the entire sample, showing relationships between all the components prior to cutting the sample. Images were analyzed quantitatively using routines written in the Interactive Data Language (RSI/Kodak), and using the ImageJ and Imaris software packages. Samples were then cut through void spaces observed from the tomography, and polished thick sections were analyzed on the electron microprobe and field emission scanning electron microscope (SEM) at the AMNH.
Derived from text
Chondrule; Voids

20030110648 Oulu Univ., Finland
Impactites of the Paasselka and Suvasvesi South Craters, Finland
Oehman, T.; Badjukov, D.; Raitala, J.; Petrova, T.; Stehlik, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Paasselka and Suvasvesi South circular structures were proposed as impact craters 10 years ago but mineralogical evidences of their impact origin were found only 3 and 1 years ago, respectively. It is noteworthy that all but a few of the impact craters in Finland are old, deeply eroded and occupied by lakes. This is the reason for absence of impactite exposures at these craters (only the Lappajarvi crater has impactite outcrops). However, impactite boulders and pebbles can be found usually in Quarternary glacifluvial deposits in vicinities of craters. Here we report the discovery of new types of impact rocks found in sandy pits located close to the proven Paasselka and the probable Suvasvesi South craters. The impactites provide further definitive evidences of impact origin of these structures.
Derived from text
Finland; Igneous Rocks; Lunar Craters; Hypervelocity Impact; Mineralogy

20030110649 Nevada Univ., Reno, NV, USA
Two-Dimensional Wrinkle Ridge Strain & Energy Release Based on Numerical Modeling of MOLA Topography
Okubo, O. H.; Schultz, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this abstract, we use numerical models of MOLA based wrinkle ridge topography to determine fault induced displacement vectors of the subjacent crust. These displacements not only provide individual magnitudes of fault- and fold-related strain, but more significantly provide a measurement of the work done, or energy released, through wrinkle ridge formation.
Author
Mathematical Models; Geological Faults; Mars Surface

20030110650 New Brunswick Univ., Fredericton, New Brunswick, Canada
Impact Melt Rocks from the Ries Impact Structure, Germany: Preliminary Results of an Analytical SEM Study
Osinski, G. R.; Spray, J. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact melted materials occur in two main forms in the Ries impact structure [1]: (1) as isolated bodies of reddish, vesicular, fine-grained impact melt rock; (2) as individual glass y particles or c lasts in melt-bearing breccias or suevites. The latter lithologies have been the subject of a considerable number of investigations over the past few decades. In contrast, no detailed investigations of the impact melt rocks have been published. Here, we present the preliminary results of an analytical scanning electron microscope (SEM) study of impact melt rocks from the Ries structure.
Author
Impact Melts; Rocks; Meteoritic Composition

20030110651 Cologne Univ., Germany
An In-Situ Trace Element Study of Refractory Forsterites from Different Types of Unequilibrated Chondrites
Pack, A.; Shelley, M.; ONeill, H. St.C.; Palme, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Refractory forsterites are widespread components of all types of unequilibrated chondrites. They occur in concentrations up to 0.3 vol.% and are extremely poor in Fe, Ni, Co and Mn and are rich in refractory lithophile elements (Ca, Al, Ti, Sc, V, REEs). A further characteristic of refractory forsterites is that they are often significantly enriched in O-16. In order to trace the origin of refractory forsterites, we have conducted an in-situ LA-ICP-MS trace element study of refractory forsterites from carbonaceous chondrites (Murchison, Allende, Vigarano) and, for the first time, from unequilibrated ordinary chondrites (Dar al Gani 369, Dar al Gani 378 and Chainpur) and an R-chondrite (Dar al Gani 013). Preliminary results of these analyses are presented.
Derived from text
Chondrites; Forsterite; Refractories; Meteoritic Composition; Trace Elements

20030110652 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA
Measurement of PGEs, Re, Mo, W and Au in Meteoritic Fe-Ni Metal
Petaev, M. I.; Jacobsen, S. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The concentrations of Ni, Ga, Ge, and Ir are typically used to assign an iron meteorite to one of the chemical groups. The improvements in analytical techniques, mainly INAA, and the systematic study of a large number of iron meteorites resulted in the development of an extensive database on their chemical compositions which has been used in deciphering the origins of iron meteorites. Other sources of high-quality data for trace elements are isotopic studies of iron meteorites. The quality of the analytical data varies depending upon the time and technique used to acquire the data.
Derived from text
Chemical Composition; Isotopes; Meteoritic Composition; Trace Elements; Rhenium; Tungsten; Gold; Iron Compounds; Nickel

20030110654 Johns Hopkins Univ., Laurel, MD, USA
Comparison of Ridges on Triton and Europa
Prockter, L. M.; Pappalardo, R. .; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-11616; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Triton and Europa each display a variety of ridges and associated troughs. The resemblance of double ridges on these two satellites has been previously noted [R. Kirk, pers. comm.], but as yet, the similarities and differences between these feature types have not been examined in any detail. Triton s ridges, and Europa s, exhibit an evolutionary sequence ranging from isolated troughs, through doublet ridges, to complex ridge swaths [1, 2]. Comparison of ridges on Europa to those on Triton may provide insight into their formation on both satellites, and thereby have implications for the satellites' histories.
Author
Europa; Landforms; Topography; Triton

20030110655 Arizona Univ., Tucson, AZ, USA
Paleomagnetic Pole Positions of Mars
Richmond, N. C.; Hood, L. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Global Surveyor magnetometer experiment has obtained nearly uniform global measurements of the Martian crustal magnetic field at mapping orbit altitudes (approximately 370-440 km) since March 1999. Lower altitude, partial coverage aerobraking data (approximately 80-200 km) has also been obtained, primarily over the southern hemisphere. In this paper, we report mapping of these data using methods introduced earlier by Hood and Zakharian. Results will be summarized and new model results from aerobraking data presented. The main goal is to use these data to calculate paleopole positions for relatively isolated anomaly sources.
Derived from text
Magnetic Poles; Mars (Planet); Paleomagnetism; Planetary Magnetic Fields; Planetary Mapping

20030110656 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Spectroscopy and Photometry of the Earth Grazer 2002 NY40
Rivkin, A. S.; Howell, E. S.; Bus, S. J.; Hicks, M.; Reach, W. T.; Jarrett, T. H.; Binzel, R. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The near Earth asteroid 2002 NY40 was discovered on July 14, 2002 by the LINEAR survey. The object was predicted to make a close pass by the Earth on August 18, which led to observations at a large range of wavelengths, including radar. The combination of visible and near infrared spectroscopy/spectrophotometry gives some indication of the composition. Thermal emission in the 3 micron spectral region gives constraints on the albedo, which is consistent with the spectral type and with the available size from the radar measurements. The lightcurve was well measured by a large number of observers, which helps to determine the rotation phase of the observations at the various wavelengths. The favorable observing conditions and rapid dissemination of the astrometry have led to a good physical characterization of this object, which is relatively rare for a newly discovered near Earth asteroid. The data sets reported in this abstract are shown.
Derived from text
Asteroids; Near Earth Objects; Composition (Property)

20030110657 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Volatile-rich Crater Interior Deposits on Mars: An Energy Balance Model of Modification

Russell, Patrick S.; Head, James W.; Hecht, Michael H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several craters on Mars are partially filled by material emplaced by post-impact processes. Populations of such craters include those in the circumsouth polar cap region, in Arabia Terra, associated with the Medusae Fossae Formation, and in the northern lowlands proximal to the north polar cap. In this study, crater fill material refers to an interior mound, generally separated from the interior walls of the crater by a trough that may be continuous along the crater s circumference (i.e. a ring-shaped trough), or may only partially contact the crater walls (i.e. a crescent-shaped trough). The fill deposit is frequently off-center from the crater center and may be asymmetric, (i.e. not circular) in plan view shape. Here we test the hypothesis that asymmetries in volatile fill shape, profile, and center-location within a crater result from asymmetries in local energy balance within the crater due mainly to variation of solar insolation and radiative effects of the crater walls over the crater interior. We first focus on Korolev crater in the northern lowlands. We can then apply this model to other craters in different regions. If asymmetry in morphology and location of crater fill are consistent with radiative-dominated asymmetries in energy budget within the crater, then 1) the volatile-rich composition of the fill is supported (this process should not be effective at shaping volcanic or sedimentary deposits), and 2) the dominant factor determining the observed shape of volatile-rich crater fill is the local radiative energy budget within the crater (and erosive processes such as eolian deflation are not necessary). Author

Mars Craters; Polar Caps; Morphology; Populations; Volatile Organic Compounds

20030110658 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Martian Buried Basins and Implications for Characteristics of the Burial Layer and Underlying Surface

Sarid, A. R.; Frey, H. V.; Roark, J. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Deciphering the cratering record on Mars has been challenging because it may reflect the changes in both the population of impactors and in the resurfacing processes on Mars. However, it is possible to determine the breadth of impactors captured in the cratering record. Extensive areas of resurfacing are of particular interest because they likely contain material from various ages in Martian history. By deducing the impact populations in both surface and underlying layers of terrain, it is possible to determine the age of the layers and constrain theories on the development of the Martian surface. However, to do so requires a method of seeing impact features which are no longer visible. Topographic data of Mars, taken by the Mars Orbiter Laser Altimeter (MOLA), has revealed impact features buried by resurfacing processes. These features are often indistinguishable on Viking images of the Martian surface. In this study, gridded MOLA data was analyzed in order to locate buried impact features, also called buried basins, in Syria, Solis, and Sinai Planum just south of Valles Marineris. The population statistics of buried features can be compared to those of visible features in order to determine the age of the underlying material and characteristics of the surface cover. Specifically, if the buried population in the Hesperian terrain is similar to the population of visible features in the Noachian, it would suggest that the underlying terrain is Noachian in age. The buried craters can then be compared to visible Noachian craters to reveal the amount of deterioration of the buried features. These comparisons allow us to explore the morphology of the terrain in the Hesperian region to determine if topographic variations are due to differences in the thickness of the overlying material or are a characteristic of the underlying terrain.

Derived from text

Planetary Geology; Mars Surface; Topography; Structural Basins; Geochronology

20030110660 Open Univ., Milton Keynes, UK

Hydropyrolysis of High Molecular Weight Organic Matter in Murchison

Sephton, M. A.; Love, G. D.; Watson, J. S.; Verchovsky, A. B.; Wright, I. P.; Snape, C. E.; Gilmour, I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pyrolysis-based techniques are probably the most common means of analysing the macromolecular material in meteorites. Analytical pyrolysis involves thermally decomposing macromolecular organic matter in an inert atmosphere into lower molecular weight fragments that are more amenable to conventional organic analytical techniques. Hydropyrolysis, which refers to pyrolysis assisted by high hydrogen gas pressures and a dispersed sulphided molybdenum catalyst, has not been

previously applied to the study of high molecular weight meteoritic organic matter.
Author
Meteoritic Composition; Hydropyrolysis; Murchison Meteorite

20030110661 Stanford Univ., Stanford, CA, USA
Highly Oblique Bistatic Radar Observations Using Mars Global Surveyor
Simpson, R. A.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the beginning of Mapping, Mars Global Surveyor (MGS) has collected data from over 10000 radio occultations -- more than half accompanied by transient surface echoes. These echoes arise when the spacecraft high-gain antenna (HGA) incidentally illuminates parts of the surface near the occulting limb. When the direct raypath is well separated from the limb, no microwave energy falls on the surface and no echoes are observed. The HGA beamwidth is 1.6 deg, so the majority of echo energy results from illumination at incidence angles phi greater than 89 deg, well beyond the regime for which traditional quasi-specular scattering models are valid and making geophysical interpretation difficult. The work to date has focused on characterizing the reflected signals to identify patterns and detect systematic biases.
Derived from text
Radar Tracking; Planetary Mapping; Occultation; Geophysics

20030110662 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Why are There So Few Magnetic Anomalies in Martian Lowlands and Basins?
Solomon, Sean C.; Aharonson, Oded; Banerdt, W. Bruce; Dombard, Andrew J.; Frey, Herbert V.; Golombek, Matthew P.; Hauck, Steven A., II; Head, James W., III; Johnson, Catherine L.; McGovern, Patrick J., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The discovery of large areas of strongly magnetized crust on Mars [1,2] provides important information on the timing of both crustal and deeper interior processes on that planet. Critical to an understanding of that timing, as well as to the processes that have contributed to the magnetization and demagnetization of crustal materials, is the geographical distribution of magnetic anomalies discernible from spacecraft orbit. The paucity of resolved magnetic anomalies in the northern lowlands and within and surrounding the best-preserved major impact basins has been noted since the crustal field was first globally mapped [1], but no straightforward explanation of that full pattern has yet been offered. Here we suggest that ancient hydrothermal alteration of magnetic carriers in Martian lowlands and basins may have contributed to the magnetization distribution observed today.
Author
Mars (Planet); Magnetic Anomalies

20030110663 Geological Survey, Flagstaff, AZ, USA
Global Comparisons of Mare Crater Spectra from Clementine UVVIS and NIR Data
Staid, M. I.; Eliason, E.; Gaddis, L. R.; Pieters, C. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The relatively crystalline and unweathered regolith exposed at young impact craters in the lunar maria exhibit diagnostic visible to near infrared reflectance properties related to their mineralogy. As a result, spectral measurements of small mare craters provide an opportunity to directly investigate the mineralogy of emplaced basalts, while circumventing many of the complications associated with the space weathering and non-mare contamination of mature lunar soils. The reflectance properties of small craters representing the least weathered and uncontaminated surfaces in the lunar maria are examined using high spatial resolution data from the Clementine UVVIS and NIR cameras. This study extends previous analyses of mare crater spectra from several deposits on the near side of the Moon in order to examine the global distribution and diversity of lunar volcanism.
Derived from text
Clementine Spacecraft; Lunar Maria; Mineralogy; Near Infrared Radiation; Ultraviolet Radiation; Light (Visible Radiation); Spectrum Analysis; Lunar Craters

20030110664 Washington Univ., Saint Louis, MO, USA

FIDO Analyst's Notebook: An Approach to Integrating Science Data for Rover Mission Playback

Stein, T. C.; Arvidson, R. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The FIDO Analyst's Notebook (AN) is a set of static web pages serves as the archive for the Jet Propulsion Laboratory FIDO Rover field trials held between October 1999 and August 2002. Rover missions are nondeterministic, thus scientists need context to understand observations. This is the role of the AN, which integrates engineering and science data and documentation in a single tool. The FIDO AN is not an operational but rather a reference tool made available to participating scientists and to the Planetary Data System (PDS) science community. During the field trial, FIDO Rover Experiment Data Records (EDRs) were transferred from JPL to Washington University via ftp. Standard products were automatically processed for the Panorama (Pancam) and Navigation (Navcam) Cameras, Infrared Point Spectrometer (IPS), Color Microscopic Imager (CMI), and Front and Rear Hazard (Hazcam) Cameras. Standard products for the Mini-Thermal Emission and Mossbauer Spectrometers were submitted by the respective instrument teams.

Author

Mars Roving Vehicles; Mars Exploration; Multisensor Fusion; Data Systems

20030110665 University of Northern Illinois, De Kalb, IL, USA

Uplift of Venus Geoid Highs: Timing from Coronae and Craters

Stoddard, Paul R.; Jurdy, Donna M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Crater distribution on Venus indicates that the surface has undergone global-scale resurfacing in a short period of time. Determining the timing of events has been difficult due to the near-random crater pattern. Some progress has been made in the relative dating of various types of features. In addition, current deformation of Venus' surface has been described as a swell-push force, defined as the gradient of the geoid height. Two likely areas of current geologic activity, Atla Regio and Beta Regio are marked by most prominent geoid highs. We compare these two features in terms of coronae and craters to establish the relative timing of the their formation.

Derived from text

Coronas; Geoids; Venus Surface; Venus (Planet); Planetary Craters; Geochronology

20030110666 Cologne Univ., Germany

Complex Thermal History of Nakhla and Y000593

Szymanski, A.; Brenker, F. e.; ElGoresy, A.; Palme, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In order to unravel the thermal history of the Martian meteorites Nakhla and Y000593 we applied several geo-thermometers including single and two pyroxene thermometry, the Fe, Ti- thermometer/oxybarometer and TEM microstructures.

Derived from text

Temperature Measurement; Thermal Emission; Nakhlites; Mars Surface

20030110667 NASA Johnson Space Center, Houston, TX, USA

Mineralogical Characterization of Lunar Highland Soils

Taylor, L. A.; Pieters, C.; Patchen, A.; Taylor, D.-H.; Morris, R. V.; Keller, L. P.; McKay, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ten pristine highland soils were selected for this study from Apollo 14 and 16 collections. These soils were chosen for their contrasting maturities, as reflected in their Is/FeO values [6]. For each soil, the 44- 20, 20-10, and < 10 m size fractions were obtained by wet sieving, with triply distilled water [7]. As outlined in Taylor et al. [2], each soil was split into appropriate sizes and distributed to LSCC members. The Tennessee team has characterized these soil size fractions both chemically and mineralogically, with detailed modal and phase compositional analyses, using techniques described previously by our group

[8]. The results of the bulk chemistry of each size fraction of the highland soils was presented earlier.
Derived from text
Lunar Soil; Mineralogy; Characterization; Lunar Composition

20030110668 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
Coordinated Science Operations of Mars Express Orbiter and Lander
Trautner, R.; Chicarro, A. C.; Martin, P. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Express orbiter carrying the Beagle2 lander will arrive at Mars in late 2003. Both spacecraft carry a comprehensive set of instruments for the investigation of Mars. Many of the orbiter and lander instruments measure the same or similar parameters of the Martian environment. A coordination of these measurements will allow the acquisition of ground truth for the orbiter investigations, and allow the extrapolation of data obtained at the Beagle2 landing site to the global coverage provided by the orbiter. An overview of the orbiter and lander payloads and their science goals, as well as potential areas for the coordination of science operations is provided.
Derived from text
Mars Express; Coordination; Payloads; Landing Sites

20030110669 Lunar and Planetary Inst., Houston, TX, USA
Mantle Metasomatism in Mars: Evidence from Bulk Chemical Compositions of Martian Basalts
Treiman, A. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAGW-12184; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Bulk compositions of martian meteorite basalts suggest that they formed from a highly depleted mantle that was variably metasomatised and enriched in incompatible elements. These results are consistent with radio-isotope results. Bulk chemical compositions of basaltic rocks retain clues and tracers to their origins and histories. Interpretations of bulk compositions are not so straight-forward as once envisioned, because real-world magmatic processes can be far from theoretical simple models like one-stage partial melting or closed-system fractional crystallization. Yet, bulk chemistry can shed a broad (if dim) light on Martian basalt petrogenesis that complements the sharply focussed illumination of radio-isotope systematics.
Author
Mars Surface; Basalt; Chemical Composition

20030110670 Keele Univ., UK
Controls on the Formation of Polygonally Organised Structures
Tuckwell, G. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Polygonally organized deformation is seen at all scales in terrestrial geology from mud-cracks and cooling joints, to kilometer-scale structures in the Tertiary mud-rocks in the North Sea. Extra-terrestrial examples include the giant polygons that have been imaged on the surface of Mars, in the Utopia Planita region, the polygonal fabrics in the lowland flow fields of Venus, and the chaos regions on Europa. Polygonal systems can be divided into two categories: Layer-bound systems in which the propagation direction is in the plane of the layer (e.g., mudcracks), and non-layer-bound systems such as columnar cooling joints, where propagation is out of the polygon plane. Geometric differences can be identified between the observed map-view patterns of polygonal systems. Most striking are differences in polygon size, however, more subtle geometric differences can also be identified.
Author
Polygons; Rocks; Deformation

20030110671 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Axial Surface Mapping of Wrinkle Ridges on Solis Planum, Mars from MOLA Topography: Constraints on Subsurface Blind Thrust Geometry
Vidal, A.; Mueller, K.; Golombek, M. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We undertook axial surface mapping of selected wrinkle ridges on Solis Planum, Mars in order to assess the subsurface geometry of blind thrusts proposed to exist beneath them. This work builds on previous work that defined structural families of wrinkle ridges based on their surface morphology in this region. Although a growing consensus exists for models of wrinkle ridge kinematics and mechanics, a number of current problems remain. These include the origin of topographic offset across the edges of wrinkle ridges, the relationship between broad arches and superposed ridges, the origin of smaller wrinkles, and perhaps most importantly, the trajectory of blind thrusts that underlie wrinkle ridges and accommodate shortening at deeper crustal levels. We are particularly interested in defining the depths at which blind thrusts flatten under wrinkle ridges in order to provide constraints on the brittle-ductile transition during Early Hesperian time. We also seek to test whether wrinkle ridges on Solis Planum develop above reactivated faults or newly formed ones.
Derived from text
Mars Surface; Laser Altimeters; Topography; Ridges; Structural Properties (Geology); Geomorphology; Thrust; Planetary Mapping

20030110672 Carnegie Institution of Washington, Washington, DC, USA
Diffusion of Siderophile Elements in Iron-Nickel Alloys at High Pressure and Temperature
Watson, H. C.; Fei, Y.; Watson, E. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Siderophile elements are ironloving elements that tend to partition themselves into iron metal. These elements all have characteristic signatures in the mantle, as well as in extra-terrestrial materials such as meteorites, some of which are assumed to represent differentiated primordial solar system material. It is recognized that diffusion of siderophile elements in the metal phase is an important rate-limiting factor in many processes. Comprehensive understanding of siderophile diffusion in iron-rich metal, and related systems could lead to important time constraints on partitioning and models of core formation. It can also aid in understanding the siderophile element distribution observed in nature, in both terrestrial and extra-terrestrial materials. We have performed experiments to determine the diffusivity of a variety of siderophile elements (Pd, Au, and Re) in a 90wt% Fe and 10wt% Ni alloy at high pressure and temperature. The end goals of this study are to provide a comprehensive set of siderophile diffusion coefficients and characterize siderophile diffusion in systems relevant to the applications mentioned above.
Derived from text
Diffusion; High Pressure; Iron Alloys; Nickel Alloys; Siderophile Elements; High Temperature

20030110673 NASA Ames Research Center, Moffett Field, CA, USA
Mapping of the Culann-Tohil Region of Io
Turtle, E. P.; Keszthelyi, L. P.; Jaeger, W. L.; Radebaugh, J.; Milazzo, M. P.; McEwen, A. S.; Moore, J. M.; Schenk, P. M.; Lopes, R. M. C., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Galileo spacecraft completed its observations of Jupiter's volcanic moon Io in October 2001 with the orbit I32 flyby, during which new local (13-55 m/pixel) and regional (130-400 m/pixel) resolution images and spectroscopic data were returned of the antijovian hemisphere. We have combined a I32 regional mosaic (330 m/pixel) with lower-resolution C21 color data (1.4 km/pixel, Figure 1) and produced a geomorphologic map of the Culann-Tohil area of this hemisphere. Here we present the geologic features, map units, and structures in this region, and give preliminary conclusions about geologic activity for comparison with other regions to better understand Io's geologic evolution.
Derived from text
Io; Volcanoes; Planetary Mapping; Structural Properties (Geology); Geomorphology; Jupiter (Planet)

20030110674 Brown Univ., Providence, RI, USA
Oceans in the Northern Lowlands of Mars? Assessment of Dike Emplacement as a Mechanism for Rapid Release of a Confined Subcryosphere Aquifer
Wilson, L.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We show that cracking of the cryosphere by dike injection and subsequent release of water from a confined aquifer can

take place fast enough to form an ocean in the northern lowlands of Mars.
Author
Oceans; Mars Surface; Water; Cryospheres; Aquifers

20030110676 Academy of Sciences (USSR), Moscow, USSR
Study of Evaporation of Microelements from Anorthosite and ICP-MS Analyses of the Condensate Products
Yakovlev, O. I.; Ivanov, L. I.; Kolotov, V. P.; Dogadkin, N. N.; Karandashev, V. K.; Kazilin, E. E.; Popov, V. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is known that high velocity impacts might lead to melting and evaporation of rocks on the lunar surface. In this process selective evaporation of the melts as well as vapor condensation change the chemical composition of the materials. However there are few data especially for microelement distribution between the vapor phase and impact melt at high temperature conditions even for main rocks such as basalt and anorthosite. Meanwhile such information can provide insight into origin of some chemically exotic lunar rocks. To study possible chemical alterations, which might happen during the evaporation of lunar highland rocks, we carried out the impulse melting experiments using an anorthosite sample. The experiments permitted to collect amount of the condensate matter large enough to make chemical analysis by means of ICP-MS method. The comparison of chemical composition of the condensate with the initial anorthosite allows to predict element redistribution between the products of anorthositic impact melts and their vapor/condensate.
Derived from text
Anorthosite; Chemical Composition; Condensates; Impact Melts; Vapors; Lunar Rocks

20030110677 Massachusetts Univ., Amherst, MA, USA
An Improved Model to Determine the Cooling Rates of Mesosiderites and Iron Meteorites
Yang, J.; Goldstein, J. I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Data on the Ni concentration and distribution in kamacite (alpha) and taenite (gamma) of meteoritic metal can be used to determine the cooling rates of meteorites. Several metallographic cooling rate methods have been used to determine the cooling rates of meteorites and have been recently reviewed. The reliability of these models depends on the accuracy of the phase diagram and diffusion coefficients in Fe-Ni alloy systems. This paper reports a major revision to the Hopfe and Goldstein computer model for kamacite growth in meteoritic Fe-Ni metal using the latest Fe-Ni phase diagram [2] and interdiffusion coefficient data. The improved model is used to determine the cooling rates of the mesosiderites and the Toluca iron meteorite.
Derived from text
Computerized Simulation; Cooling; Iron Meteorites; Meteoritic Composition; Nickel

20030110678 Arizona State Univ., Tempe, AZ, USA
Aqueous Oxidation of Parent Bodies of Carbonaceous Chondrites and Galilean Satellites Driven by Hydrogen Escape
Zolotov, M. Y.; Shock, E. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chemistry and mineralogy of carbonaceous chondrites and remote sensing data on the Galilean satellites indicate a trend in oxidation of the original material formed in the solar nebula and in the Jovian subnebula. In particular, the presence of sulfates in CM and CI carbonaceous chondrites and on the surfaces of Europa and Ganymede, as well as SO2-rich volcanism on Io indicate profound oxidation of corresponding parent bodies and satellites. Here we propose that oxidation that led to the formation of sulfates in parent bodies of carbonaceous chondrites and Galilean satellites was driven by hydrothermal alteration followed by H2 escape into space.
Derived from text
Carbonaceous Chondrites; Galilean Satellites; Hydrogen; Oxidation; Aqueous Solutions; Mineralogy

20030110679 Arizona Univ., Tucson, AZ, USA
Finite-Difference Modeling of Impact-induced Hydrothermal Systems
Abramov, O.; Kring, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Current research indicates that impact- generated hydrothermal systems played an important role on early Earth. A dramatic increase in the number of impact events occurred at approximately 3.9 Ga, and coincides remarkably well with the earliest isotopic evidence of life at approximately 3.85 Ga. This period lasted 20 to 200 million years, during which time hydrothermal heat generated by impact events may have exceeded that generated by volcanic activity. These impacts would have resurfaced most of Earth, and may have vaporized the Earth s oceans, virtually eliminating surface habitats while creating a abundance of subsurface habitats. In addition, there is genetic evidence indicating a common ancestor comparable to present-day thermophilic organisms. These lines of evidence suggest that impact-generated hydrothermal systems were important for the origin and evolution of early life, and deserve further study. Several hydrothermal systems associated with terrestrial impact craters have been identified based on mineralogical evidence. Examples of known systems include the 35 km Manson crater, the 80 km Puchezh-Katunki crater, and the 250 km Sudbury crater. The primary heat sources driving a hydrothermal system associated with a complex impact crater are the central uplift and the melt sheet, with the latter contributing approximately 10-100 times more energy. The lifetimes of hydrothermal systems in craters 20 to 200 km in diameter are 10(exp 3) to 10(exp 6) years if conductive cooling is assumed. In order to better constrain the expected lifetimes of these systems and further understand their mechanics, a finite-difference computer simulation is used to evaluate the effects of convection.
Derived from text
Finite Difference Theory; Hydrothermal Systems; Mathematical Models; Earth Surface; Biological Evolution

20030110680 Southwest Research Inst., Boulder, CO, USA
An Exploration of Charon's Putative Eccentricity Around Pluto
Bottke, W. F.; Stern, S. A.; Levison, H. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Charon's orbital eccentricity has been reported to be in the range of 0.003 - 0.008. This non-zero value, if correct, indicates some significant forcing against the two-body tidal equilibrium value, which should formally be zero. We investigated whether the reported eccentricity could be a byproduct of gravitational perturbations by KBO flybys through the Pluto-Charon system and KBO impacts directly onto Pluto/Charon. Our results indicate that Charon's reported eccentricity is unlikely to be caused by this effect. Although we cannot rule out some additional source of eccentricity excitation (e.g., an undiscovered satellite in the system, or a Kozai resonance), our analysis indicates it is plausible that Charon's actual orbital eccentricity is substantially smaller than the 0.003 lower limit reported previously.
Author
Pluto (Planet); Charon; Perturbation; Eccentricity

20030110681 Hawaii Univ., Honolulu, HI, USA
Mineralogy of the Valles Marineris: Initial Stratigraphic Results from Comparing TES Endmember Compositions with MOLA
Anderson, F. S.; Hamilton, V. E.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study tests the proposition that data from the Mars Global Surveyor Thermal Emission Spectrometer (MGS TES) and Mars Orbiting Laser Altimeter (MOLA) can be used to identify stratigraphic and mineralogic layering in the wall and floor deposits of the Valles Marineris (VM). By using TES data at full resolution to identify unique local compositional signatures, our study complements previous studies that averaged data at a regional scale. The absolute elevation, dip, and stratigraphic relationships of observed layering in wall rock is determined using MOLA data. The observed composition and stratigraphic relationships can then be used to constrain the formation process of the Valles Marineris.
Derived from text
Stratigraphy; Mineralogy; Thermal Emission; Mars Surface

20030110682 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Digital Image Model 2.1 Control Network
Archinal, B. A.; Kirk, R. L.; Duxbury, T. C.; Lee, E. M.; Sucharski, R.; Cook, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

USGS is currently preparing a new version of its global Mars digital image mosaic, which will be known as MDIM 2.1. As part of this process we are completing a new photogrammetric solution of the global Mars control network. This is an improved version of the network established earlier by RAND and USGS personnel, as partially described previously. MDIM 2.1 will have many improvements over earlier Viking Orbiter (VO) global mosaics. Geometrically, it will be an orthoimage product, draped on Mars Orbiter Laser Altimeter (MOLA) derived topography, thus accounting properly for the commonly oblique VO imagery. Through the network being described here it will be tied to the newly defined IAU/IAG 2000 Mars coordinate system via ties to MOLA data. Thus, MDIM 2.1 will provide complete global orthorectified imagery coverage of Mars at the resolution of 1/256 deg of MDIM 2.0, and be compatible with MOLA and other products produced in the current coordinate system.
Author
Planetary Mapping; Mars Surface; Digital Techniques; Mosaics; Photogrammetry; Networks; Spacecraft Control

20030110683 Colorado Univ., Boulder, CO, USA
Upper Dao Vallis: A Basin Dominated by Ice-rich Viscous Materials
Arfstrom, J. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

I present preliminary geomorphic interpretations of Upper Dao Vallis, based on Mars Orbiter Camera (MOC) images and Mars Orbiter Laser Altimeter (MOLA) data.
Author
Mars Surface; Geomorphology; Structural Basins

20030110684 McGill Univ., Montreal, Quebec, Canada
Thermo-Remanent Magnetization of Martian Lithosphere
Arkani-Hamed, Jafar; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is evidence for moderate temperatures in the deep Martian lithosphere in the last approx. 4 Gyr, suggesting the possibility of deeper magnetic source bodies magnetized by the magnetic field of the upper lithosphere in the absence of the core field. The support of large shield volcanos on Mars requires a thick and strong lithosphere, about 100-300 km. Arkani-Hamed and Reindler showed that stresses of up to approx. 100 MPa have existed in the upper 200 km of Mars since the formation of Olympus and the Tharsis mountains. The temperature at the base of the elastic lithosphere is suggested to be approx. 650 C. The elastic lithosphere thickness estimates suggest that the lithosphere has cooled below the Curie temperature (assumed 600C) down to 100-200 km in the last 4 Gyr. I assume that the upper lithosphere was magnetized by the core field in the early history of the planet, whereas the lower lithosphere was magnetized gradually as it cooled below the Curie temperature in the presence of the magnetic field of the upper lithosphere. The present day observed magnetic field arises from the magnetization of that portion of the lithosphere which is presently below the Curie temperature, hereafter refered to as the magnetic lithosphere.
Author
Planetary Geology; Mars (Planet); Planetary Magnetic Fields; Magnetization; Field Strength; Planetary Structure

20030110685 Maryland Univ., College Park, MD, USA
Rare Earth Elements and Oxygen Isotopes in Allende Chondrules as Evidence for CAI Mixing in Chondrule Precursors
Ash, R. D.; McDonough, W. F.; Rumble, D., III; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In order to try to further clarify the relationship between chondrules and CAIs we have undertaken a correlated study of oxygen isotopes and rare earth abundances in order to distinguish between mixing of components and the degree of processing resulting from temporal, spatial or thermal variations. Rare earth element abundances were determined by laser ablation ICP-MS at the University of Maryland. 213nm light was provided by a quintupled Nd-YAG laser, ablated material was transported via a He stream into a Finnigan Element 2 magnetic sector ICP-MS. Spot sizes for the ablation ranged from 16 m to 60 m, depending upon the REE concentration of the analysed phases. Between five and ten analyses were made on each chondrule in an attempt to sample each of the mineral species present. Results were normalized using the abundances. Oxygen

isotopes were determined by UV laser ablation, with 248nm light provided by a KrF excimer laser, and isotope ratios measured by a Finnigan Matt 252 stable isotope mass spectrometer at the Geophysical Laboratory. A broad spot-size (ca. 800 microns, provided a bulk oxygen isotope determination). Samples were petrographically characterised and mineral chemistry measurements made by electron microprobe.
Derived from text
Rare Earth Elements; Oxygen Isotopes; Chondrule; Meteoritic Composition

20030110686 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Genesis Solar Wind Collection Mission: Current Status
Barraclough, B. L.; Wiens, R. C.; Steinberg, J. T.; Dors, E. E.; Neugebauer, M.; Burnett, D. S.; Gosling, J.; Bremmer, R. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA Genesis spacecraft was launched August 8, 2001 on a mission to collect samples of solar wind for greater than or equal to 2 years and then return them to Earth in 2004. Detailed analyses of the solar wind ions implanted into high-purity collection substrates will subsequently be carried out in earth-based laboratories using various mass spectrometry techniques. These analyses are expected to determine key isotopic ratios and elemental abundances in the solar wind and, by extension, in the solar photosphere. Further, the photospheric composition is thought to be representative of the solar nebula with a few exceptions so that the Genesis mission will provide a baseline for the average solar nebula composition with which to compare present-day compositions of planets, meteorites, and asteroids. The implications of the solar oxygen isotopic composition have been discussed. A list of other isotopic and elemental measurement objectives, and some of the rationale behind them, is given.
Derived from text
Solar Wind; NASA Space Programs; Genesis Mission; Wind (Meteorology)

20030110687 Eotvos Lorand Univ., Budapest, Hungary
Atlas Series of the Solar System (5 Booklets) and Other Works for Education and Public Outreach by Cosmic Materials, Planetology and Hunveyor Groups of the Eotvos University, Hungary
Berczi, S.; Fabriczy, A.; Hargitai, H.; Hegyi, S.; Illes, E.; Kabai, S.; Kovacs, Z.; Kereszturi, A.; Opitz, A.; Sik, A., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): MUI-TP-154; MUI-TP-190; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Atlas Series of the Solar System Research is recently a 5 booklet interactive material in space science education on Eotvos University: 1) Planetary petrography, 2) Surveyor-Hunveyor ed. robotics, 3) Planetary surfaces atl., 4) Planetary atmospheres, 5) Space sci. and geometry. Some maps and CD-s are also shown on the 34. LPSC Open House Event in LPI. Our Space Research Group on Eotvos University uses NASA Lunar set and NIPR Antarctic meteorite set during the last 8 years in studies and forming exciting planetary science education programs. In the last 3 years we compiled five high school atlases of the Solar System research, study, activities, field works, space probe constructions. Every year we make 3 new atlases. Now we show the first 5 volumes.
Derived from text
Education; Planetary Atmospheres; Planetary Surfaces; Solar System; Public Relations

20030110688 Eotvos Lorand Univ., Budapest, Hungary
Space Simulators in Space Science Education in Hungary (2): Hunveyor Orientations and Astronomical Observations on Martian Surface
Berczi, S.; Hegyi, S.; Kovacs, Z.; Hudoba, E.; Horvath, A.; Kabai, S.; Fabriczy, A.; Foldi, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We developed our Hunveyor simulator, a planetary lander, with capabilities for observations and orientations on the Martian surface. We studied also orientation and space station activities at the Lagrangian points of the Earth+Sun or Earth+Moon system. The basic coordinate transformations were formulated in this course and the space-orientation requirements for planetary surface robotics were also studied.
Author
Coordinate Transformations; Education; Planetary Surfaces; Robotics; Space Simulators; Earth-Moon System

20030110689 Academy of Sciences of the Ukraine, Kharkov, Ukraine

Dark Crater-related Deposits on Venus in Radar Cross-Section: Emissivity Domain

Bondarenko, N. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The population of Venus impact craters is rather small (about 1000). About 10% of all craters have distinctive associated dark diffuse features (DDF) like parabolas or halos. Such craters are thought to be the youngest on the planet The DDF are interpreted as surface deposits of loose material (dust) formed by the impact. DDF change their form with geological time and disappear due to eolian activity, which moves the dust and scatters it over large areas, and/or due to some weathering processes. In [4] the morphological degradation stage of DDF was used to arrange the craters according to their relative age. The objective of this work is the study of DDF material and processes of its evolution with the radio-physical properties of the DDF.

Derived from text

Craters; Radio Physics; Geochronology; Deposits; Dust

20030110690 Bookamer (R.), Micco, FL, USA

The Occultation of SAO 60107 by (516) Amherstia on Jan. 14, 2002

Bookamer, R.; Povenmire, H.; Povenmire, K. I.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On the night of September 20, 1903, astronomer R.S. Dugan discovered a bright asteroid while observing at Heidelberg, Germany. It was later numbered and named (516) Amherstia. The occultation of stars by asteroids is a common event. Favorable occultations of a star where valuable data can be obtained on the shape and diameter of asteroids are rare events.

Derived from text

Asteroids; Stellar Occultation

20030110691 Museum fuer Naturkunde, Berlin, Germany

NWA 1465 and NWA 1665: Two Unusual Carbonaceous Chondrites from Northwest Africa

Greshake, Ansgar; Clayton, Robert N.; Mayeda, Toshiko K.; Kurz, Matthias; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past decades numerous interesting new meteorites were found in the north African and Arabian sand deserts of Libya, Algeria, Morocco, and Oman. The new findings include many basaltic and primitive achondrites, e.g., Martian and Lunar meteorites, Eucrites, Howardites, and Acapulcoites as well as rare types of carbonaceous chondrites, e.g., Rumuruti, CH, CK and CM chondrites [e.g., 1-3]. Additionally, several of the meteorites found could not be unambiguously assigned to one of the known meteorites classes [e.g., 1-3]. Some of these samples contributed significantly to our understanding of processes in the early solar nebula and on the meteorite's parent bodies [e.g., 4, 5]. We report here on two unusual carbonaceous chondrites which were recently recovered from the Moroccan Sahara.

Author

Chondrites; Meteoritic Composition

20030110692 Arizona Univ., Tucson, AZ, USA

Compositional Diversity of the Martian Crust: Preliminary Data from the Mars Odyssey Gamma-Ray Spectrometer

Boynton, William V.; Taylor, G. J.; Hamara, D.; Kerry, K.; Janes, D.; Keller, J.; Feldman, W.; Prettyman, T.; Reedy, R.; Brueckner, J., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report preliminary data on the concentrations of Si, Fe, H, K, and Th on the Martian surface. K and Th are also discussed in the context of crustal evolution and the bulk composition of Mars in a companion abstract. The data reveal that the varies considerably in composition. We present these variations and use the data to assess the nature of surface materials and their relationship to Martian meteorites and suspected andesitic and basaltic surface types. In this abstract we confine our

interest to the equatorial region between approximately 70 degrees north and 50 degrees south.
Derived from text
Mars Surface; Planetary Crusts; Surface Properties; Andesite; Basalt; Planetary Evolution

20030110693 Proxemy Research, Inc., Laytonsville, MD, USA
The Summit, Tectonic and Flank Characteristics of Large Venusian Volcanoes: A New Global Survey
Brian, A. W.; Stofan, E. R.; Guest, J. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Large volcanoes on Venus are defined as topographically positive, broadly domical structures with lava flow aprons larger than 100 km in diameter surrounding a central volcanic vent. Several surveys have been carried out since the first return of data from the Magellan mission, investigating the location and distribution of volcanoes over the venusian surface, their structure and variation in size with altitude. The number of volcanoes included in each survey varies from 123 to 167, but to date, only the 1997 survey by Crumpler et al. has been published. Large volcanoes on Venus show a diversity of morphologies with some displaying similar characteristics to large coronae. It is not surprising therefore that many features included in the 1997 database have been classified by others as coronae and included in other relevant corona databases. The first task of this new study was re-examine the large volcano population to eliminate the overlap with other catalogues and to try to accurately determine the number of features on the planet. In addition to their earlier surveys, Head et al. and Crumpler et al. described nine fundamental types of large volcano suggested to represent a morphological classification describing individual features and associations with each edifice. Large volcanoes are structurally diverse with many different morphologies. The 9 classes describe a mix of both summit and tectonic characteristics meaning that an individual volcano may not be described accurately by any individual field or fields. The second task was to therefore devise a new classification scheme that would better describe the major morphological features of each edifice.
Derived from text
Volcanoes; Morphology; Tectonics; Venus (Planet); Classifications; Fluid Flow; Lava

20030110694 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Electrical Breakdown in a Martian Gas Mixture
Buhler, C. R.; Calle, C. I.; Nelson, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The high probability for dust interactions during Martian dust storms and dust devils combined with the cold, dry climate of Mars most likely result in airborne dust that is highly charged. On Earth, potential gradients up to 5 kV/m have been recorded and in some cases resulted in lightning. Although the Martian atmosphere is not conducive to lightning generation, it is widely believed that electrical discharge in the form of a corona occurs. In order to understand the breakdown of gases, Paschen measurements are taken which relate the minimum potential required to spark across a gap between two electrodes. The minimum potential is plotted versus the pressure-distance value for electrodes of a given geometry. For most gases, the potential decreases as the pressure decreases. For CO2, the minimum in the curve happens to be at Mars atmospheric pressures (5-7 mm Hg) for many distances and geometries. However, a very small amount (<0.1%) of mixing gases radically changes the curve, as noted by Leach. Here, we present the first experimental results of a Paschen curve for a Mars gas mixture compared with 100% pure CO2.
Derived from text
Mars Atmosphere; Mars Environment; Electric Potential; Gas Dissociation; Potential Gradients

20030110695 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Determining Possible Building Blocks of the Earth
Burbine, T. H.; O'Brien, K. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: One of the fundamental questions concerning the formation of the Earth is what is it made out of. The Earth appears to have condensed out of material from the solar nebula. We sample this 'primitive' material in the form of chondritic meteorites. One of the most important constraints on possible building blocks for the Earth is the Earth#s oxygen iso-topic composition. Rocks from the Earth and Moon plot along a line (the terrestrial fractionation line) in diagrams of delta(sup 17)O

(% relative to Standard Mean Ocean Water or SMOW) versus delta(sup 18)O (% relative to SMOW). Chondritic meteorites fall above and below this line. Distances from this line are given as Delta(sup 17)O (%) (= delta(sup 17)O - 0.52 x delta(sup 18)O).
Derived from text
Earth (Planet); Evolution (Development); Solar Nebula

20030110697 NASA Kennedy Space Center, Cocoa Beach, FL, USA
A Wheel Electrometer to Measure Electrostatic Fields on the Martian Surface
Calle, C. I.; Buhler, C. R.; Mantovani, J. G.; Groop, E. E.; Buehler, M. G.; Nowicki, A. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A system of embedded sensors that can be incorporated into the wheel of any future mission rover would provide for a simple and fairly unobtrusive way to measure the distribution of electrostatic fields on the Martian surface and to measure variations in soil electrostatic response. This technology could perhaps be applied to different types of sensors that require the mobility provided by a rover s wheel.
Derived from text
Electrostatics; Electrometers; Mars Roving Vehicles

20030110698 Chicago Univ., Chicago, IL, USA
Zoned and Unzoned Metal Grains in the CH Chondrites ALH 85085 and PCA 91467
Campbell, A. J.; Humayun, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this report we present analogous measurements on metal in two CH chondrites, extending earlier work [4], and show that the Ni-zoned metal in these meteorites also contain nebular condensate metal, similar to the results of the CBb chondrites [3]. We further examine the Ni-unzoned metal in CH chondrites, and show that it is commonly zoned in Cu, a volatile element.
Author
Meteorites; Chondrites; Nickel

20030110699 Eotvos Lorand Univ., Budapest, Hungary
How We Used NASA Lunar Set in Planetary and Material Science Studies: Comparison of Breccias from Moon, Earth, Asteroids and Ancient Ceramics by Textures and Processes
Berczi, S.; Szakmany, G.; Jozsa, S.; Kubovics, I.; Puskas, Z.; Unger, Z.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): MUI-TP-154; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Breccias from the NASA Lunar Set, NIPR Antarctic meteorite set, chondritic meteorites from Hungary, terrestrial rock samples and ceramic industrial samples were compared, their processing steps were concluded in our comparative planetary petrography course. Various types of brecciation: early solar nebula mixing and accretion (chondrites), surface impacts (chondrite parent body, lunar, basaltic achondritic), pyroclastic ejection (terrestrial), and repeated reworking (lunar, ancient ceramics) were studied, and the sequence of the main steps of operations (breaking, crushing, transporting, mixing, recycling and final welding or heating) were compared and petrography/technology conclusions were deduced in this course.
Author
Breccia; Asteroids; Basalt; Ceramics

20030110700 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Endemic Ru Isotopic Anomalies in Iron Meteorites and in Allende
Chen, J. H.; Papanastassiou, D. A.; Wasserburg, G. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Small variations for Mo isotopes have been observed recently in the Allende meteorite and in iron meteorites, mesosiderites, and pallasites, using ICPMS. Large effects for Mo have been reported for leaches of Orgueil and in SiC and graphite from Murchison. Variations for Mo in bulk Allende and in Murchison have also been presented by NTIMS. Effects in Ru isotopes can define further the preserved exotic r, s, and p contributions in this mass region, and possible effects in Ru-98

and Ru-99 from Tc-98 (4.2 Ma half-life) and Tc-99 (0.21 Ma half-life). Previous attempts at determination of Ru isotopes yielded no resolved effects. The present work represents a substantial improvement in precision over the earlier work. Chemical and mass spectrometric analytical techniques are presented to determine the Ru isotope compositions in terrestrial standards and in meteorites.
Derived from text
Allende Meteorite; Anomalies; Iron Meteorites; Ruthenium Isotopes; Planetary Geology; Isotope Ratios

20030110701 Johns Hopkins Univ., Laurel, MD, USA
Highest Resolution Topography of 433 Eros and Implications for MUSES-C
Cheng, A. F.; Barnouin-Jha, O.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The highest resolution observations of surface morphology and topography at asteroid 433 Eros were obtained by the Near Earth Asteroid Rendezvous (NEAR) Shoemaker spacecraft on 12 February 2001, as it landed within a ponded deposit on Eros. Coordinated observations were obtained by the imager and the laser rangefinder, at best image resolution of 1 cm/pixel and best topographic resolution of 0.4 m. The NEAR landing datasets provide unique information on rock size and height distributions and regolith processes. Rocks and soil can be distinguished photometrically, suggesting that bare rock is indeed exposed. The NEAR landing data are the only data at sufficient resolution to be relevant to hazard assessment on future landed missions to asteroids, such as the MUSES-C mission which will land on asteroid 25143 (1998 SF36) in order to obtain samples. In a typical region just outside the pond where NEAR landed, the areal coverage by resolved positive topographic features is 18%. At least one topographic feature in the vicinity of the NEAR landing site would have been hazardous for a spacecraft.
Derived from text
Asteroids; Near Earth Asteroid Rendezvous Mission; Topography; Image Resolution

20030110702 Arizona Univ., Tucson, AZ, USA
Evaluating Planetesimal Bow Shocks as Possible Sites for Chondrule Formation
Ciesla, F. J.; Hood, L. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nebular shockwaves are considered among the leading candidates for forming chondrules and are also capable of explaining the existence of other components of primitive meteorites. While it has been shown that shock waves can explain the thermal processing of chondrules, the source of the shock waves is still debated. Among the candidates for producing chondrule-forming shock waves are: (1) gravitational instabilities in a massive nebula, (2) shocks produced by tidal interactions of the inner nebula with an accreting or migrating Jupiter, and (3) supersonic planetesimals in resonance with Jupiter. Mechanisms (1) and (2) would likely lead to large scale shocks 10(exp 4)-10(exp 5) km in thickness, while those shocks produced by supersonic planetesimals would be much smaller. Recent work has quantitatively shown that large shock waves can explain the existence of many objects found in primitive meteorites, but similar detailed calculations for smaller shock waves have not been performed. Such investigations are needed now after radiometric dating of chondrules and CAIs has suggested that chondrules formed too late in the nebula to be processed by gravitational instabilities. Thus, while these shocks may have operated in the nebula, they may have been too early to have been responsible for processing chondrules. Therefore, it is necessary to consider those shock waves that would have operated at later stages of nebula evolution. Planetesimal bow shocks would operate in these later stages and may provide a way to account for the difference in ages of CAIs and chondrules.
Author
Protoplanets; Shock Waves; Meteorite Parent Bodies; Meteoritic Composition; Chondrule

20030110703 Carnegie Institution of Washington, Washington, DC, USA
Compositional Trends in Chondritic Organic Solids Within and Between Meteoritic Groups
Cody, G. D.; Alexander, C. M. O. D.; Tera, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The organic matter in carbonaceous chondritic meteorites has the potential of adding to our understanding of the formation of the solar system. The challenge is that the organic matter constitutes, generally, a small percentage of the total

mass of a given chondritic meteorite. Additionally, the physical nature of this carbon provides particular difficulties for analysis. Specifically, the vast majority of organic carbon in chondritic meteorites exits as an insoluble (possibly macromolecular) solid; consequently the most effective means of chemically analyzing this material is the use of solid state nuclear magnetic resonance NMR spectroscopy. In order to obtain self consistent chemical structural data on meteoritic organic matter we employ a series (seven) of independent solid state NMR experiments on organic residues obtained from demineralized meteorite samples. The essential information obtained includes the fraction of aromatic carbon, the fraction of aromatic carbon that is bonded to hydrogen, the fraction of aliphatic and aromatic hydrogen, and a measure of the content of nano-diamond in each sample.
Author
Meteoritic Composition; Chondrites; Organic Solids

20030110704 Rice Univ., Houston, TX, USA
Martian Geomorphology from Statistics of Drainage Networks
Collier, M. L.; Stepinski, T. F.; Clifford, S. M.; McGovern, P. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Martian terrains are represented as a series of drainage basins, regardless of the historical presence or absence of actual fluid flow. A statistical analysis of each drainage network, computationally extracted from an underlying topography based on the MOLA data, yields a network descriptor, a compact, numerical characterization of a network. These descriptors are used to compare different martian surfaces. Altogether, 386 drainage networks, representing all major epochs and geological units, were extracted and analyzed. We have found that our approach can distinguish morphologically different terrains, but only in a statistical sense. In particular, the method could be used to measure the degree of surface cratering and thus the age of the surface. In addition, for surfaces that are not heavily cratered the method is capable of distinguishing between different geological units. We have found no global trends in the character of martian drainage networks, their network descriptors show no systematic dependence on location or elevation.
Author
Drainage; Geomorphology; Mars Surface; Planetary Geology; Structural Basins

20030110705 Prairie View Agricultural and Mechanical Coll., TX, USA
Multi-Wavelength Observations of the Mercury Transit of November 1999
Cudnik, B. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG8-1338; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mercury transit of the Sun, 15 November 1999, was observed at the Prairie View Solar Observatory (PVSO) and with three channels of the TRACE satellite. These CCD observations enabled an objective study of the historic Black Drop under different conditions and with different filters. The Black Drop phenomenon has a much subtler counterpart referred to as the 'Gray Drop phenomenon', of which the former is a more prominent component of the latter. The optical causes of both effects are very similar and appear to require a sharp, uniform boundary of sufficient contrast (e.g. the solar limb against a sky at least as dark as the center of Mercury's disk), coupled with a blurring agent. Without all these conditions in place, the visibility of the Black Drop is greatly reduced or eliminated. Such was the case of the transit as observed with Ha at line center, the TRACE UV (1600A) channel, and the EUV (171A) channel. This suppression of visibility in these cases was due to the contrast-lowering background of the chromosphere or corona.
Author
Mercury (Planet); Transit; Solar Limb

20030110706 Biosphere 2 Center, Oracle, AZ, USA
Fractal Dimension of the Upland/Lowland Contact of Deuteronilus Mensae, Mars Implies Shoreline Erosion
Cull, S. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Multiple boundary contacts of the southern uplands and northern lowlands have been identified from Viking Orbiter images. In places, these contacts take the form of distinct escarpments, 1.5 to 2.5 kilometers high, and have been likened to

shorelines found along terrestrial paleolakes. It has been suggested that the escarpments may have formed due to wave action by an ancient ocean occupying most of the northern hemisphere. On Earth, some geologic processes create fractals. Lava flows produce fractal dimensions ranging from 1.12 to 1.42; topographic contours show fractal dimensions between 1.20 and 1.25; and shorelines formed from wave erosion display fractal dimensions ranging from 1.13 to 1.25, independent of age. If the upland/lowland contact escarpments on Mars were formed from wave erosion, they may retain some of their original fracticality, although some may have been wiped out due to later, non-fractal-producing wind erosion. I have analyzed a series of escarpments along the upland/lowland contact at Deuteronilus Mensae for their fractal dimensions.
Author
Planetary Geology; Mars Surface; Shorelines; Extraterrestrial Oceans; Fractals; Escarpments

20030110707 Chicago Univ., Chicago, IL, USA
Heavy Element Nucleosynthesis in Low Metallicity, Low Mass AGB Stars
Davis, A. M.; Gallino, R.; Straniero, O.; Dominguez, I.; Lugaro, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The most common type of presolar SiC grains, the mainstream grains, have silicon isotopic compositions that plot on a delta Si-29 vs. delta Si-30 diagram along a line of slope 1.3 passing though the origin and extending to delta Si-29 = 20%o. Grains of Type Y and Z lie to the right of the mainstream array by as much as several hundred. Neutron capture nucleosynthesis in AGB stars tends to enrich silicon isotopic compositions in Si-30, but only by a few tens of %o in solar metallicity AGB stars, where mainstream grains are believed to have formed. At low metallicity, Si-30 is much more strongly enhanced and it has been suggested that Type Y and Z grains come from low metallicity AGB stars. Lugaro et al. have recently summarized predictions from s-process nucleosynthesis calculations for solar metallicity AGB stellar models and compared them with measurements on single mainstream presolar SiC grains and SiC aggregates for strontium, zirconium, molybdenum and barium. Here, we have extended these calculations to low metallicity AGB stars in order to predict what isotope anomalies might be found in Type Y and Z SiC grains.
Derived from text
Asymptotic Giant Branch Stars; Heavy Elements; Mass; Metallicity; Nuclear Fusion; Isotope Ratios

20030110710 NASA Johnson Space Center, Houston, TX, USA
About Tagish Lake as a Potential Parent Body for Polar Micrometeorites; Clues from their Hydrogen Isotopic Compositions
Engrand, C.; Gounelle, M.; Zolensky, M. E.; Duprat, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The origin of the Antarctic micrometeorites (AMMs) is still a matter of debate. Their closest meteoritic counterparts are the C2 chondrites, but the match is not perfect, and the parent body(ies) of the AMMs is(are) still to be identified. Tagish Lake is a new meteorite fall which bears similarity with CI1 and CM2 chondrites, but is distinct from both. Based on the mineralogy of phyllosilicates, Noguchi et al. proposed that the phyllosilicate-rich AMMs and the Tagish Lake meteorites could derive from similar asteroids. The hydrogen isotopic compositions of extra-terrestrial samples can be used to get some insight on their origin. The D/H ratios of AMMs and of Tagish Lake have been measured, but using different analytical techniques. They are therefore not directly comparable. We performed additional hydrogen isotopic analyses of fragments of Tagish Lake using the same experimental setup previously used for the measurement of the hydrogen isotopic composition of AMMs. In this work, we could also analyze separately both lithologies of Tagish Lake (carbonate-poor and -rich). The distributions of delta D values measured in the two lithologies of Tagish Lake are very similar, indicating that fluids with similar hydrogen isotopic compositions altered the meteorite on the parent body for the two lithologies. Yet, the hydrogen isotopic composition of Tagish Lake is different from that of AMMs, suggesting that they do not derive from the same parent body.
Author
Micrometeorites; Meteorite Parent Bodies; Chondrites; Hydrogen Isotopes; Isotope Ratios

20030110711 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Characterization of Martian Rock Shape for MER Airbag Drop Tests
DiMaggio, E. N.; Schroeder, R. D.; Golombek, M. P.; Haldemann, A.; Castle, N.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Using the Viking and Mars Pathfinder landing sites as a guide, this study assessed rock shapes, sizes and burial so they could be compared with rocks on the test platforms. This work allowed comparison of the severity of the rock distributions on the test platforms with the 3 landing sites and helped guide the rocks used on the test platforms during the final airbag qualification tests.
Derived from text
Mars Surface; Rocks

20030110712 California Inst. of Tech., Pasadena, CA, USA
Martian Polar Wind Patterns Derived from Mapping of Seasonal Cap Dark Streaks
Diniega, S.; Richardson, M. I.; Ewald, S. P.; Toigo, A. D.; Byrne, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Through an intensive survey, the location and orientation of frost streaks, were identified in Narrow Angle images taken by the Mars Orbital Camera [MOC] on the Mars Global Surveyor [MGS] [3]. From this data, a map of the southern spring polar circulation patterns was developed for early southern spring. Subsets of the same region during the same season were then examined with MM5, a mesoscale atmospheric circulation modeling program. Comparing the resultant model with the observed aeolian features allows an analysis of the parameters used in the model, as well as a study of the threedimensional circulation system responsible for the surface winds.
Author
Frost; Mars (Planet); Ground Wind

20030110713 Los Alamos National Lab., NM, USA
Growth of CO2 Frost Thickness near Chasma Borealis During Northern Winter and Spring
Feldman, W. C.; Boynton, W. V.; Prettyman, T. H.; Kelly, N.; Maurice, S.; Mellon, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Epithermal neutron fluxes measured using the Neutron Spectrometer component of the Mars Odyssey Gamma-Ray Spectrometer suite of instruments were studied to determine the spatial and temporal dependence of CO2 frost cover of the north polar cap for L(sub s) between 329 degrees and 99 degrees areocentric longitude. This time period spans the late northern winter through summer solstice. In the absence of a CO2 cover, the entire basement terrain poleward of about +55degrees latitude is very rich in H2O. The consequent enhanced abundance of hydrogen in near-surface soils leads to an anomalously low flux of outwardly leaking epithermal neutrons, which is a prominent signature of epithermal neutron maps measured after about L(sub s) = 90 degrees. Because the epithermal neutron flux rises monotonically with increasing thickness of the CO2 frost cover, it provides a robust measure of the CO2 thickness in space and time.
Author
Frost; Carbon Dioxide; Mars (Planet)

20030110714 Mount Holyoke Coll., South Hadley, MA, USA
Moessbauer Spectroscopy on the Martian Surface: Constraints on Interpretation of MER Data
Dyar, M. D.; Schaefer, M. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-10424; NAG5-12687; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Moessbauer spectrometers will be used on martian landers and rovers to identify and quantify relative amounts of Fe-bearing minerals, as well as to determine their Fe(3+)/Fe(2+) ratios, allowing more realistic modeling of martian mineralogy and evolution. However, derivation of mineral modes, Fe(3+)/Fe(2+) ratios, and phase identification via Moessbauer spectroscopy (MS) does have limitations. We discuss here the exciting potential of MS for remote planetary exploration, as well as constraints on interpretation of remote Moessbauer data.
Derived from text
Mars (Planet); Mars Surface; Planetary Geology; Spectroscopy; Mossbauer Effect; Mineralogy

20030110715 Malin Space Science Systems, San Diego, CA, USA

The Layered Upper Crust of Mars: An Update on MGS MOC Observations After Two Mars Years in the Mapping Orbit

Edgett, K. S.; Malin, M. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The upper crust of Mars is layered and geologically diverse. Burial and exhumation complicate the use of impact craters to determine the age of materials. Since September 1997, we have employed the Mars Global Surveyor (MGS) Mars Orbiter Camera (MOC) to test hypotheses regarding the nature of the layered crust. Here we summarize key observations and update earlier findings, based on new MOC images acquired in 2002 and early 2003.

Author

Mars Surface; Planetary Crusts; Planetary Geology; Mars Global Surveyor; Planetary Mapping

20030110716 Brown Univ., Providence, RI, USA

Magmatic Processes that Produced Lunar Fire Fountains: Evidence from Vesicular Rims on Picritic Glass Beads

Elkins-Tanton, L. T.; Chatterjee, N.; Grove, T. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The standing hypothesis for the formation of the lunar picritic glass beads is eruption in a volatile-driven fire fountain followed by degassing while suspended in a hot, turbulent vapor plume. Reanalysis of the Apollo 15 A, B, and C green glass beads from slide 15426,72, led to the discovery of beads with small patches of highly vesicular green glass adhering to their rims. There are now three related compositional data sets for the lunar picritic glasses: the glass bead compositions themselves, the vesicular glass rims, and thin surface coatings on the beads, which may represent the gases that drove the fire fountain eruptions.

Author

Lunar Geology; Lunar Evolution; Volcanic Eruptions; Magma; Glass; Beads

20030110717 Brown Univ., Providence, RI, USA

A Model for Martian Magma Ocean Crystallization and Overturn

Elkins-Tanton, L. T.; Parmentier, E. M.; Hess, P. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Early Mars is assumed to have melted completely during accretion. Solidification of this magma ocean determines initial planetary compositional differentiation and the stability of the mantle density profile, which in turn have significance for magmatic source regions, convective instability, and magnetic field generation. Excellent progress on the dynamical problem of magma ocean crystallization has been made, but the dynamic and compositional results of crystallizing a magma ocean have not previously been investigated specifically for Mars. The goals of this study are to create a simple model for Martian magma ocean crystallization and assess the outcome of overturn due to density instability. We explore the possibility that this can explain aspects of the Martian magnetic field and can reproduce the compositions of Martian meteorite source regions.

Derived from text

Crystallization; Magma; Mars (Planet); Oceans; Mathematical Models

20030110718 Brown Univ., Providence, RI, USA

Effect of Initial Conditions on Impact Flash Decay

Ernst, C. M.; Schultz, P. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Light flashes due to thermal heating and vaporization are produced during hypervelocity impact events. The shape of such a flash's light curve may be used to determine certain initial conditions of the impact. The measured flash peak intensity depends on the impact velocity and angle and varies with target and projectile type, as shown in previous studies. Here, we examine the dependence of the flash decay curve on initial conditions for macroscopic impacts.

Derived from text

Light Curve; Vaporizing; Impact Velocity; Hypervelocity Impact

20030110720 Carnegie Institution of Washington, Washington, DC, USA

Experimental Constraints on the Thermal Structure of the Martian Interior and Martian Magmatism

Fei, Y.; Bertka, C. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The distribution of Martian crust and provided new insight into Mars thermal history [e.g., 9]. Understanding mantle convention on Mars is critical for explaining the crustal dichotomy and magma production on Mars [7, 10]. Our experimentally determined melting relations in an iron-rich mantle composition up to core-mantle boundary pressures provide important constraints on thermal history models. We used a multi-anvil high-pressure apparatus to simulate the pressure temperature conditions of the Martian interior. Experiments were conducted using an 8/3 high-pressure cell assembly [11] that is capable of generating pressures up to 28 GPa, covering the entire range of Martian mantle pressures and the upper portion of the core pressures. For the melting relations of the Martian core, we used a model core composition in the Fe-Ni-S system [12]. The starting materials were Fe-Ni-S mixtures, created by mixing pure metallic Fe, Fe-Ni alloy, and FeS. The starting materials were loaded into either MgO or boron nitride capsules. Sample temperatures were measured with a W5%Re-W26%Re thermocouple. The quenched samples were examined by X-ray diffraction and with an electron microprobe. Backscattered electron images, chemical composition maps, and quantitative chemical analyses were obtained with a JEOL-SUPERPROBE JXA-8900 electron microprobe. Melting of the samples was determined on the basis of quenched textures and composition maps. Melting experiments of the Martian mantle were performed on a model mantle composition [12]. The starting material was made by mixing spectroscopically pure oxides [13].

Author

Mars Surface; Core-Mantle Boundary; Magma

20030110721 Arizona State Univ., Tempe, AZ, USA

Thermal Inertia Using THEMIS Infrared Data

Fergason, R. L.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many landforms observed in Mars Orbiter Camera (MOC) narrow-angle images are too small to detect using Mars Global Surveyor Thermal Emission Spectrometer (TES) thermal inertia data. This makes the task of studying the thermophysical properties of features undetectable at TES resolution (3 km per pixel), such as inter-crater deposits, inter-channel deposits, and small-scale surface characteristics, unfeasible. Therefore, the understanding of physical processes that have recently affected the martian surface is limited. In this study, a method was developed to produce high-resolution (100 meters per pixel) thermal inertia maps by calculating thermal inertia values using Mars Odyssey Thermal Emission Imaging System (THEMIS) night-IR temperature data. These maps provide high-resolution thermophysical information, which is necessary to further understand smaller surface features and the recent aeolian processes that produced these landforms.

Author

Planetary Geology; Infrared Imagery; Mars Surface; Infrared Spectrometers; Planetary Mapping; Thermophysical Properties

20030110722 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Mapping the Concentration of Iron, Titanium, and Thorium in Mare Basalts in the Western Procellarum Region of the Moon

Flor, E. L.; Jolliff, B. L.; Gillis, J. J.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NAG5-10227; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mare basalt flows in the Western Procellarum region (WPR) are extensive and include some of the youngest geologic features on the Moon. Compositional remote sensing by the Lunar Prospector gammaray spectrometer (LPGRS) indicates elevated Th concentrations in many of these flows relative to basalts sampled by the Apollo and Luna missions [1,2,3,4]. The primary goals of this investigation are to determine whether the Th enrichment in this region contributed to the extensive and prolonged volcanism in the WPR, and to determine whether the Th is inherent to the basalts themselves or a result of contamination from nonvolcanic material. Thorium enrichment indigenous to the basalts of the Western Procellarum Region would provide evidence that the general concentration of Th in the Procellarum region extends below the crust and possibly as deep as the sources for the basalts themselves.

Derived from text

Iron; Titanium; Thorium; Basalt; Structural Properties (Geology); Moon

20030110723 Case Western Reserve Univ., Cleveland, OH, USA

The Broken Belt: Meteorite Concentrations on Stranded Ice

Harvey, R. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-11122; NSF OPP-99-80452; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the first Antarctic meteorite concentrations were discovered more than 25 years ago, many theories regarding the role of iceflow in the production of meteorite concentrations have been put forward, and most agree on the basic principles. These models suggest that as the East Antarctic icesheet flows toward the margins of the continent, meteorites randomly located within the volume of ice are transported toward the icesheet margin. Where mountains or subsurface obstructions block glacial flow, diversion of ice around or over an obstruction reduces horizontal ice movement rates adjacent to the barriers and creates a vertical (upward) component of movement. If local mechanisms for ice loss (ablation) exist at such sites, an equilibrium surface will develop according to the balance between ice supply and loss, and the cargo of meteorites is exhumed on a blue ice surface. The result is a conceptual conveyor belt bringing meteorite-bearing volumes of ice from the interior of the continent to stagnant or slowmoving surfaces where ice is then lost and a precious cargo is left as a lag deposit. Cassidy et al. provides an excellent overview of how this model has been adapted to several Antarctic stranding surfaces.

Derived from text

Ice; Meteorites; Planetary Geology; Meteoroid Concentration; Planetary Surfaces

20030110724 Saint Louis Univ., MO, USA

Students Work Alongside Scientists to Test Mars Rover

Fuchs, M. P.; Green, T. J.; Levant, J. M. S.; Nunez, J. I.; Bowman, C. D.; Sherman, D. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NASA's 2003-2004 Mars Exploration Rovers and associated Athena Science Payload will provide an exciting opportunity to get students and the public involved in Mars exploration. One outreach component, the Athena Student Interns Program, will directly engage high school students in scientific discovery on Mars by incorporating the students into the mission s science team. The Athena Student Interns Program, based on the successful LAPIS program, was prototyped during the FIDO rover field trials that took place in the Arizona desert and at the Jet Propulsion Laboratory (JPL) in August 2002 (http://mars.jpl.nasa.gov/mer/fido). Use of a participatory evaluation process allowed mid-course corrections to be made to the program and provided the model for mission-related outreach.

Derived from text

Mars Exploration; Mars Surface; Roving Vehicles

20030110725 Southwestern Indian Polytechnic Inst., Albuquerque, NM, USA

Development of a Digital Meteorite Identification Program at University of New Mexico (UNM) (Institute of Meteoritics) and Southwestern Indian Polytechnic Institute (SIPI)

Gakin, R.; Lewis, K.; Simmons, J.; Gchachu, K.; Karner, J. M.; Newsom, H. E.; Jones, R. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NRA-00-OSS-02; NAG5-10143; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Determining the origin and chemical composition of suspect extra terrestrial specimens has lead to meteorite identification research programs. Such programs, like the University of New Mexico-Southwestern Indian Polytechnic Institute partnership, are being inundated with many non-meteorites (meteor wrongs) sent in by interested individuals from all over the world. This meteorite identification program developed a spreadsheet that aids in identifying the types of minerals in a sample for physical properties, possible meteorite characteristics, minerals and rock properties, and possible man made characteristics. Samples that show meteorite distinctiveness are further analyzed via the Scanning Electron Microprobe (SEM).

Derived from text

Meteoritic Composition; Chemical Composition; Electron Probes; Scanning Electron Microscopy

20030110726 Lunar and Planetary Inst., Houston, TX, USA

Surface Changes on Io During the Galileo Mission

Geissler, P. E.; McEwen, A. S.; Phillips, C.; Keszthelyi, L.; Spencer, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Identification and mapping of surface changes from Galileo images is complicated by uneven temporal coverage, marked color variations that alter Io s appearance when seen through different colored filters, and photometric variations that produce dramatic contrast reversals depending upon the phase angle of the observations. Our approach was to make 3 passes through the imaging data. The first pass examined well matched color and monochrome images to identify sites of definite change and determine periods in which these areas were inactive. The second pass examined all the available images of each active volcanic center in chronological order to determine the history of its eruptions. The final step involved scrutinizing pairs of images taken before and after each identified surface change to ascertain the details of each eruption.
Author
Io; Volcanoes; Image Analysis

20030110727 Washington Univ., Saint Louis, MO, USA
South Pole-Aitken Sample Return Mission: Collecting Mare Basalts from the Far Side of the Moon
Gillis, J. J.; Jolliff, B. L.; Lucey, P. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-8905; NAG5-10227; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We consider the probability that a sample mission to a site within the South Pole-Aitken Basin (SPA) would return basaltic material. A sample mission to the SPA would be the first opportunity to sample basalts from the far side of the Moon. The near side basalts are more abundant in terms of volume and area than their far-side counterparts (16:1), and the basalt deposits within SPA represent approx. 28% of the total basalt surface area on the far side. Sampling far-side basalts is of particular importance because as partial melts of the mantle, they could have derived from a mantle that is mineralogically and chemically different than determined for the nearside, as would be expected if the magma ocean solidified earlier on the far side. For example, evidence to support the existence of high-Th basalts like those that appear to be common on the nearside in the Procellarum KREEP Terrane has been found. Although SPA is the deepest basin on the Moon, it is not extensively filled with mare basalt, as might be expected if similar amounts of partial melting occurred in the mantle below SPA as for basins on the near side. These observations may mean that mantle beneath the far-side crust is lower in Th and other heat producing elements than the nearside. One proposed location for a sample-return landing site is 60 S, 160 W. This site was suggested to maximize the science return with respect to sampling crustal material and SPA impact melt, however, basaltic samples would undoubtedly occur there. On the basis of Apollo samples, we should expect that basaltic materials would be found in the vicinity of any landing site within SPA, even if located away from mare deposits. For example, the Apollo 16 mission landed in an ancient highlands region 250-300 km away from the nearest mare-highlands boundary yet it still contains a small component of basaltic samples (20 lithic fragments ranging is size from <1 to .01 cm). A soil sample from the floor of SPA will likely contain an assortment of basaltic fragments from surrounding regions. In terms both of selecting the best landing sites and understanding the geologic context for returned samples, it is important to understand the compositional distribution of basalts within SPA basin.
Author
Sample Return Missions; Lunar Landing Sites; Structural Basins; Lunar Surface; Lunar Far Side; Basalt; Lunar Maria

20030110729 Shemakha Astrophysical Observatory, Azerbaijan, USSR
Albedo (750 nm)-Color (950/750 nm) Diagram for the Moon, Asteroids and Meteorites: Modeling Optical Maturation of the Cosmic Body Surfaces
Golubeva, L. F.; Shestopalov, D. I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Space weathering process changes albedo and color of planetary surface material and thus disguises optical properties of the unweathered equivalents. Recently albedo A(750 nm) - color index (950/750 nm) plots have been already utilized for modeling optical maturation of the lunar samples and the asteroid Eros surface. In this work we construct general diagram for the lunar nearside, S-asteroids, and meteorites to calculate optical maturation trends.
Derived from text
Albedo; Asteroids; Optical Properties; Cosmology; Space Weathering; Moon; Color-Color Diagram

20030110730 Arizona State Univ., Tempe, AZ, USA

The Geology of Aram Chaos

Glotch, Timothy D.; Christensen, Philip R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Thermal Emission Spectrometer (TES) instrument aboard the Mars Global Surveyor (MGS) spacecraft located deposits of gray, crystalline hematite in Sinus Meridiani, Aram Chaos, and Valles Marineris. Since the initial discovery, most work has focused on the Sinus Meridiani site, primarily because of its large size and its probable choice as a landing site for one of NASA's 2003 Mars Excursion Rover (MER) rovers. Christensen et al. provided five testable hypotheses regarding the formation of crystalline hematite on Mars: 1) low-temperature precipitaion of Fe oxides/hydroxides from standing, oxygenated, Ferich water, followed by subsequent alteration to gray hematite, 2) low-temperature leaching of iron-bearing silicates and other materials leaving a Fe-rich residue (laterite-style weathering) which is subsequently altered to gray hematite, 3) direct precipitation of gray hematite from Fe-rich circulating fluids of hydrothermal or other origin, 4) formation of gray hematitic surface coatings during weathering, and 5) thermal oxidation of magnetite-rich lavas. The study of Aram Chaos provides another geologic setting with which to test these hematite formation processes. Aram Chaos is a 280 km diameter crater centered at 2.5 N, 338.5 E. Like other nearby craters, it has been filled with a large amount of material since its formation. It is connected to the Ares Vallis outflow channel by a small, 15 km wide channel that flowed outward, from Aram Chaos to Ares Vallis. The association of Aram Chaos with the outflow channels, as well as its obvious basin morphology, indicates a possible connection to past surface and subsurface water in the region.

Author

Mars Surface; Planetary Geology; Hematite; Petrogenesis; Mars Craters

20030110731 Nevada Univ., Reno, NV, USA

Wrinkle Ridges in Hesperia Planum and the Stress State in the Eastern Hemisphere of Mars

Goudy, C. L.; Schultz, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hesperia Planum (20 S, 250 W) is the basis for the Hesperian Epoch, and contains wrinkle ridges which show a bimodal distribution of orientations. Over the past 20 years the temporal relationship between each set of wrinkle ridges and with Tyrrhena Patera has been ambiguous, with the cross-cutting relationships in the western portion of Hesperia Planum indicating that the NW-trending wrinkle ridges are younger than the NE ridges and contemporaneous with the emplacement of Tyrrhena Patera. In eastern Hesperia Planum no such pattern was found. Throughout all of Hesperia Planum, a larger number of older wrinkle ridges is observed in the NW-trending direction. The wrinkle ridges in this area are interpreted to result from two temporally distinct events. We reevaluate timing relationships between the wrinkle ridges and Tyrrhena Patera in order to evaluate timing, orientations, thrust fault dip directions, and the Late Noachian regional stress state. We show that wrinkle ridge intersections observed in Hesperia Planum are due to reactivation of the older wrinkle ridge thrust faults by the younger set, similar to terrestrial observations of fault reactivation during earthquakes.

Derived from text

Eastern Hemisphere; Geological Faults; Mars Surface; Ridges; Structural Properties (Geology); Wrinkling; Stress Concentration

20030110732 Museum fuer Naturkunde, Berlin, Germany

Chemical Composition of Fine-grained Rims in the Tagish Lake Carbonaceous Chondrite

Greshake, Ansgar; Flynn, George J.; Krot, Alexander N.; Keil, Klaus; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the striking similarities of the Tagish Lake carbonaceous chondrite to CM chondrites is that the majority of distinct components in Tagish Lake, i.e. chondrules, CAIs, mineral fragments, and magnetite-rich clusters, are mantled by fine-grained phyllosilicate-rich rims [1, 2]. The rims consist of a highly unequilibrated assemblage of phyllosilicates, FeNi-sulfides, FeNi-metal, magnetites, pyroxenes, and olivines and are, except for a lower abundance of carbonates, mineralogically very similar to the matrix of Tagish Lake [2]. In order to address the origin of the matrix and rim material, we have determined the bulk chemical compositions of the fine-grained rims and matrix in Tagish Lake by electron microprobe and xray microprobe.

Author

Chondrites; Meteoritic Composition

20030110734 Poltava Gravimetric Observatory, Ukraine
On the Possible Dusty Rings Around Mars
Gulak, Yu. K.; Dichko, I. O.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents information on the possibility of dusty rings around Mars. The mean distances of these rings and a comparison of the calculated semi-major axes of Phobos and Deimos orbits with their observed values are also provided.
CASI
Mars (Planet); Planetary Rings; Terrestrial Dust Belt; Solar System

20030110735 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
SPADE: A Rock Crushing and Sample Handling System Developed for Mars Missions
Hansen, Candice J.; Paige, David A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Access to the interior of rocks on Mars is an important goal for understanding Mars petrology and geologic history. The spectral signature of the potentially diverse mineralogy of rocks on Mars is veiled by the ubiquitous dust and may be further hidden by weathered rind. We have developed a rock crusher and sample distribution system under the auspices of NASA s PIDDP program. We call it the SPADE : the Sample Processing and Distribution Experiment. Its purpose is to access the interiors of rocks on Mars and prepare samples for analysis by a suite of in situ instruments.
Author
Crushers; Mars Surface Samples; Rocks

20030110736 Tokyo Inst. of Tech., Tokyo, Japan
Oxygen Isotopic Variations in a Fluffy Type A CAI from the Vigarano Meteorite
Harazono, K.; Yurimoto, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Here we report coexistence of O16-rich and O16-poor melilite in a fluffy Type A calcium- aluminum- rich inclusions (CAIs) from the Vigarano meteorite. The discovery indicates that multiple heating processes in the solar nebula are required to form fluffy Type A CAIs.
Derived from text
Meteorites; Minerals; Isotope Ratios

20030110737 Eotvos Lorand Univ., Budapest, Hungary
Silicic Volcanism on Io? Evidence from Tohil Mons and Other Possible Volcanic Cones
Hargitai, Henrik; Karatson, David; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent volcanic activity of Io generally does not produce conical mountains. Instead, their lava run out in thin, long flows. Volcanic centers are typically large, deep calderas cut into the interpatera plains. Bright lava flows on Io can mostly be associated with sulfur lavas, with no visible escarpments that would indicate higher viscosity material. From temperature measurements it is clear that silicate lavas are present on Io. However, they are ultramafic, low viscosity lavas. There are very few examples where the lava is thick enough to form positive relief features. Mountains of Io are of generally explained as tectonic features. One of the most geologically complex mountains is Tohil Mons. Although its unique morphology suggests a volcanic origin, earlier interpretations explained its formation, similarly to other mountains, by tectonic and erosional (collapse) processes. We now see more evidence that its genesis, at least in part, is also due to viscous silicic volcanic activity. Moreover, from other smaller conical mountains, we postulate that silicic magmas are not unique on present Io originating probably from other depths or magma chambers than those of the large calderas or sulfur flows.
Author
Io; Volcanoes

20030110738 Planetary Science Inst., Tucson, AZ, USA
SNC's That Didn't Make It: Analysis of Impact Crater Clusters on Mars
Hartmann, W. K.; Popova, O.; Nemtchinov, I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This abstract reports progress in modeling unusual clusters of impact craters that have been found on Mars in Viking and Mars Global Surveyor images.
Author
Mars Craters; Meteorite Craters

20030110739 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Berlin, Germany
The Thaumasia 'Rift', Mars: Is It a Rift?
Hauber, E.; Kronberg, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We describe the morphology of a large and complex graben structure in the western Thaumasia region (the 'Thaumasia graben' or TG). We consider possible fault geometries, determine extension, and discuss shortly possible models for its origin.
Derived from text
Geological Faults; Mars Surface; Displacement

20030110740 Hawaii Univ., Honolulu, HI, USA
Geochemical Anomalies in the Lunar Highlands
Hawke, B. R.; Blewett, D. T.; Bussey, D. B. J.; Giguere, T. A.; Lawrence, D. J.; Lucey, P. G.; Smith, G. A.; Spudis, P. D.; Taylor, G. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analysis of orbital geochemistry data have shown that some lunar regions exhibit unusual abundances of certain elements relative to surrounding or adjacent areas, or have a surface chemistry unlike that which would be expected from the examination of local geological relationships. Investigation of the formation of these geochemical anomalies can provide important clues to understanding the impact and volcanic processes operative during the early phases of lunar evolution [e.g., 1, 2, 3, 4]. A wide variety of elemental abundance data was obtained by the Lunar Prospector (LP) neutron and gamma ray spectrometers. We have used selected LP elemental abundance data to identify mafic chemical anomalies on the lunar surface. The purpose of this study was to investigate the nature and origin of geochemical anomalies in the lunar highlands. Since some of the mafic anomalies are clearly related to cryptomare deposits, we used LP data to better understand the composition and origin of these buried ancient basalts.
Author
Lunar Surface; Basalt

20030110741 Hawaii Univ., Honolulu, HI, USA
Spectral Anomalies in the Imbrium Region of the Moon
Hawke, B. R.; Lawrence, D. J.; Gillis, J. J.; Blewett, D. T.; Lucey, P. G.; Peterson, C. A.; Smith, G. A.; Spudis, P. D.; Taylor, G. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

About 100 m of impactites (suevitetype breccias) have been drilled at the ICDP drill site Yax-1 within the Chicxulub impact structure. Post-impact hydrothermal alteration including alkali metasomatism and devitrification of impact melt glass has significantly modified the mineralogy and chemistry of the impact breccia lithologies. Hydrothermal alteration has also affected the breccia dikes in the cretaceous megablock and locally the host sediments.
Derived from text
Breccia; Impact Melts; Drilling; Metamorphism (Geology)

20030110742 NASA Johnson Space Center, Houston, TX, USA
Light Lithophile Elements in Natural and Experimental Phases in Martian Basalts: Implications for the Degassing of Water from Martian Magmas
Herd, C. D. K.; Treiman, A. H.; McKay, G. A.; Shearer, C. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lentz et al. argued that zoning trends in light lithophile elements (LLE) in pyroxene in Shergotty and Zagami are evidence for the degassing of magmatic water. We tested this inference by obtaining: additional LLE analyses of Shergotty and Zagami

pyroxene; analyses of Pasamonte pyroxene; and silicate and phosphate partition coefficients for B and Li for martian magma and mineral compositions.
Derived from text
Light Elements; Degassing; Water; Mars Surface; Meteoritic Composition; Achondrites

20030110743 Muenster Univ., Germany
The Effect of Pressure on Sulfide Melt Distribution in Partially Molten Silicate Aggregates: Implications to Core Formation Scenarios for Terrestrial Planets
Holzheid, A.; Balog, P.; Rubie, D. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The dihedral angle of reduced metallic melts with upper mantle silicate minerals is larger than 60, with the result that isolated metallic melt pockets are trapped at four-grain junctions at low melt fractions. Small degrees of silicate partial melting do not significantly change the dihedral angle between metallic melts and olivine. The high dihedral angle of metallic melts with upper mantle silicate minerals and the resulting inefficiency of percolative segregation have led to models for core segregation that require the production of large fractions of silicate partial melt: an end-member model being a global magma ocean. A factor that may affect the efficiency of percolation is pressure. Shannon & Agee determined a dihedral angle of approx. 108 of an Fe-Ni-S melt in an olivine-spinel-dominated matrix at upper mantle pressure conditions and a dihedral angle of approx. 71 of an Fe-Ni-S melt in a perovskite-dominated matrix at 25 GPa. Although this dihedral angle is >60 and therefore significant amounts of metallic liquid will be trapped in the solid silicate matrix, it is considerably less than the angles observed in mineral matrices at upper mantle pressure and temperature conditions. There are, however, only a few experimental data which bear on the effect of pressure on the interfacial energy of metallic melts or on the connectivity structure of coexisting immiscible silicate and metallic liquids in solid silicate matrices at upper and lower mantle pressure conditions. In the present study experiments were performed to systematically study the effect of pressure on the wetting behavior of sulfide melt in partially molten solid silicate matrices.
Author
Pressure Effects; Melts (Crystal Growth); Terrestrial Planets; Sulfides; Silicates; Aggregates; High Pressure; High Temperature Tests; Planetary Geology

20030110744 Arizona Univ., Tucson, AZ, USA
Distribution of Crustal Magnetic Fields on Mars: Shock Effects of Basin-forming Impacts
Hood, L. L.; Richmond, N. C.; Pierazzo, E.; Rochette, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Crustal magnetic fields on Mars are inhomogeneously distributed with the strongest fields occurring over the southern highlands in a longitude sector between approximately 130 E and 240 E. Here we investigate whether radially extended shock demagnetization associated with the Hellas and Argyre basin impacts (in addition to thermal demagnetization associated with the northern resurfacing event and the formation of the Tharsis volcanic complex) may largely explain this distribution.
Author
Mars Surface; Magnetic Anomalies; Planetary Magnetic Fields; Planetary Crusts; Mars Craters; Structural Basins; Planetary Geology

20030110745 Konkoly Observatory, Budapest, Hungary
Proposals for Mars Express and Nozomi Missions How to Determine the Layered Structure of Phobos
Horvath, A.; Berczi, Sz.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On the Viking Orbiter images of Phobos it has been discovered that a complex system of lineaments and grooves cover the whole surface of this Martian satellite. Based on earlier studies we suggest some measurements to be taken by Nozomi and Mars Express spacecrafts in order to observe the suggested layered structure in more details and to decide the relevance of this model.
Author
Phobos; Terrain; Grooves; Remote Sensing; Spacecraft Instruments; Satellite Surfaces

20030110746 California Inst. of Tech., Pasadena, CA, USA

A Themodynamic Basis for Extensive Intermediate Temperature Vapor Phase Transport on Meteorite Parent Bodies

Housley, R. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Compelling observational evidence for extensive vapor phase transport on the Allende parent body has been in the literature for many years. This evidence includes 1) widespread observations of disequilibrium Fe-rich olivine on surfaces and in internal cracks in MgSiO4, 2) widespread occurrences of isolated grains of low temperature pentlandite in the matrix, and 3) vesicle-like largely empty pores where metal/sulfide droplets had initially been in chondrules. It was suggested that this vapor transport took place on a body that initially incorporated significant amounts of ices and was subsequently heated on a short time scale by extinct radionucleides. The possible gas phase species involved in this transport have not discussed until now. This work remedies that omission, and shows that at least Fe, Si, Mg, and Ni are indeed highly mobile as hydroxide molecules.

Author

Thermodynamics; Meteorite Parent Bodies; Meteoritic Composition; Vapor Phases; Transport Properties; Meteorites

20030110747 Budapest Polytechnik, Szekesfehervar, Hungary

Hunveyor-4 Construction at Kands Kalman Electrical Engineering Faculty of Budapest Polytechnik, Szekesfehervar, Hungary

Hudoba, Gy.; Sasvari, G.; Kerese, P.; Kiss, Sz.; Berczi, Sz.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report about the construction and main system characteristics of the fourth Hungarian University Surveyor at Szekesfeher-var, Budapest Polytechnik Kando Kalman Faculty of Electr. Eng. Inst. of Computer Tech. Hungary.

Author

Spacecraft Instruments; Space Probes; Hungarian Space Program; Spacecraft Equipment

20030110749 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Ten-Meter Scale Topography and Roughness of Mars Exploration Rovers Landing Sites and Martian Polar Regions

Ivanov, Anton B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Orbiter Camera (MOC) has been operating on board of the Mars Global Surveyor (MGS) spacecraft since 1998. It consists of three cameras - Red and Blue Wide Angle cameras (FOV=140 deg.) and Narrow Angle camera (FOV=0.44 deg.). The Wide Angle camera allows surface resolution down to 230 m/pixel and the Narrow Angle camera - down to 1.5 m/pixel. This work is a continuation of the project, which we have reported previously. Since then we have refined and improved our stereo correlation algorithm and have processed many more stereo pairs. We will discuss results of our stereo pair analysis located in the Mars Exploration rovers (MER) landing sites and address feasibility of recovering topography from stereo pairs (especially in the polar regions), taken during MGS 'Relay-16' mode.

Author

Mars Surface; Topography; Mars Roving Vehicles; Surface Roughness; Mars Landing Sites

20030110750 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Medusae Fossae-Elysium Region, Mars: Depression in the HEND/Odyssey Map of Mars Epithermal Neutrons

Ivanov, M. A.; Litvak, M. L.; Mitrofanov, I. G.; Boynton, W.; Saunders, R. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first data from the Gamma Ray Spectrometer (GRS) onboard Mars Odyssey spacecraft showed that the low neutron fluxes characterize both subpolar regions of Mars. The low neutron fluxes mean the presence of hydrogen-rich soils and have been interpreted as an indication on abundant water ice in these areas. The equatorial region of Mars (equatorward of approx. 50 deg) is characterized by higher fluxes of both epithermal (0.4 eV-100 keV, come from depth 1-2 m) and fast (3.4-7.3 MeV, come from depth 0.2-0.3 m) neutrons meaning that this area is mostly dry. The pattern of distribution of the neutron fluxes is in a good agreement with the theoretical predictions on the stability of ground ice on present Mars. The actual distribution of the ice, however, depends on variations of thermal inertia of soils and albedo of the surface. The flux of the epithermal neutrons detected by the HEND instrument, which is part of GRS, has two noticeable depressions in the equatorial region, one

in Arabia Terra and another in the Medusae Fossae-Elysium region (MFER). Here we present the initial results of analysis of characteristics of the neutron fluxes and regional geological setting of the epithermal neutron depression in this area. The main goal of our study was to put some constraints on the time of the anomaly formation and to assess possible form of hydrogen (ground ice vs. chemically bound water) there.
Author
Mars Surface; Planetary Mapping; Neutron Emission; Flux (Rate); Geographic Distribution

20030110751 Harvard Univ., Cambridge, MA, USA
Hf-W, Accretion of the Earth, Core Formation and the Origin of the Moon
Jacobsen, Stein B.; Yin, Qingzhu; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Here we present new model results for the Hf-W system using the constraints from the revised CHUR parameters. The models are based on isotopic and chemical mass balance between a primitive nebular reservoir, the primitive mantle and the core. An example of accretion histories investigated is shown.
Derived from text
Lunar Evolution; Moon; Earth Core; Deposition; Tungsten Isotopes; Hafnium Isotopes

20030110752 Arizona Univ., Tucson, AZ, USA
Ring Dike Structures in the Channeled Scabland as Analogs for Circular Features in Athabasca Valles, Mars
Jaeger, W. L.; Keszthelyi, L. P.; Burr, D. M.; McEwen, A. S.; Baker, V. R.; Miyamoto, H.; Beyer, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the Channeled Scabland of eastern Washington, catastrophic Pleistocene floods scoured the surface of the Columbia River Basalts, exposing numerous ring dike structures. These structures are quasi-circular in plan view and typically have raised rims and topographically low centers with respect to the surrounding terrain. They range in diameter from 75-500 m. Some of these structures are comprised of only one ring while others have concentric raised rings or arcuate ridges. The ring dike structures are best exposed near Odessa, Washington where greater than 200 are scattered over an area of approximately 650 square kilometers. All of these structures occur within the Roza Member of the Wanapum Basalt Formation, which was emplaced approximately 15 Ma. We studied in detail 3 such structures: Amphitheater Crater, Cinnamon Roll Crater, and Wild Garden Crater.
Derived from text
Basalt; Geomorphology; Rock Intrusions; Mars Surface; Mars Volcanoes; Topography

20030110753 Scripps Institution of Oceanography, La Jolla, CA, USA
Constraints on the Evolution of the Tharsis Region of Mars
Johnson, C. L.; Phillips, R. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars Global Surveyor (MGS) gravity, topography, magnetic, and imaging data provide new constraints on models for Tharsis. Here we summarize the primary aspects of the tectonic history of the region, the present- day gravity and topography, and the magnetic field. We suggest a mechanism for the formation and evolution of the Tharsis province that satisfies these observations qualitatively. We present preliminary results on constraints on the thermal history of the crust provided by the magnetic field observations.
Derived from text
Mars Surface; Tectonics

20030110754 Northwestern Univ., Evanston, IL, USA
Mars Magnetic Data: The Impact of Noise on the Vertical Extrapolation of Fields and Methods of Suppression
Jurdy, Donna M.; Stefanick, Michael; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars Global Surveyor MAG/ER measured strongly magnetized crust; despite Mars weak field at present, the intensity reaches about 10 times that of Earth s magnetic lineations. This implies either very strongly magnetic rocks, or magnetization

through a large section of the crust, possibly to a depth of 30 km. Most startling is the preservation in the southern hemisphere of ten or more magnetic bands, possibly reversals, 100-200 km wide, extending up to 2000 km in length. The magnetic lineations centered at 180deg +/- 30deg, are concentrated in the more heavily cratered hemisphere. The disturbance near large impact craters suggests that magnetization came before the impacts in the Noachian epoch of Mars' history at about 4 Ga. Derived from text

Magnetization; Mars Surface; Craters; Mars Global Surveyor

20030110755 Geological Survey, Flagstaff, AZ, USA

Ceramic Volcanism on Refractory Worlds: The Cases of Io and Chondrite CAIs

Kargel, J. S.; Fegley, B., Jr.; Schaefer, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most differentiated rocky worlds in our Solar System have mantles of olivine, pyroxene, spinel, and calcic plagioclase (or equivalent high-pressure phase assemblages). Earth's mantle peridotite and similar rocks in other silicate planets and asteroids normally melt to form basaltic magma, komatiite, or other olivine-normative melts. Details of planetary mantle compositions and magma petrogenesis may lead to departures of magma compositions from olivine-normative liquids, e.g., the silicic trend of magmas derived from Earth's subduction-watered mantle. However, magma genesis on inner Solar System bodies produces melts that are generally less refractory (in melting and volatility senses) than the mantle source was to begin with. There are hints that a very different process might occur on Io and some asteroids, resulting in ultrarefractory, silica-deficient Ca-Al-rich lava compositions that would make a ceramic engineer proud. In the extreme, volatilization of very hot lavas could produce unsilicated, nonmagnesian, non-ferroan residues of simple refractory oxides.

Author

Ceramics; Volcanic Eruptions; Refractory Materials; Io; Chondrites

20030110756 New Mexico Univ., Albuquerque, NM, USA

Comparative Planetary Mineralogy: Basaltic Plagioclase from Earth, Moon, Mars and 4 Vesta

Karner, J. M.; Papike, J. J.; Shearer, C. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Major, minor and trace element analysis of silicates has allowed for the study of planetary basalts in a comparative planetary mineralogy context. We continue this initiative by exploring the chemistry of plagioclase feldspar in basalts from the Earth, Moon, Mars and 4 Vesta. This paper presents new data on plagioclase from six terrestrial basalt suites including Keweenawan, Island Arc, Hawaiian, Columbia Plateau, Taos Plateau, and Ocean Floor; six lunar basalt suites including Apollo 11 Low K, Apollo 12 Ilmenite, Apollo 12 Olivine, Apollo 12 Pigeonite, Apollo 15 Olivine, and Apollo 15 Pigeonite; two basaltic martian meteorites, Shergotty and QUE 94201; and one unequilibrated eucrite, Pasamonte.

Author

Planetary Geology; Mineralogy; Basalt; Lunar Rocks; Shergottites; Feldspars; Trace Elements; Vesta Asteroid

20030110758 Lunar and Planetary Inst., Houston, TX, USA

Gravity Evidence for Extinct Magma Chambers on Mars: Tyrrhena Patera and Hadriaca Patera

Kiefer, Walter S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Global Surveyor mission has vastly improved our knowledge of the topography and gravity of Mars, permitting detailed geophysical modeling of subsurface structures such as magma chambers for the first time. I have recently presented a gravity model for Syrtis Major and showed that the gravity data requires the presence of a buried, high-density body. The spatial association between the caldera and the buried structure indicates that the subsurface structure is most likely due to dense cumulate minerals in an extinct magma chamber. The Syrtis Major magma chamber is approximately 300 by 600 km across, broader than the topographic caldera but narrower than the overall volcanic edifice. Like the caldera, the magma chamber is elongated in the north-south direction. The minimum magma chamber thickness is 3.6 km. In this work, I build on the Syrtis Major study by examining two additional highland volcanos, Tyrrhena Patera and Hadriaca Patera.

Author

Mars (Planet); Planetary Geology; Calderas; Magma; Gravimetry; Mars Volcanoes

20030110760 Washington and Lee Univ., Lexington, VA, USA
Analysis of Unusual Fault Structures in Terra Cimmeria, Mars
Kilby, R. E.; Herrick, R. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most major geologic structures on Mars are related to a major volcanic province (Tharsis, Elysium) or a large impact basin. It is of interest then to identify and study tectonic features not attributable to known volcanic provinces or impact basins. Located in the central Terra Cimmeria region of the Southern Highlands of Mars is a set of linear scarps not clearly associated with major known tectonic provinces. Several scarps exhibit relief in excess of 500 meters and the set displays a consistent NE-SW trend for over 1500 kilometers. The analysis of these scarps of undefined origin is divided into three parts. The first element is mapping and characterization of the observable scarps. The next is construction of a geologic history aided by the determination of the relative age of the scarp set by use of crater counts and cross cutting relationships. The final point is to incorporate the formation of this scarp set into the account of Mars geological evolution.
Author
Tectonics; Mars Surface; Geological Faults

20030110762 Komensky Univ., Bratislava, Czechoslovakia
Monte Carlo Simulation of Cosmogenic Nuclide Production in the Brenham Pallasite
Kollar, D.; Masarik, J.; Nishiizumi, K.; Reedy, R. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Depth-dependent production rates of cosmogenic nuclides were calculated for the Brenham pallasite. The calculations were done with the well-tested LCS Code System. Results of simulations were compared with experimental data measured in the separated metal and olivine phases from numerous samples representing a wide range of shielding conditions in the meteoroid. The pre-atmospheric radius of Brenham was approx. 4-6 meters. The quality of some cross sections used for the calculations need to be improved.
Derived from text
Monte Carlo Method; Simulation; Nuclides; Production

20030110763 International Research School of Planetary Sciences, Pescara, Italy
Geological Processes in the Baikal Rift Zone: Potential Terrestrial Analogs for the Valles Marineris Region on Mars
Komatsu, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent researches are shedding new lights on the evolution of Valles Marineris and neighboring chaotic terrain and outflow channels. For example, Chapman and Tanaka proposed a hypothesis with an emphasis on magma-ice interactions for the formation of chasmata, interior deposits, chaotic terrain, outflow channels, and surface materials. Terrestrial analog studies are useful in providing examples of processes that may have operated in this complex region on Mars. I introduce here some geological processes of the Baikal Rift Zone in southern Siberia, which could be compared with those in the Valles Marineris region. Many of the proposed geological activities of the Valles Marineris region have occurred also in the Baikal Rift Zone. Therefore, comparisons of these two unique regions on Earth and Mars could provide potentially very rich understanding of how elements such as rift volcanism and climate influence each other, and of the important role hydrology plays in forming landforms.
Derived from text
Mars Surface; Planetary Geology; Volcanology; Tectonics; Valleys; Analogs; Arctic Regions

20030110764 Open Univ., Milton Keynes, UK
An X-Ray Diffraction Study of Inclusions in Allende Using a Focussed X-Ray MicroSource
Menzies, O. N.; Bland, P. A.; Cressey, G.; Berry, F. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have analysed milligram samples of dark inclusion, CAI, and matrix from Allende using a novel X-ray powder diffraction (XRD) system that employs a high-brightness X-ray source. The MicroSource X-ray generator produces a finely focussed X-ray beam with an output intensity at least x30 greater than that from sealed-tube sources, allowing rapid data

acquisition from small samples. Our XRD system utilises a position sensitive detector (PSD) - a fixed diffraction geometry means that mechanical movement is not necessary, so irradiated volume remains constant for each experiment. Consequently, diffraction patterns from standard phases and multiphase mixtures can be compared directly. This allows not only characterisation of phases, but also quantification of their abundance. When our database of standards is complete it will be possible to quantify mineral abundance in milligram samples of extraterrestrial materials.
Derived from text
X Ray Diffraction; X Ray Sources; Diffraction Patterns; Extraterrestrial Matter

20030110766 NASA Johnson Space Center, Houston, TX, USA
Continued Studies of Stardust in IDPs
Messenger, S.; Keller, L. P.; Walker, R. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We recently reported the first identification of stardust in IDPs. Here we present the results of a detailed analysis of the original and subsequent O isotopic studies of anhydrous cluster IDPs. Anhydrous cluster IDPs were selected because they have preserved molecular cloud material, as evidenced by large enrichments in deuterium. Further, they have escaped aqueous and thermal processing, which could destroy or modify their mineralogy.
Derived from text
Molecular Clouds; Stardust Mission; Deuterium; Enrichment

20030110767 Dayton Univ., OH, USA
Magnetite-Magnesioferrite Phase Relations and Application to ALH84001
Koziol, Andrea M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-9808; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Oxygen fugacity (fO2) is an important factor in planetary formation and evolution. Certain minerals or assemblages of minerals are stable only under certain fO2 conditions (at a constant T and P) and can be recorders of ambient fO2 during geologic processes. The best estimate of oxygen fugacity from mineral assemblages has implications, from large-scale models of planetary evolution to interpretation of single meteorites. For example, redox conditions are part of the discussion of the origin and history of shergottites, basaltic rocks in meteorites from Mars [1-4]. In addition oxygen fugacity may be an important factor to consider in the interpretation of the carbonate and magnetite assemblages seen in ALH84001 [5].
Author
Mars Surface Samples; Planetary Evolution

20030110768 NASA Johnson Space Center, Houston, TX, USA
Laboratory Simulation of Space Weathering: ESR Measurements of Nanophase Metallic Iron in Laser-irradiated Olivine and Pyroxene Samples
Kurahashi, E.; Yamanaka, C.; Nakamura, K.; Sasaki, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

S-type asteroids are believed to be parent bodies of ordinary chondrites. Although both S-type asteroids and ordinary chondrites contain the same mineral assemblage, mainly olivine and pyroxene, the reflectance spectra of the asteroids exhibit more overall depletion (darkening) and reddening, and more weakening of absorption bands relative to the meteorites. This spectral mismatch is explained by space weathering process, where high-velocity dust particle impacts should change the optical properties of the uppermost regolith surface of asteroids. In order to simulate the space weathering, we irradiated nanosecond pulse laser beam onto pellet samples of olivine (8.97wt% FeO) and pyroxene (enstatite: 9.88wt% FeO, hypersthene: 16.70wt%). We got spectral changes in our samples similar to that by space weathering on asteroids and confirmed nanophase alpha-metallic iron particles, which were theoretically predicted, not only on olivine but also on pyroxene samples by Transmission Electron Microscopy (TEM). Nanophase metallic iron particles were widely scattered throughout the amorphous rims developed along the olivine grains, whereas they were embedded in aggregates of amorphous in enstatite samples. Recently, we also measured laser-irradiated samples by ESR (Electron Spin Resonance). Strong ESR signals, characteristic to nanophase iron particles, are observed on irradiated olivine samples. In this paper, we report the

quantities of nanophase metallic iron particles in pyroxene samples by ESR observations in addition to olivine samples.
Author
Space Environment Simulation; Space Weathering; Iron; Olivine; Pyroxenes

20030110770 Brown Univ., Providence, RI, USA
How Much Melt Breccia Can be Found in South Pole-Aitken Basin?
Petro, Noah E.; Pieters, Carle M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The South Pole-Aitken (SPA) Basin is the largest, oldest basin on the Moon. The extreme size of the basin, less than or equal to 2,500 km in diameter and a present depth of up to 13km, suggests that much of the upper crust would have been excavated during the formation/impact event, exposing the lower crust or upper mantle. Also, a large volume of impact melt breccia containing extensive lower crust components is also expected to have been. Samples of the SPA melt breccia can be used to constrain the age of the basin as well as the composition of the lower crust. However, some of the unique features of the SPA basin have been affected by billions of years of subsequent evolution of the lunar surface. While several processes have been active during this time (extensive impact cratering, emplacement of mare basalts, lateral mixing by craters, space weathering, etc.), this abstract will only consider the early emplacement and mixing of basin ejecta within the interior of SPA. Previous work estimated the amount of foreign material that has been introduced into the center of SPA by later basin forming events. We extend these studies to include the interaction and mixing of this ejecta with the surface of the basin. Investigation of these processes allow an estimation of the percent of current surface components that is derived from the original SPA melt breccia.
Author
Lunar Surface; Structural Basins; Impact Melts; Breccia

20030110771 Los Alamos National Lab., NM, USA
Effects of an RTG Power Source on Neutron Spectroscopy Measurements on the Martian Surface
Lawrence, D. J.; Elphic, R. C.; Prettyman, T. H.; Wiens, R. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A continuing goal of Mars science is to identify the exact locations of near-surface water and/or hydrated minerals using in situ measurements. Recent data from Mars Odyssey has used both neutron and gamma-ray spectroscopy to measure large amounts of water ice near both polar regions. Furthermore, these data have also determined that in the mid-latitude regions, there likely exist relatively large amounts of hydrogen. While these are exciting results, one drawback of these measurements is that they are averaged over a large (approx. 400 km) footprint and do not reflect potential small (less than 1 km) inhomogenieties in hydrogen abundance that likely exist at the Martian surface. For any future in situ mission (e.g., Mars Smart Lander (MSL)) that seeks to measure and characterize near-surface H2O, it will be necessary to know the locations of the H2O. In previous work, we studied the feasibility of using neutron spectrometers (NS) at the Martian surface for making such an identification and measurement. In that work, we concluded that attaching a NS to a surface-based rover does not substantially degrade its ability to detect water. However, in order to extend the surface life of a rover, there have been suggestions of powering the rover using a Cassini-like radioactive thermal generator RTG). While this extends the life of the rover mission, the intense radiation environment of an RTG-based rover also raises questions regarding the NS measurement technique: 1) Will the background radiation from the RTG's be too intense and overwhelm the NS sensors, thereby preventing a measurement of surface hydrogen content? 2) Conversely, is it possible to use the RTG radiation as a source that enables the measurement of the surface hydrogen content? Here we investigate these questions.
Derived from text
Hydrogen; Ice; In Situ Measurement; Mars Surface; Minerals; Spectroscopy; Thermoelectric Generators; Neutron Spectrometers

20030110772 State Univ. of New York, Buffalo, NY, USA
A'a Versus Pahoehoe on Mars, Venus, and Earth: What Do Fractal Dimensions Actually Reveal?
Lipkaman, L. J.; Gregg, T. K. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fractals are objects, either real or mathematical, that look the same at all scales. Bruno et al. established that lava-flow

margins are fractal. They determined that Hawaiian a'a lava-flow margins have fractal dimensions (D) of 1.05-1.09, whereas for pahoehoe lava-flow margins, D = 1.13-1.23. Here, we emphasize that fractal dimensions of flow margins do not define the surface lava-flow morphology; but rather reflect flow emplacement style or mechanism. Furthermore, lava-flow margins are not fractal at all scales.
Derived from text
Fractals; Fluid Flow; Lava

20030110773 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Seasonal CO2 Observations on North and South of Mars as Seen by HEND (Mars Odyssey) and MOLA (MGS)
Litvak, M. L.; Mitrofanov, I. G.; Smith, D. E.; Zuber, M. T.; Boynton, W.; Saunders, R. S.; Drake, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first year of neutron mapping measurements from the Mars Odyssey spacecraft are presented based on observations from the High Energy Neutron Detector (HEND). The HEND instrument is a part of GRS suite responsible for registration of epithermal and fast neutrons originating in the Mars subsurface layer. The gamma ray and neutron spectrometers measure the scattering of fast neutrons from the Martian surface, which is caused by bombardment of primary cosmic rays and is strongly sensitive to the presence of hydrogen atoms. Even several percent subsurface hydrogen significantly depresses the flux of epithermal and fast neutrons. The recent Mars Odyssey observations detected a considerable amount of hydrogen, almost certainly corresponding to water ice, in the shallow near surface of the southern and northern hemispheres of Mars.
Derived from text
Carbon Dioxide; Neutron Spectrometers; Fast Neutrons; Hydrogen Atoms; Primary Cosmic Rays; Planetary Mapping

20030110774 Southwestern Indian Polytechnic Inst., Albuquerque, NM, USA
Examining Topography of Mars Impact Basins to Determine If Impact Basins Have Topographic Characteristics of a Crater
Livingston, A.; Lewis, K.; Simmons, J.; Chavez, D.; Gchachu, K.; Newsom, H. E.; Sutherland, V.; Gordon, H.; Hare, T. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations Contract(s)/Grant(s): NRA-00-OSS-02; NAG5-10143; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Determining the topography of suspect craters on Mars will help scientists better understand the land deformation that occurs from an asteroid or comet impact. This will provide a better understanding of how Mars has changed over time and the topography data could be used for planning future missions to Mars. We have begun a program at the Southwestern Indian Polytechnic Institute (SIPI), a Bureau of Indian Affairs junior college, to analyze large impact basins on Mars (>300 km diameter) utilizing Geographic Information System (GIS) technology. Collaborators at the University of New Mexico and the U.S. Geological Survey are providing technical support for this effort.
Derived from text
Structural Basins; Mars Craters; Mars Surface; Geographic Information Systems; Geological Surveys; Topography

20030110775 Barcelona Univ., Spain
Chemical Abundances of Rock-forming Elements of Cometary Streams Obtained from Meteor Spectroscopy
Llorca, J.; Trigo-Rodriguez, J. M.; Borovicka, J.; Fabregat, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Up to now, only cometary dust from comet 1P/Halley has been analyzed in situ by mass spectrometry techniques. In contrast, numerous studies have been performed in the laboratory over interplanetary dust particles (IDPs) thought to be related to comets. Another discipline that addresses the study of the chemical composition of small meteoroids is meteor spectroscopy, which focuses on the light emitted upon the process of ablation and fragmentation of these particles into the atmosphere due to the high velocity encounter with the Earth. We have derived the relative chemical abundances of Si, Mg, Fe and Ca of eight fireballs belonging to well-known cometary streams (5 Perseids, 1 k Cignid, 1 Andromedid and 1 Leonid) and compared them to the chemical composition of 1P/Halley dust as well as IDPs.
Derived from text
Meteoroids; Mass Spectroscopy; Chemical Composition; Interplanetary Dust; Abundance; Comets

20030110776 NASA Johnson Space Center, Houston, TX, USA

Kinetic Fractionation of Stable Isotopes in Carbonates on Mars: Terrestrial Analogs

Socki, Richard A.; Gibson, Everett K., Jr.; Golden, D. C.; Ming, Douglas W.; McKay, Gordon A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An ancient Martian hydrosphere consisting of an alkali-rich ocean would likely produce solid carbonate minerals through the processes of evaporation and/or freezing. We postulate that both (or either) of these kinetically-driven processes would produce carbonate minerals whose stable isotopic compositions are highly fractionated (enriched) with respect to the source carbon. Various scenarios have been proposed for carbonate formation on Mars, including high temperature formation, hydrothermal alteration, precipitation from evaporating brines, and cryogenic formation. 13C and 18O -fractionated carbonates have previously been shown to form kinetically under some of these conditions, ie.: 1) alteration by hydrothermal processes, 2) low temperature precipitation (sedimentary) from evaporating bicarbonate (brine) solutions, and 3) precipitation during the process of cryogenic freezing of bicarbonate-rich fluids. Here we examine several terrestrial field settings within the context of kinetically controlled carbonate precipitation where stable isotope enrichments have been observed.

Author

Carbonates; Mars (Planet)

20030110777 Hawaii Univ., Honolulu, HI, USA

Global Mineral Maps of the Moon

Lucey, P. G.; Steutel, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Determining the global distribution of minerals on the Moon has been an important goal of lunar science. Lunar mineralogy is relatively simple, being dominated by just five minerals. Tompkins and Pieters showed that the major lunar minerals can be detected using data from the Clementine UVVIS camera for locations that are sufficiently immature such that the effects of space weathering can be neglected. They also employed a Hapke-based mixing model to construct a framework within which to interpret their results. Building on that work, we used an improved Hapke mixing model to determine the mineralogy of the approximately 1% of the lunar surface with low enough maturity for analysis. We then interpolated these data to prepare maps of the entire lunar surface of the distribution and abundance of olivine, orthopyroxene, clinopyroxene and plagioclase.

Derived from text

Moon; Mineralogy; Maps; Lunar Surface

20030110779 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Volatiles Inventory to the Inner Planets Due to Small Bodies Migration

Marov, M. Y.; Ipatov, S. I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): NRC-01-58730; NAG5-10776; INTAS-00-240; RFBR-02-16165; RFBR-01-02-17540; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The concurrent processes of endogeneous and exogeneous origin are assumed to be responsible for the volatile reserves in the terrestrial planets. Volatiles inventory through collisions is rooted in orbital dynamics of small bodies including near-Earth objects (NEOs), short and long-period comets, and trans-Neptunian objects (TNOs), the latter probably supplying a large amount of Jupiter crossing objects (JCOs). Our model testifies that even a relatively small portion (approx. 0.001) of JCOs which transit to orbits with aphelia inside Jupiter's orbit (Q<4.7 AU) and reside such orbits during more than 1 Myr may contribute significantly in collisions with the terrestrial planets. The total mass of volatiles delivered to the Earth from the feeding zone of the giant planets could be greater than the mass of the Earth's oceans.

Derived from text

Volatile Organic Compounds; Solar System Evolution; Terrestrial Planets; Protoplanets; Orbital Mechanics; Gravitational Effects

20030110781 Washington Univ., Saint Louis, MO, USA

Carbon Isotopic Heterogeneity of Graphite in the San Juan Mass of the Campo Del Cielo IAB Iron Meteorite

Maruoka, T.; Kurat, G.; Zinner, E.; Varela, M. E.; Ametrano, S. J.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578

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The origin of IAB iron meteorites is still a matter of debate. It is generally believed that iron meteorites originated from molten cores in small planetesimals because the fractionation trend of trace elements (e.g., Ir, Ge, Ga, etc. vs. Ni) for most iron meteorites can be more or less explained by fractional crystallization from metal melts. However, this process cannot produce trace element characteristics of the IAB (and other) iron meteorites. To explain these trace element abundance patterns, several models have been proposed. Although most of these models require a high temperature, clear evidence has recently been obtained for a sub-solidus formation of IAB iron meteorites from noble gas analyses. Moreover, heterogeneous distributions of some trace elements in metal and other phases also suggest a low temperature origin of at least some IAB iron meteorites. Here we use the carbon isotopic compositions of graphite to constrain the origin of IAB iron meteorites. Our data confirm a possible low temperature origin of IAB iron meteorites.
Author
Iron Meteorites; Meteoritic Composition; Graphite; Carbon Isotopes; Isotope Ratios

20030110782 California Univ., San Diego, CA, USA
Xe-126 Excesses: Monoisotopic Anomalies in Regolith Samples?
Mathew, K. J.; Marti, K.; Levskii, L. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present new Xe isotopic signatures of Pesyanoe regolith samples which document excesses of 126Xe and we explore the possibility that it formed by low-energy reactions on transient Te-rich coatings.
Author
Xenon Isotopes; Isotope Ratios; Meteoritic Composition; Regolith; Solar Wind

20030110783 Nevada Univ., Reno, NV, USA
Radial Variations in Lithospheric Properties in Northeast Tharsis: First Results
Matney, R. N.; Schultz, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As the first phase of our quantification of Tharsis tectonism, we create an MGS-referenced data set of normal faults and grabens in Northeast Tharsis. The radial slice from central Tharsis through Tempe Terra will provide a window into thermal, mechanical, and tectonic properties there as a function of time, and therefore of load and lithospheric evolution.
Author
Mars Surface; Planetary Geology; Mars Volcanoes; Geological Faults; Digital Elevation Models

20030110784 State Univ. of New York, Stony Brook, NY, USA
Evidence for a Distinctive Rare Earth Element-enriched Mantle Reservoir on Mars
McLennan, Scott M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At least three major geochemical reservoirs have been identified in the crust-mantle system of Mars, including the primitive mantle, an ancient highly depleted mantle, best sampled by the most LREE-depleted basaltic shergottites, and an ancient enriched crust . Some workers, evaluating both isotopic and geochemical data, have suggested additional reservoirs, for example, representing the sources of Nakhlites and Chassigny . In light of the recent dramatic increase in the number of basaltic through ultramafic meteorites derived from Mars, and better understanding of the composition and size of the Martian crust, from Pathfinder chemical data, GRS measurements, the chemistry of shergottites, and geophysical data from Pathfinder and Mars Global Surveyor, there is a need for re-evaluating the character of major geochemical reservoirs in the crust-mantle system on Mars.
Author
Mars Surface; Planetary Mantles

20030110785 Paris VI Univ., France
Valles Marineris Wallslopes: Evidence for Amazonian Variations in Wallrock Strength and Oblique Crustal Fabric
Mege, Daniel; Gatineau, Delphine; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have measured angles of gravity slopes that are associated with three morphologic types in SW Valles Marineris:

landslides, sapping channels, and a linear trough, Calydon Fossa. Although the three are thought to be gravity-controlled and of the same recent age (Amazonian), significant differences in slope angles are observed. They may reflect variation of rock strength through time, maybe in relation with hydrothermal activity or variations in pore pressure (ice/liquid phase change, desiccation). Many sapping channel slopes are asymmetric. This feature may result from oblique structural fabric in the basement rocks a possible consequence of uplift-subsidence history during an early Tharsis or pre-Tharsis thermal event?
Derived from text
Crusts; Mars Surface; Gravitation; Landslides

20030110786 Arkansas-Oklahoma Center for Space and Planetary Sciences, USA
Cathodoluminescence Color Indices as a Parameter for Measuring Petrologic Changes in Meteorites
Meier, A.; Akridge, D. G.; Akridge, J. M. C.; Batchelor, J. D.; Benoit, P. H.; Brewer, J.; DeHart, J. M.; Keck, B. D.; Jie, Lu; Schneider, D. M., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cathodoluminescence (CL) is the emission of light when a target material is placed in an electron beam. The wavelength of light emitted is a property of the composition and the crystallographic structure. While the mechanism for the excitation/deexcitation with photon emission is well understood for free atoms, the mechanism for atoms in the solid state is less clear. Ions trapped in the crystal lattice can act as activators, and increase the luminescence of the sample. Other ions, notably Fe2+, act as quenchers, and reduce or eliminate the luminescence. The presence of activator ions can radically alter the spectrum. For some ions, the position in the crystal lattice and abundance can affect whether they act as activators or quenchers. Cathodoluminescence was first applied in a systematic way to geological studies in the mid-1960's, and has since been used extensively in sedimentary petrography. A recent application is the identification of shocked quartz in samples from potential terrestrial impact craters.
Derived from text
Meteoritic Composition; Petrology; Crystal Structure; Cathodoluminescence; Color

20030110787 Pittsburgh Univ., Pittsburgh, PA, USA
Geology of Crater Millochau, Terra Tyrrhena Region of Mars
Mest, S. C.; Crown, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The martian highlands preserve a long and complex history of degradation by fluvial, eolian, and mass wasting processes. The effects of these processes are best observed on impact craters that characterize the ancient highlands. Previous studies of highland terrains - Margaritifer Sinus, Ismenius Lacus, Arabia Terra, and Promethei Terra - have shown that craters display pristine to highly degraded morphologies. Some craters exhibit distinctive interior deposits, suggesting infilling by sedimentary and (or) volcanic deposits. Several studies have suggested that large impact craters on Mars may have contained standing bodies of water that could have been ideal environments for life to persist.
Derived from text
Geology; Mars Craters; Degradation; Deposits

20030110789 Lancaster Univ., UK
Dike Emplacement as a Mechanism for Generation of Massive Water Floods at Cerberus Fossae, Mars
Mitchell, K. L.; Wilson, L.; Head, J. W., III; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We model the dynamics of the release of water from the Cerberus Fossae fracture system to feed the Athabasca Valles water flood channels. The near-source topography and morphology is consistent with water rising through a approx. 20 km long, approx. 20 km wide fracture (caused by dike emplacement) at approx. 60 m/s. Extremely efficient sub-surface water transport is needed to feed the inferred discharge
Derived from text
Fracturing; Surface Water; Rock Intrusions; Morphology

20030110790 NASA, Washington, DC, USA

Global Distribution of Shallow Water on Mars: Neutron Mapping of Summer-Time Surface by HEND/Odyssey

Mitrofanov, I. G.; Litvak, M. L.; Kozyrev, A. S.; Sanin, A. B.; Tretyakov, V. I.; Boynton, W.; Hamara, D.; Shinohara, C.; Saunders, R. S.; Drake, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Orbital mapping of induced neutrons and gamma-rays by Odyssey has recently successfully proven the applicability of nuclear methods for studying of the elementary composition of Martian upper-most subsurface. In particular, the suite of Gamma-Ray Spectrometer (GRS) has discovered the presence of large water-ice rich regions southward and northward on Mars. The data of neutron mapping of summer-time surface are presented below from the Russian High Energy Neutron Spectrometer (HEND), which is a part of GRS suite. These maps represent the content of water in the soil for summer season at Southern and Northern hemispheres, when the winter deposit of CO2 is absent on the surface. The seasonal evolution of CO2 coverage on Mars is the subject of the complementary paper.

Author

Mars (Planet); Spatial Distribution; Shallow Water; Ice; Carbon Dioxide

20030110791 NASA Johnson Space Center, Houston, TX, USA

Northwest Africa 1401: A Polymict Cumulate Eucrite with a Unique Ferroan Heteradcumulate Mafic Clast

Mittlefehldt, David W.; Killgore, Marvin; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The howardite, eucrite and diogenite (HED) clan is the largest suite of achondrites available for study. The suite gives us a unique view of the magmatism that affected some asteroids early in solar system history. One problem with mining the HED clan for petrogenetic information is that there is only limited petrologic diversity among the rock types. Thus, discovering unusual HED materials holds the potential for revealing new insights into the petrologic evolution of the HED parent asteroid. Here we report on petrologic study of an unusual, 27 gram polymict eucrite, Northwest Africa (NWA) 1401. The thin section studied (approx. 20 x 10 mm) contains one large, ferroan clast described separately. The remainder of the rock, including mineral fragments and other, smaller lithic clasts, forms the host breccia.

Derived from text

Achondrites; Meteoritic Composition; Breccia; Igneous Rocks; Magma

20030110792 National Air and Space Museum, Washington, DC, USA

Application of THEMIS Data to an Investigation of a Long Lava Flow in the Tharsis Montes Region of Mars

Zimbelman, J. R.; Peitersen, M. N.; Christensen, P. R.; Rice, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-10375; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Tharsis region of Mars has long been known for the numerous lava flows radiating from the Tharsis Montes shield volcanoes. A 480-km-long flow southwest of Ascraeus Mons has been the subject of previous investigations using Viking and MGS data. The new data currently being obtained with the Thermal Emission Imaging System (THEMIS) on the Mars Odyssey spacecraft can shed new light on the volcanology of Martian lava flows, illustrated in this paper by two THEMIS images of the previously studied flow near Ascraeus Mons. The lava flow examined is on the western flank of the topographic saddle between the Ascraeus Mons and Pavonis Mons shield volcanoes. Flow morphology in the dust-covered Tharsis region is revealed in exquisite detail in daytime IR and VIS images from THEMIS, which will aid in documentation and analysis of lava flow features on Mars and improve constraints for volcanic modeling.

Derived from text

Lava; Mars Volcanoes; Planetary Geology; Themis Project; Topography

20030110793 Texas Univ., Austin, TX, USA

Modeling of Particulates and Condensates in Io's Pele-type Volcanic Plumes

Moore, C.; Zhang, J.; Goldstein, D. B.; Varghese, P. L.; Trafton, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Volcanic plumes on Io consist mainly of SO2 gas, but are made visible by the presence of either nonvolatile dust or condensed particles. Photometric studies of one plume indicate that particles of sizes from 0.01 microns to 1000 microns are present. Storm and Schneider suggested that the bright envelope that appeared in the ultraviolet brightness images of Io's largest volcano, Pele, may be the result of a concentration of particles at a shock front. In the present work the direct simulation Monte Carlo (DSMC) method is used to show that dust particulates up to 0.1 microns can reach the canopy shock. A computational overlay technique is used to examine the feasibility of condensing volatiles forming the entrained particulates observed in Io's volcanic plumes. Preliminary results show that it may be possible to form condensates of 0.1 microns at the shock front.
Derived from text
Particulates; Condensates; Volcanoes; Plumes; Shock Fronts; Computerized Simulation; Io

20030110795 Brown Univ., Providence, RI, USA
Correlating Meter-Scale Morphology and Kilometer-Scale Topography: Evidence for a Degraded Mid-Latitude Surface Layer on Mars
Mustard, J. F.; Kreslavsky, M. A.; Head, J. W.; Milliken, R. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have been investigating several independent data sets from recent Mars missions that provide evidence for a meters-thick, latitude-dependent surface layer. Based on apparent physical properties observed in Mars Orbiter Camera (MOC) images and Mars Laser Altimeter (MOLA) data, and the distinct latitude dependence of these observations, we interpreted this to be an ice-rich layer, and interpretation supported by recent Mars Odyssey results. Our current focus is on the latitude zones 30-60 N and S where the surface layer is discontinuous. The relative paucity of impact craters supports an interpretation that the ice-rich layer is recent. Our goal in this analysis is to directly compare the distribution of MOC images exhibiting the discontinuous layer with MOLA observations of roughness on several scales and to assess the degree of correspondence. The MOC images provide high spatial resolution observations of morphology, but each image covers a very small portion of the surface. The MOLA observations are global, but relating the various roughness measurements with specific surface features can be difficult. By combining these observations we can a) provide a means of relating the MOLA roughness measurements to specific surface morphology and b) scale the MOC observations across the regions between observations. The ultimate goal is to provide insight into the regional and global properties of the ice-rich surface layer.
Author
Mars Surface; Image Analysis

20030110796 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Statistical Analysis of Corona Topography: New Insights into Corona Formation and Evolution
Stofan, E. R.; Glaze, L. S.; Smrekar, S. E.; Baloga, S. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Extensive mapping of the surface of Venus and continued analysis of Magellan data have allowed a more comprehensive survey of coronae to be conducted. Our updated corona database contains 514 features, an increase from the 326 coronae of the previous survey. We include a new set of 106 Type 2 or stealth coronae, which have a topographic rather than a fracture annulus. The large increase in the number of coronae over the 1992 survey results from several factors, including the use of the full Magellan data set and the addition of features identified as part of the systematic geologic mapping of Venus. Parameters of the population that we have analyzed to date include size and topography.
Derived from text
Coronas; Planetary Evolution; Planetary Mapping; Statistical Analysis; Topography; Venus Surface

20030110797 Hawaii Univ., Honolulu, HI, USA
Measurements of Martian Impact Crater Geometry Via a New Interactive Computer Program
Mouginis-Mark, P. J.; Boyce, J. M.; Baloga, S. M.; Ui, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have developed an interactive computer program to investigate the geometry of Martian impact craters. The program is written in C++ for MS Windows based personal computers, so that it will run on any moderately powerful PC running

Windows 98/NT/XP/2000. As input data, we use the 1/64th degree digital elevation model (DEM) of Mars obtained from the Mars Orbiter Laser Altimeter (MOLA). Our objective is to search for spatial variations in crater geometry (e.g., depth/diameter, rim volume/rim height, or ejecta volume/crater volume) that might indicate variations in target properties or the resurfacing history of Mars. Here we describe the measurement technique, and in a companion abstract [1] present our preliminary assessment of 1,430 craters within Utopia Planitia (25.1 - 66.8 N, 88.4 - 149.6 E).
Author
Mars Craters; Dimensional Measurement

20030110798 Tsukuba Univ., Japan
Heating Energy Input Rate for Chondrule Forming Region and Its Evolution
Najamoto, T.; Kita, N. T.; Tachibana, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chondrules are believed to have formed through some sort of heating events in the early solar system. Although several heating mechanisms have been proposed to date, no one has been widely accepted. In this work, we attempt to reveal the gross feature of the heating events, especially the heating energy input rate, which is a product of the energy given to the chondrule-forming system by every heating event and the frequency of the chondrule-forming heating events, and its time variation. The energy input rate can be deduced without specifying any particular heating mechanism by using the fraction of chondrules in chondrites and the age distribution of chondrules as constraints. Since the age distribution of chondrules is not well-determined, we estimate it first. Then, we make a simple model for chondrule formation and obtain the heating energy input rate as a function of time by comparing model results with observations.
Derived from text
Heating; Meteoritic Composition; Chondrule; Time Dependence; Chondrites

20030110799 Sternberg Astronomical Inst., Moscow, USSR
Photometry of the Moon with AMIE/SMART-1: Photometric Parameter as Roughness Index
Pugacheva, S. G.; Shevchenko, V. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): INTAS-ESA-00-0792; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One scientific goal of the AMIE experiment to fly onboard the SMART-1 mission (ESA) is to investigate, at low polar orbit, the regolith surface layer in different regions of the Moon. The AMIE camera will observe the surface in nadir direction within a large phase angle interval, thus providing photometry investigation of selected regions. The view is taken here that information retrieved from the local surface photometric behaviour of the Moon could be used for guiding the remote sensing analyses of specific morphological targets. The peculiarity of the photometric method is that gives information concerning structure of the lunar surface in meter-scale (boulders, debris etc.).
Author
Photometry; Lunar Surface

20030110800 Universidad Complutense, Madrid, Spain
The Geology of Mars Through 3D Digital Videos in the Classroom
Nieto, A. B.; Lopez, C.; dePablo, M. A.; Castilla, G.; Montoya, I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The study of other bodies (planets and satellites) of the Solar System, and especially Mars, it is a very attractive form of introducing to the Obligatory Secondary Education students on the Planetary Sciences in general, and to the Planetary Geology in particular. Moreover, to study other planets is a very useful tool to consolidate the basic geological knowledge contents in the curriculum of subjects, like Geology and Sciences of the Earth and of the Environment, imparted in the Secondary Education in Spain. If the didactic activities are reinforced with the employment of informatic tools, will be obtained a better learning of the concepts that are intended to teach. In this work we show an activity about the geology of Mars, employing informatic tools, developed within a greater didactic unit on Planetary Geology.
Derived from text
Mars Surface; Planetary Geology; Solar System; Video Communication; Education; Three Dimensional Models

20030110801 University Coll., London, UK

Estimates of Europa's Ice Shell Thickness from Elastically-supported Topography

Nimmo, F.; Giese, B.; Pappalardo, R. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The thickness of Europa's solid ice shell is uncertain, and has important implications for Europa s habitability and thermal history. Here we obtain an estimate for the ice shell thickness from observations of a plateau SW of Cilix impact crater (3 degrees N; 182 degrees W). A shell thickness of approximately equal to 25 km is compatible with our observations; a conservative lower bound is 6 km.

Derived from text

Europa; Ice; Thickness

20030110802 Australian National Univ., Canberra, Australia

Regional Heterogeneity of KREEP: Impact Melts from Apollo 16 and 17

Norman, M. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact melt breccias from Apollo 16 and 17 show subtle but resolvable differences in trace element composition between the two sites, possibly indicating regional heterogeneity in the KREEP component contributing to these breccias. The compositional differences are most apparent in the high-field strength elements (HFSE; e.g., Zr, Hf, Nb, Ta), which are fractionated in KREEP relative to the bulk Moon. Compatible trace elements such as Cr, V, and Sc further document compositional differences in target lithologies. These trace element signatures appear to reflect multiple impact events into compositionally distinct crustal terranes during the Nectarian (3.8-3.9 Ga) episode of intense bombardment.

Derived from text

Breccia; Field Strength; Impact Melts; Kreep; Moon; Trace Elements; Lunar Rocks

20030110803 NASA Johnson Space Center, Houston, TX, USA

Fossil Al-26 and Mn-53 in D'Orbigny and Sahara 99555 and the Timescale for Angrite Magmatism

Nyquist, L. E.; Shih, C. Y.; Wiesmann, H.; Mikouchi, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report Mn-Cr, Al-Mg, Rb-Sr, and Sm-Nd investigations of the D'Orbigny and Sahara 99555 angrites.

Derived from text

Aluminum Isotopes; Magma; Manganese Isotopes; Fossils; Meteoritic Composition; Mineralogy

20030110804 National Space Development Agency, Ibaraki, Japan

Study of the Optical Standard Site for the SELENE Multiband Imager

Ohtake, M.; Demura, H.; Haruyama, J.; Hirata, N.; Nakamura, R.; Sugihara, T.; Takeda, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Lunar Imager/SpectroMeter (LISM) is an instrument being developed for the SELENE project that will be launched in 2005. LISM consists of the three subsystems, Terrain Camera (TC), Multiband Imager (MI), and Spectral Profiler (SP). The sub-systems share some components and electronics.

Derived from text

Cameras; Spectrometers; Lunar Programs

20030110805 Tokyo Univ., Japan

Oxygen Isotopic Composition of Individual Chondrules in an Enstatite Chondrite Yamato 791810

Okazaki, R.; Huss, G. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report preliminary results for oxygen isotope measurement of individual chrondules in Y791810. The same chrondules will also be measured for REE and noble gaseds.
Author
Chondrule; Meteoritic Composition

20030110808 NASA Ames Research Center, Moffett Field, CA, USA
Grooved Terrain on Ganymede: A Galileo-based Synthesis
Pappalardo, Robert T.; Collins, Geoffrey C.; Head, James W.; Moore, Jeffrey M.; Schenk, Paul M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-11616; NAG5-11774; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Swaths of bright 'grooved terrain' (sulci) on Ganymede are 10s to 100s of kilometers wide and cross-cut the older dark terrain, forming an intricate patchwork across 2/3 of Ganymede's surface. The view of grooved terrain developed from Voyager images is that bright cells are broad graben infilled by extrusion of relatively clean (silicate-poor) liquid water, warm ice, or icy slush, and then extended and faulted. Galileo imaging has greatly improved understanding of the emplacement history and geological implications of grooved terrain, supporting a rift-like model for its formation.
Derived from text
Terrain; Ganymede; Ice; Geological Faults

20030110809 Arizona Univ., Tucson, AZ, USA
An Extended Classification Scheme for the Acapulcoites and Lodranites
Patzer, A.; Hill, D. H.; Boynton, W. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Acapulcoites and lodranites (AL) are counted among the primitive achondrites. Their bulk composition roughly matches that of ordinary chondrites but was altered by heterogeneous partial melting and small-scale melt migration processes. Originally, the two subgroups were discriminated by means of grain size as well as feldspar and sulfide contents. With the recovery of more and more class members from cold and hot desert, however, the bimodal classification scheme soon proved to be too limited to accommodate transitional samples.
Derived from text
Meteoritic Composition; Chondrites; Achondrites; Classifications

20030110810 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Effect of Levee and Channel Structures on Long Lava Flow Emplacement: Martian Examples from THEMIS and MOLA Data
Peitersen, M. N.; Zimbelman, J. R.; Christensen, P. R.; Bare, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Long lava flows (discrete flow units with lengths exceeding 50 km) are easily identified features found on many planetary surfaces. An ongoing investigation is being conducted into the origin of these flows. Here, we limit our attention to long lava flows which show evidence of channel-like structures.
Derived from text
Lava; Fluid Flow; Planetary Surfaces

20030110811 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Gish Bar Patera, Io: Geology and Volcanic Activity, 1996-2001
Perry, Jason; Radebaugh, Jani; Lopes, Rosaly; McEwen, Alfred; Keszthelyi, Laszlo; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the two Voyagers passed by Jupiter in 1979, it has been known that volcanic activity is ubiquitous on the surface of Io. With over 400 volcanic centers, Io is even more volcanically active than the earth with massive flood basalt-style eruptions and komatitite lavas a common occurrence. Additionally, some volcanoes appear to be giant lava lakes, with violent activity churning the crust of the lake for periods of 20 years or more. Finally, sulfur is believed to play a large role in Io's

volcanism, be it as a primary lava or as a secondary product of large, high-temperature eruptions. By studying one volcano in particular, Gish Bar Patera, one can observe many of these characteristics in one volcanic center.
Derived from text
Volcanology; Io; Geology; Basalt; Crusts

20030110812 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Size-dependent Measurements of the Scattering Properties of Planetary Regolith Analogs: A Challenge to Theory
Piatek, J. L.; Hapke, B. W.; Nelson, R. M.; Hale, A. S.; Smythe, W. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The nature of the scattering of light is thought to be well understood when the medium is made up of independent scatterers that are much larger than the wavelength of that light. This is not the case when the size of the scattering objects is similar to or smaller than the wavelength or the scatterers are not independent. In an attempt to examine the applicability of independent particle scattering models, to planetary regoliths, a dataset of experimental results were compared with theoretical predictions.
Author
Light Scattering; Size (Dimensions); Regolith; Particulates

20030110813 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Selenium During Stepwise Dissolution of Allende: An Exploratory Study
Plagge, M.; Sudek, Ch.; Ott, U.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Abundance and isotopic composition of Se have been determined during stepwise dissolution of the Allende meteorite. From preliminary results we conclude that there is no evidence for mass-independent isotopic effects larger than an (at this stage still rather imprecise) upper limit of approx. 1%.
Derived from text
Selenium; Isotopes; Allende Meteorite

20030110814 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Odyssey Science: The First Year and Beyond
Plaut, J. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 2001 Mars Odyssey orbital science mission officially began in late February, 2002. The spacecraft carries three science instrument packages: the Gamma Ray Spectrometer suite (GRS), the Thermal Emission Imaging System (THEMIS), and the Martian Radiation Environment Experiment (MARIE). The GRS suite of three instruments includes the Gamma Sensor Subsystem (GSS), the Neutron Spectrometer (NS) and the High Energy Neutron Detector (HEND). THEMIS consists of two cameras sharing a single set of telescopic optics: a 5-band visible imager and a 10-band thermal infrared imager. Spacecraft and instrument performance have been nominal to this point in the science mission.
Derived from text
2001 Mars Odyssey; Imaging Techniques; Infrared Radiation; Mars Environment; Thermal Emission

20030110815 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Geometric Properties of Possible Volcanoes in the South Polar Region, Mars
Polit, A. T.; Sakimoto, S. E. H.; Mitchell, D. E.; Grosfils, E. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-11150; NAG5-12287; NAG5-10498; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 1987 Tanaka and Scott mapped the south polar region of Mars using Viking Orbiter data and identified several features as volcanoes, probable volcanoes of uncertain origin, or mountains of uncertain origin. Several workers have since studied these features using Mars Orbiter Laser Altimetry (MOLA) data. In the north polar region of Mars volcanic edifices have been identified that have surrounding annular depressions, perhaps formed when magma chamber heat melted surrounding ground ice causing surface subsidence. Our objective is to use Martian south polar volcanoes as indicators of magma-ground ice interactions and as indicators of regional eruptive styles. In this study we use high resolution MOLA data to characterize the

geometric parameters of mapped volcanoes and mountains and systematically search for any unidentified volcanic edifices from latitude 55 S to the South Pole.
Derived from text
Mars Volcanoes; Planetary Geology; Polar Regions; Magma

20030110816 Ohio State Univ., Columbus, OH, USA
Gravity Drilling of Mass Differentiated Planets
Potts, L. V.; Leftwich, T.; Kim, H. R.; Han, S.-H.; vonFrese, R. R. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analysis of satellite-measured gravity and topography can provide crust-to-core mass variation models for considering the geologic evolution of terrestrial planets. These mass differentiated models facilitate developing new perspectives on the poorly understood crustal and subcrustal features of the terrestrial planets.
Derived from text
Drilling; Gravitation; Planetary Evolution; Terrestrial Planets; Satellite-Borne Instruments; Topography

20030110817 Paris-Sud Univ., Orsay, France
Modelling of Mineral Mixture Reflectance Spectra
Poulet, F.; Erard, S.; Gendrin, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the forthcoming years, high spectral resolution imaging spectroscopy in the visible/near-infrared range will be used to obtain compositional information for planetary surfaces (especially for Mars surface with the space missions Mars Express and Mars Reconnaissance Orbiter). Deconvolving a reflectance spectrum to mineral abundance in an unambiguous way is difficult, because the spectra are complex nonlinear functions of grain size, abundance, material opacity, and type of mixtures (dust, sand, areal). The common approach is to extract information from the measured spectrum itself, using e.g. the Modified Gaussian Model or automated band detection. The strength of these methods is to aid in determining appropriate endmembers to model, but no information can be derived on abundance, grain size, and type of mixtures of the end-members. Multiple scattering models can provide approximate solutions to the radiative transfer in a particulate medium. One such model is the semiempirical Hapke model which has been used by most modelers of natural and laboratory common geologic mixtures. Applications of the Hapke model to quantitative analysis of laboratory mineral intimate mixtures give abundances estimates better than 10% if an estimate of the particle sizes of the respective mixture components is known.
Derived from text
Near Infrared Radiation; Planetary Surfaces; Spectral Resolution; Radiative Transfer; Quantitative Analysis; Minerals

20030110818 Colorado Univ., Boulder, CO, USA
Thermal Inertia Analysis of the Martian Globe, South Polar Region, and Past Landing Sites
Putzig, N. E.; Mellon, M. T.; Arvidson, R. E.; Kretke, K. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present new results from the analysis of thermal inertia as derived from Thermal Emission Spectrometer (TES) data throughout the primary mapping mission of the Mars Global Surveyor (MGS) [1,2]. Global analysis of thermal inertia together with albedo confirms the presence of three previously identified major surface units [2], and further delineates several smaller regions with distinct characteristics. Most notably, a fourth unit of low thermal inertia and low-to-intermediate albedo dominates the region poleward of 65 S. We also performed a detailed analysis of thermal inertia over the Pathfinder and Viking landing sites, providing an important link between surface characteristics observed in situ and those derived from remote-sensing data.
Author
Mars Surface; Thermal Mapping

20030110819 Oulu Univ., Finland
Geotraverse Through the Terra Arabia Area of Low Epithermal Neutron Flux
Raitala, Jouko; Basilevsky, Alexander T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Terra Arabia is one of two large-scale areas of low flux of epithermal neutrons in the low to middle latitudes of Mars discovered by High Energy Neutron Detector and Neutron Spectrometer on board of Mars Odyssey 1,2,3]. Joint consideration of the neutron flux values with a number of surface parameters (surface altitude, thermal inertia, albedo, radiophysical properties, the bedrock geology) and with theoretically calculated geographic distribution of zones free of ground ice led to conclusion that the low epithermal neutron flux in these anomalous areas is due to relatively high content of chemically bound water in the areas surface mantle [4,5]. The analysis of high-resolution MOC images was suggested as a tool to study this mantle so this work implements this suggestion for the Terra Arabia area.
Author
Mars Surface; Flux (Rate)

20030110820 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Berlin, Germany
Debris Flows on Mars: Global Distribution and Their Correlation to Present Day Maximum Surface Pressures and Temperatures
Reiss, D.; Jaumann, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The observation of debris flows in high resolution MGS-MOC images suggests that liquid water was involved in their formation in the recent past. The fact that many debris flows on Mars start from the top of isolated peaks and from the crest of dunes favors an origin by melting of near-surface ice by solar heating. The minimum requirements for pure liquid water are surface pressures above 6.1 mbar and temperatures above 273 K. Haberle et al. tested the distribution of the debris flows against these minimum requirements using a general circulation model (GCM). They found no correlation mainly because of the low pressures in the southern hemisphere. The surface pressure primarily depends on the topography. The 6.1 mbar pressure level on Mars occurs at a MOLA-topographic height of approximately -1600 m at L(sub s)=0 deg, but varies by 1.5-2.5 km within a Martian year over this mean value due to the annual CO2 condensation-sublimation cycle. Maximum surface pressures above 6.1 mbar can occur seasonally at MOLA topographic heights up to about 1000 m. To produce a global maximum ground temperature map we used the TES brightness temperature data. Only brightness temperatures above 273 K and nadir measurements (<1 deg) were used. The temperature values were binned to a 12 km global grid using the maximum temperature value of each bin.
Derived from text
Debris; Mars Surface; Mars Atmosphere; Surface Temperature; Flow Distribution; Atmospheric Pressure

20030110821 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Obliquity, Ice Sheets, and Layered Sediments on Mars: What Spacecraft Observations and Climate Models are Telling Us
Richardson, M. I.; McCleese, Daniel J.; Mischna, Michael; Vasavada, Ashwin R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Odyssey Gamma-Ray Spectrometer (GRS) data present a quandary: On the one hand, large deposits of (inferred) water ice are located where thermal models suggest they would form and best be protected, e.g., if deposited during periods of higher obliquity. On the other hand, the volume mixing ratios (approx. 70%) are so high that diffusive deposition of water in regolith pore space (which is the process assumed by these models) cannot be the primary formation mechanism. Furthermore, given that the water is inferred to be so close to the surface (less than a few 10's of cm's), it must be in communication with the atmosphere on time scales that are geologically relatively short (10(exp 3)-10(exp 6) years); therefore the water cannot be archaic. Considering the GRS data, images of mantled, fretted, and disaggregated terrain, and new climate modeling of Mars orbital cycles, we are led to an alternate conclusion about the ice deposits: that they form as subaerial ice sheets. This scenario not only provides a simple explanation for these observations, but may also help explain the formation of globally distributed, sedimentary layered deposits.
Author
Mars Surface; Ice; Planetary Cryospheres; Sediments; Strata; Climate Models

20030110822 NASA Johnson Space Center, Houston, TX, USA

Leonid Dust Spheres Captured During the 2002 Storm?

Rietmeijer, Frans J. M.; Pfeffer, Melissa A.; Chizmadia, Lysa; Macy, B.; Fischer, T. P.; Zolensky, M. E.; Warren, J. L.; Jenniskens, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

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An effort was made to collect dust from a known source, comet 55P/Tempel-Tuttle, in the form of Leonid meteor debris in the hours after the 2002 storm. No interplanetary dust particles (IDPs) have yet been recovered from a known source. We do not expect Leonid debris at 72 km/s to survive atmospheric entry as aggregates and our effort was predicated on the notion that mm-sized and larger meteoroids after extreme mass could survive as up to approximately 100 micron-sized silicate spheres. Two anticipated Leonid storms, rather than its annual shower activity, were the target of the last Leonid Multi-Aircraft Campaign during the Nov. 19, 2002 storm. Flying westwards from Spain to the US the mission covered both the 1767 and 1866 dust trails whereby early in the flight the aircraft flew several hours across the region exposed to the first storm peak that did not include the continental US of the second peak with 5,400 meteors.

Derived from text

Comets; Interplanetary Dust; Leonid Meteoroids; Micrometeoroids

20030110823 National Museum of Natural History, Washington, DC, USA

Al-rich Chondrules: Petrologic Basis for Their Diversity, and Relation to Type C CAIs

MacPherson, G. J.; Huss, G. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): NAG5-10468; NAG5-7396; NAG5-11543; NAG5-8158; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Al-rich chondrules share mineralogical and chemical properties with, and are intermediate in a volatility sense between, CAIs and ferromagnesian chondrules. In some way they must be petrogenetic links between the two. A recent upsurge of interest in Al-rich chondrules is due to their constituent plagioclase feldspar and Al-rich glass being amenable to successful ion microprobe searches for radiogenic Mg-26, the decay product of Al-26 (t(sub 1/2) = 720,000 y). This has allowed estimates to be made of the time duration between CAI formation and the onset of Al-rich (and possibly, by extension, ferromagnesian) chondrule formation, on the order of 1.5-2.5 million years.

Derived from text

Aluminum Isotopes; Chondrule; Radiogenic Materials; Meteoritic Composition; Magnesium Isotopes

20030110824 Tsukuba Univ., Japan

A Shock-Wave Heating Model for Chondrule Formation: Mechanism to Determine Minimum Size of Chondrules

Miura, H.; Nakamoto, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chondrules have a typical size distribution between about a few tens m to a few mm [e.g., 1]. This size distribution should have a close relation to the chondrule formation mechanism. We explore the relation in this study based on a shock-wave heating chondrule formation model. The shock-wave heating model is one of the most popular models for chondrule formation. Many authors argue that the precursor dust particles can melt, solidify, and form chondrules by this mechanism. Here, we report that chondrules formed through this mechanism have minimum size below which no chondrule exists. Our computational experiments indicate that this minimum size is about 1 - 10 microns. This result agrees with the size distribution of chondrules in CO chondrites.

Derived from text

Meteoritic Composition; Chondrites; Chondrule; Heating

20030110825 Brown Univ., Providence, RI, USA

Eruption Conditions and Mechanism of A17 Orange Glass Eruption: Petrology and Modeling Data

Rutherford, M. J.; Papale, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The eruption of the orange glass magma to form the deposits sampled at the Apollo 17 site is considered to have been a gas-rich, fire-fountain eruption. The deposit consists entirely of small 1-2 mm spherical beads of the orange glass created during fragmentation of the magma. The data on the gas phase components in the pre-eruption A17 orange glass magma are

constrained by C-O-S system phase equilibria and the compositions of glass and phenorysts in the erupted samples. Glass-rich melt inclusions trapped in 74002 olivine exposed in orange glass thin sections have been analyzed for major elements as well as sulfur and other volatiles, correcting for the crystallization of olivine and ilmenite around the margins of the inclusions to obtain the pre-eruption composition. The sulfur present in the melt inclusions indicates there has been a loss of 560 ppm of S from the pre-eruption melt. The sulfur fugacity would not initiate the nucleation of a gas in this magma; it had to be created by the oxidation of reduced C in the magma. The depth of equilibrium C-O gas generation by graphite oxidation is at 20 MPa or 4 km, and the S would partition into the CO-rich gas. The modeling calculations constrain the amount of C necessary to achieve fragmentation of the orange glass melt prior to its reaching the surface.
Author
Vapor Phases; Oxidation; Glass; Fragmentation; Crystallization; Moon; Olivine

20030110826 Commissariat a l'Energie Atomique, Gif-sur-Yvette, France
Laser Induced Breakdown Spectroscopy on Mars: Elemental Composition Study at Different Distances
Salle, B.; Vors, E.; Lacour, J. L.; Rivoallan, A.; Fichet, P.; Fabre, C.; Dubessy, J.; Maurice, S.; Wiens, R. C.; Cremers, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

MALIS (Mars elemental Analysis by Laser Induced breakdown Spectroscopy) is a project under study to perform geochemical analysis of Mars soils and rocks at stand-off distances up to several meters. A better knowledge of the plasma emission behaviour under Martian atmospheric conditions is needed to demonstrate the performances of LIBS on Mars. This includes the study of plasma emission as a function of the laser energy, that is almost equivalent to an analysis as a function of the distance to the target. LIBS uses high powered laser pulses focused on the target at stand-off distances to obtain a plasma which emits light. Collection of the plasma light, followed by spectral dispersion and detection, permits identification of the elements present in the sample via their characteristic spectral lines. With calibration, quantitative analysis can be obtained. LIBS is a well known analytical technique which has been applied to many samples such as liquids, solid samples in hostile environment, gases, environmental and geological samples. Advantages of the method compared to conventional elemental analysis methods, in the context of Mars exploration, include: - stand-off analysis capability, - no sample preparation, - rapid analysis (few minutes), - simultaneous multi-element detection of high, low, major, minor and trace elements, - ability to clean fine layer of dust and measure composition through depth profile (very important for Mars analysis purpose). For these reasons, LIBS technique is ideally suited for geological analyses on Mars.
Derived from text
Chemical Composition; Laser-Induced Breakdown Spectroscopy; Mars Atmosphere; Mars Exploration; Geochemistry

20030110827 Washington Univ., Saint Louis, MO, USA
Volcanic Origin of Alkali Halides on Io
Schaefer, L.; Fegley, B., Jr.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-11959; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The recent observation of NaCl (gas) on Io confirms our earlier prediction that NaCl is produced volcanically. Here we extend our calculations by modeling thermochemical equilibrium of O, S, Li, Na, K, Rb, Cs, F, Cl, Br, and I as a function of temperature and pressure in a Pele-like volcanic gas with O/S/Na/Cl/K = 1.518/1/0.05/0.04/0.005 and CI chondritic ratios of the other (as yet unobserved) alkalis and halogens. For reference, the nominal temperature and pressure for Pele is 1760 plus or minus 210 K and 0.01 bars based on Galileo data and modeling.
Derived from text
Alkali Halides; Io; Volcanoes; Halogens; Thermochemistry; Monatomic Gases

20030110828 Texas Univ., Austin, TX, USA
Moessbauer Spectroscopy on the Martian Surface: Predictions
Schaefer, M. W.; Dyar, M. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-12687; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Moessbauer spectrometers will be used on the upcoming MER/Athena and Mars Express/ Beagle 2 landers to identify and

quantify relative amounts of iron-bearing minerals and determine Fe3+/Fe2+ ratios, allowing more realistic modeling of Martian mineralogy and geochemistry. To properly interpret the spectra acquired by these instruments, we must understand the Mossbauer parameters of minerals that we might expect to find on Mars. We present here a summary of predicted Fe-bearing minerals that might be observed by the MER Moessbauer spectrometers, based upon previous and our own on-going work.
Author
Mars Surface; Spectroscopic Analysis

20030110829 Michigan Univ., Ann Arbor, MI, USA
Asteroid Surface Science with Pods
Scheeres, D. J.; Asphaug, E. I.; Colwell, J.; Dissly, R.; Geissler, P. E.; McFadden, L. A.; Petr, V.; Reinert, R.; Yano, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As one component of its proposed asteroid exploration plan, the Deep Interior Discovery mission will place a number of self-contained science packages on the surface of an asteroid. These packages, called pods , will make unprecedented measurements and characterizations of the surface environment on an asteroid, and subsequently will be commanded to detonate a load of high explosives, thus creating a crater to allow for sub-surface observations from orbit. This abstract introduces the idea of surface pods, discusses the science that can ideally be done with them, and presents the particular implementation being developed for the Deep Interior Discovery mission.
Author
Asteroids; Analyzing

20030110830 Southwest Research Inst., San Antonio, TX, USA
Automated Identification of Martian Craters Using Image Processing
Magee, M.; Chapman, C. R.; Dellenback, S. W.; Enke, B.; Merline, W. J.; Rigney, M. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have developed methods for detecting craters automatically, focusing specifically on complex Martian landscapes. Mars exploration is planned as the highest priority element of NASA's Solar System Exploration Program for the next two decades. Much of this interest in Mars is based on geological evidence for running water on, or just below, the surface of Mars, especially several billion years ago when the planet's climate might have been warmer, with implications for past or present life. Numerous impact craters on the southern highlands, among which the ancient river valleys weave, provide witness to the evolving surface processes on Mars. Automation of crater detection is an important initial step toward making more efficient the work of human analysts, who face large volumes of images that are being archived by missions such as Mars Global Surveyor and Mars Odyssey. Our ongoing work (collaborating with J.P.L., funded by NASA's Applied Information System Program), had developed techniques for automated recognition of craters on planetary surfaces, chiefly the simpler craters on the lunar maria. To address the more complicated terrains of Mars, including varying states of degradation, Southwest Research Institute is supporting an Internal Research and Development Project, described here. Several automated methods, based on local intensity values, intensity gradients, and geometric traits have been developed and applied to detection of Martian craters. We have found that, collectively, these methods can successfully locate most craters in typical images by enforcing relatively high confidence measures.
Author
Mars Craters; Mars Photographs; Image Processing; Pattern Recognition; Detection; Image Analysis

20030110831 Lancaster Univ., UK
The Stress State of a Cooling Magma Ocean
Scott, R. S.; Wilson, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We address the early thermal and mechanical evolution of a lunar crust forming from a magma ocean to assess the conditions under which the earliest forms of volcanism may have occurred. Potentially large compressive stresses may have been temporally and spatially common.
Derived from text
Cooling; Lunar Crust; Magma; Selenology; Lunar Evolution

20030110832 New Mexico Univ., Albuquerque, NM, USA

Phosphates in Banded Iron Formations (BIF). A Tool for Exploring Ancient Oceans and Life on Mars

Shearer, C. K.; Hagerty, J. J.; Papike, J. J.; Pun, Aurora; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Microbial metabolic activity is significant in the cycling of phosphorus in aquatic and sedimentary environments. The requirement of microorganisms to use elemental phosphorous for energy transfer and to bind, concentrate and cause crystallization of phosphates is well established. The crystallization of phosphates in a sedimentary environment commonly occurs when the proper physical conditions and biological activity coincides. Phosphates and biogenic apatites are used in paleoclimatological and environmental studies to obtain critical information on temperature of formation and environmental conditions under which the phosphate minerals were formed or deposited. Many of these studies have explored the possibility that trace elements and stable isotopes in sedimentary apatite may be used as a proxy for water chemistry. Martian sample return missions will focus upon both the search for life and reconstructing the history of water on the martian surface. Initial missions could center upon iron-rich lithologies on the martian surface. Phosphates could potentially provide a means of exploring the composition of the surface water and the phosphorus cycle on both the ancient Earth and Mars. Here, we report the results of our initial study of phosphates in the very low-grade metamorphic lithologies of the Gunflint BIF. Our focus is to understand the presence and distribution of phosphates in BIFs and to evaluate the possibility that their major and trace element characteristics reflects conditions of BIF deposition or early diagenesis.

Derived from text

Activity (Biology); Calcium Phosphates; Extraterrestrial Life; Mars (Planet); Microorganisms

20030110833 Shemakha Astrophysical Observatory, Azerbaijan, USSR

Calculations of Optical Effects of the Laser Experiment Imitating Space Weathering of the Cosmic Body Surfaces

Shestopalov, D.; Sasaki, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Optical features of the material forming surfaces of atmosphereless celestial bodies withered with age by reason of space weathering process. To accurately interpret the reflectance spectra of these kinds of planets there is need of the correct laboratory experiments simulating optical maturation of their surfaces and acceptable theoretical models of light scattering. In this work we decided to test the agreement between the results of the laser experiments simulating micrometeorite bombardment of the planetary surface and the predictions of the model of spectral albedo of regolith-like surface.

Derived from text

Computation; Optical Properties; Lasers; Space Weathering; Celestial Bodies; Mathematical Models

20030110834 Geological Survey of Japan, Tsukuba, Japan

4.4 Ga Alteration of Chondrules in Allende (CV3) Parent Body: Evidence from the Rb-Sr System

Shimoda, Gen; Nakamura, Noboru; Kimura, Makoto; Nohda, Susumu; Yamamoto, Koshi; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has been revealed that both of the thermal and aqueous alteration had occurred in the CV parent body. To give a constraint to the alteration processes, the Allende meteorite can be a best example, because the following results indicate that the Allende is the strongest altered meteorite among the CV chondrites, those are: (a) homogeneity of the olivine in matrix of the CV3 chondrites increase from Kaba, Mokoia, Vigarano, Grosnaja to Allende; (b) Allende is markedly depleted in noble gases (c) the abundance of interstellar SiC content decreases significantly from Leoville, Vigarano and Efremovka to Allende. To examine the alteration processes of the Allende meteorite, Rb-Sr system is suitable, because the disturbance of the Rb-Sr system of the Allende chondrite has been reported. Since the opaque assemblage in the CAIs, chondrules and matrix of the Allende chondrite had equilibrated at the similar temperature and since the disturbance of the Rb-Sr system of chondrules is identical to that of the CAIs, the alteration processes affected the Allende inclusions identically. To avoid the differences in the chemical and thermal properties among the inclusions, it should be better to limit a target. Among the inclusions, the chondrules should be suitable, because they have wide variety of chemical compositions, especially in alkaline metal elements. Additionally, to reduce the effect of relict minerals, we focused upon the barred olivine chondrules. The petrographic type and the degree of alteration for the individual chondrule were also determined. In this study, we have improved our preliminary work and give a new insight into the alteration process in the CV parent body. The major goal of this study is to elucidate

of the alteration process in the CV parent body based on the Rb-Sr system of the Allende chondrules.
Derived from text
Allende Meteorite; Chemical Composition; Chondrule; Meteoritic Composition

20030110835 Chicago Univ., Chicago, IL, USA
Insights into the Formation of Type B2 Refractory Inclusions
Simon, S. B.; Grossman, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The petrology of Type B Ca-, Al-rich refractory inclusions is generally thought to be well understood, but actually most of this knowledge is based on studies of Type B1 inclusions (having melilite- rich mantles) and experiments on analogs of B1 bulk compositions. Type B2 inclusions (no mantles) tend to have relatively SiO2-rich compositions compared to those of B1s, and inferences about the formation of CA1s that are based on studies of Type B1 compositions should not be routinely extended to Type B2s. Documentation of fundamental petrologic differences between Types B1 and B2, and determination of which ones can be attributed to bulk composition differences and which depend upon the presence/ absence of a melilite mantle will improve our understanding of the formation of both suites. Some basic questions we are addressing in this study are: 1) What are the zoning patterns and ranges of compositions of melilite in Type B2 inclusions? 2) Are these patterns and ranges related in some systematic way to inclusion bulk composition? 3) Does melilite in Type B2s undergo late zoning reversals, like that in Type B1s? 4) How is melilite in Type B2 inclusions zoned with respect to Na, and do Na contents in Type B2 melilite imply that a mantle is necessary for Na retention?
Derived from text
Inclusions; Meteoritic Composition; Refractories; Formations; Calcium; Aluminum

20030110836 Massachusetts Inst. of Tech., Cambridge, MA, USA
NWA 1586: Macrosmelting in a Monomict Ureilite
Singletary, S. J.; Grove, T. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NWA 1586 is a provisional new ureilite obtained by a meteorite dealer in Morocco in the spring of 2001. In thin section, NWA1586 displays the typical monomict ureilite texture with abundant triple junctions, curved intergranular boundaries and coarse grain sizes (1-2 mm average grain size with one or two grains up to 5 mm in length, Figure 1). Modal silicate mineralogy is 75% olivine: 25% pyroxene - determined by image analysis of an electronprobe stage rastered, Mg x-ray map of the entire thin section. The olivine cores are homogeneous and Fo79 (n=61).
Author
Meteorites; Image Analysis; Ureilites

20030110837 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Oxidant and Radical Detector
Yen, A. S.; Kim, S. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Oxidant and Radical Detector is an instrument designed to characterize the reactive nature of the martian surface environment. Using Electron Paramagnetic Resonance (EPR) techniques, this instrument can detect, identify, and quantify radical species in soil samples, including those inferred to be present by the Viking experiments. This instrument is currently funded by the Mars Instrument Development Program and is compatible with the Mars Science Laboratory mission.
Derived from text
Oxidizers; Mars Surface; Soil Sampling; Radicals; Detection

20030110838 Johns Hopkins Univ., Laurel, MD, USA
South Pole-Aitken Basin: Geology, Basin Floor, and Unit Compositions
Spudis, P. D.; Bussey, D. B. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have compiled a variety of remote sensing data in order to understand as completely as possible, the geological setting of basin units, with the aim of identifying targets where specific exploration goals can be addressed. We have used Apollo, Galileo, Clementine, and Lunar Prospector data to make compositional and geological maps of the basin and its environs. Our objectives are to address the following questions: 1) Does a basin impact melt sheet exist in such form that samples of it could be identified and returned to Earth for analysis?; 2) Do units of mantle provenance exist within the floor of SPA basin?; 3) How deep into the Moon did the SPA impact excavate and what is the crustal provenance of various basin units?; 4) Do post-SPA basin geologic units obscure the original basin configuration and if so, to what degree and where? This paper is a preliminary report on our attempts to address these questions.
Author
Lunar Geology; Moon

20030110839 Kharkov Astronomical Observatory, Kharkov, Ukraine
Overmaturation of Lunar and Mercurian Regolith as a Mechanism of Brightening Effect
Starukhina, L. V.; Shkuratov, Y. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): INTAS-2000-0792; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar soils are characterized by presence of nanometer size grains of reduced iron (npFe(sup 0)) in the 100-200 nm-thick outer zones of regolith particles. Particles of mature lunar soils contain npFe(sup 0)-grains also all over the volume. The average diameter of npFe(sup 0) in the particle rims has been reported to be near 50 angstroms. Besides, Fe(sup 0)-grains of sizes up to a few microns were also found. Overmaturation of a soil, i.e., npFe(sup 0)-grain growth up to sizes as large as 0.1-1 micron may be important for remote sensing of the surface at wavelengths of the order of these sizes. Nanometer grains of Fe(sup 0), being much smaller than optical wavelengths, provide effective light absorption without light scattering. Their presence causes darkening of the lunar soil. When metal grains grow to sizes of the order of the wavelength or larger, they become opaque. For such particles, scattering dominates absorption. Such a removal of efficient light absorbers may cause brightening of overmature soil. Here we estimate the possibility of overmaturation of lunar and Mercurian regolith.
Derived from text
Lunar Rocks; Regolith; Mercury (Planet); Formations; Brightness

20030110840 Tennessee Univ., Knoxville, TN, USA
TES Hyperspectral Mapping of Proposed Paleolake Basins in the Aeolis Quadrangle of Mars: A Search for Aqueous Minerals
Stockstill, K. R.; Ruff, S.; Moersch, J. E.; Baldridge, A.; Farmer, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several studies have presented geomorphic evidence that supports the existence of paleolake basins on Mars. A list of proposed paleolake basins in impact craters was compiled and these workers noted that some basins displaying alternating bands of light and dark albedo materials conformal with the basin margins. They suggested that the bright materials may be evaporite deposits, but this has been debated. Thus far, TES searches for aqueously derived minerals on a global scale have only detected coarse-grained crystalline hematite. We are currently conducting a regional study to search for small exposures of evaporite minerals within putative paleolake basins on Mars. Detection of evaporites on Mars would provide constraints on its paleoclimate.
Derived from text
Geomorphology; Mars Surface; Planetary Mapping; Structural Basins; Minerals; Aqueous Solutions; Thermal Emission; Spectroscopy

20030110841 National Space Development Agency, Tsukuba, Japan
MGM Deconvolution of Reflectance Spectrum of the Y981031 Lunar Meteorite
Sugihara, T.; Owada, A.; Ohtake, M.; Takeda, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report Modified gaussian model (MGM) deconvolution analyses of reflectance spectrum of the Yamato (Y) 981031. Petrological characteristics of Y981031 had already reported. Absorption features derived from the MGM deconvolution are

compared with the petrological characteristics of Y981031, and implication of the absorption features are discussed. Finally, we propose source region of the meteorite using remote sensing data by future lunar exploration.
Derived from text
Lunar Exploration; Meteorites; Spectral Reflectance; Petrology; Remote Sensing

20030110843 Tokyo Univ., Japan
Si and Mg Isotope Fractionations in Melilite in Type B CAIs Measured by SIMS
Sugiura, N.; Mizuno, T.; Ushikubo, T.; Hiyagon, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Si and Mg isotopic compositions are indicators of evaporation processes experienced by CAIs. Bulk Si and Mg isotopic compositions (up to approximately 5 permil/amu for Si and approximately 11 permil/amu for Mg) have been reported. Isotopic heterogeneity within CAIs is of interest because it may reveal how evaporation processes occurred. It may also reveal if secondary processes such as recondensation and equilibration have occurred. Fairly large Mg isotopic fractionations within individual CAIs have been reported but it is not known if such Mg isotopic heterogeneity is common among CAIs. Si isotope measurements of CAIs by SIMS are scarce. A recent report suggested that precise and accurate Si isotope measurements may be difficult. Here we report Si and Mg isotope measurements of CAIs by SIMS.
Derived from text
Fractionation; Magnesium Isotopes; Silicon Isotopes; Mineralogy; Secondary Ion Mass Spectrometry; Calcium; Aluminum; Inclusions

20030110844 Geological Survey, Flagstaff, AZ, USA
Geology of the MER 2003 'Elysium' Candidate Landing Site
Tanaka, K. L.; Skinner, J. A., Jr.; Carr, Michael H.; Gilmore, Martha S.; Hare, Trent H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA Mars Exploration Rover (MER) Project is considering a landing-site ellipse designated EP78B2 in southeastern Utopia Planitia, southwest of Elysium Mons. This ellipse is centered at 11.73N, 123.96E (planetocentric coordinates) and is 155 km long and 16 km wide, has its major axis oriented N86W, and covers approximately 1640 square kilometers. The site appears to be relatively safe for a MER landing site because of its predicted low wind velocities in mesoscale atmospheric circulation models and its thin dust cover and low surface roughness at various scales as indicated by topographic, thermal, and imaging data sets. Here, we assess the geology of the site and environs and discuss the potential science results of a MER investigation to this site.
Derived from text
Mars Exploration; Rover Project; Planetary Geology; Mars Landing Sites; NASA Space Programs

20030110845 Leiden Univ., Netherlands
Simulations of Martian Surface and Subsurface Processes
Kate, I. L. ten; Ruiterkamp, R.; Botta, O.; Lehmann, B.; Hernandez, C. Gomez; Boudin, N.; Foing, B. H.; Ehrenfreund, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Simulation Chamber (MSC) used for the experiments is a 80 cm long, 60 cm diameter vacuum chamber. It has 17 flanged portholes and a hinged door installed that allow access to the interior of the chamber. To simulate the current Martian atmosphere we use a mixture of N2 (2.7 % volume), Ar (1.6 % volume), O2 (1000 volumetric ppm), CO (500 volumetric ppm), H2O (100 volumetric ppm) and CO2 (rest of mixture) at the total pressure of 7 mbar. The experimental protocol comprises three parts: (1) preparation of the chamber, (2) setting the experimental parameters, and (3) in situ and post-processing measurements of the samples. In the preparation phase the sample holders are filled with a mixture of Martian soil simulant, JSC-1, organic compounds and at a later stage also oxidizing agents. During irradiation, samples are taken from the volatiles inside the sample containers and fed to the GCMS in an automated way. Post-processing analysis of the samples will be conducted by high performance liquid chromatography (HPLC) and various other techniques, such as GCMS.
Derived from text
Mars Environment; Vacuum Chambers; Mars Surface Samples; Soils; Simulation

20030110846 Tennessee Univ., Knoxville, TN, USA

An Evaluation of the Igneous Crystallization Programs -- MELTS, MAGPOX, and COMAGMAT, Part 1, Does One Size Fit All?

Thompson, C. K.; Slater, V. P.; Stockstill, K. R.; Anand, M.; Nettles, J.; Milam, K.; Taylor, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Computer models are commonly used in the geologic community to simulate magma crystallization. The computer programs/models evaluated in this study are from 3 sources: MELTS, MAGPOX, and COMAGMAT. Multiple versions exist of the models, and versions available from the authors differ from those available on the internet. It is not always clear which version of a model is used in different studies, or if the model was adapted to fit a certain composition. Likewise, it is unknown if a different model or version should be used depending on the melt composition or its crystallization conditions (P, fO2). Here we compare and evaluate the 3 computer models designed to simulate equilibrium crystallization of basaltic magmas. The bottom line to this study was to determine whether it is appropriate to apply one model to a range of bulk compositions and oxidation states. It is not! Each model has it strengths and weaknesses and should not be used indiscriminantly.

Derived from text

Computer Programs; Crystallization; Igneous Rocks; Computerized Simulation; Melts (Crystal Growth)

20030110847 Brown Univ., Providence, RI, USA

Analogs of Martian Surface Components: Distinguishing Impact Glass from Volcanic Glass

Thomson, B. J.; Schultz, P. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Future Mars sample return missions will obtain radiometric ages of surface units in order to calibrate the relative Martian time scale. Martian geologic units are currently assigned relative ages based on the observed densities of impact craters. Ideal samples for calibration would be from regionally extensive terrains that possess well-defined formation ages, e.g., volcanic plains. The problem confronting a rover visiting such a terrain is that exposures of bedrock may be absent or rare, thereby necessitating sampling of loose material (float). While a local origin of such material may be assumed, the exact mode of origin may be unclear. Rocks on the surface of Mars may be blocks of volcanic glass from impact-disrupted lava flows, or may be impact glasses composed of fused local materials. The ages obtained by dating a sample of impact glass would likely reflect the age of the impact rather than the age of the unit in which it lies, thus complicating the calibration of the cratering time scale. Thus it is important to be able to distinguish impact from volcanic glasses before they are brought back to the lab. In the absence of in-situ petrographic analysis, an analysis of the surface texture of blocks from which samples are obtained may provide some insight into their origin due to the different formation mechanisms of impact and volcanic glasses. In this study we explore possible discriminatory methods based on rock texture.

Derived from text

Mars Surface; Mars Volcanoes; Textures; Glass; Chronology; Planetary Geology

20030110848 Los Alamos National Lab., NM, USA

Mars Odyssey Neutron Sensing of the South Residual Polar Cap

Tokar, R. L.; Moore, K. R.; Elphic, R. C.; Wiens, R. C.; Funsten, H. O.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Viking orbiter infrared thermal mapper indicated that the Mars residual south polar cap is perennially covered in predominantly CO2 [Kieffer, 1979]. This is in contrast to the North Pole, where the residual cap cover is predominantly water ice, [Kieffer et al., 1976]. There are indications that the CO2 cover is thin in spots and variable over seasonal time scales. See James et al. [1992] for a review of the early work on both the seasonal and permanent CO2 and James et al. [2001] for recent observations of the south polar cap. In analogy with the north residual polar cap and supported by recent observations of exposed solid ice near the south pole [Titus et al. 2002], it appears likely that the south residual CO2 covers dirty water ice. However, the thickness and density of the residual CO2 cover is not well known. This study extends the analysis in Tokar et al., 2002, concentrating not on the water ice circumpolar region but instead on the south residual cap. It turns out that the Odyssey GRS neutron observations near the cap are ideally suited to provide estimates of the residual cap CO2 thickness density product. This is because the neutron counts measured in this region are dominated by the cap and are a calculable function of the amount of CO2 on the cap.

Derived from text

Carbon Dioxide; Thermal Mapping; Neutrons; Mars Surface

20030110849 Osaka Univ., Osaka, Japan

Three-Dimensional Structures of Chondrules and Their High-Speed Rotation

Tsuchiyama, A.; Shigeyoshi, R.; Kawabata, T.; Nakano, T.; Uesugi, K.; Shirono, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Three-dimensional structures of chondrules have been studied using X-ray microtomography. The following results were obtained from the studies: (1) Voids are present in chondrules. (2) Olivine has platy morphology in barred olivine (BO) chondrules. (3) Pyroxene has acicular of platy morphology in radial pyroxene chondrules. (4) Chondrules with oblate shapes are present. (5) Voids seem to concentrate near the short axis of an oblate chondrule. (6) Olivine plates are normal to the short axis of an oblate BO chondrule. Tsuchiyama et al. proposed from the results of (4)-(6) that chondrules were rotating with high speed during their formation. However, as they examined only three chondrules, statistical study is required to confirm rotating chondrules.

Derived from text

Three Dimensional Models; Meteoritic Composition; Chondrule; Rotation; High Speed

20030110850 Witwatersrand Univ., Johannesburg, South Africa

Petrographic Observations and Classification: Impactites from the Yaxcopoil-1 Borehole, Chicxulub Impact Structure, Yucatan Peninsula, Mexico

Tuchscherer, M. G.; Reimold, W. U.; Gibson, R. L.; Koeberl, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): ACSPR-37299-AC8; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

First order investigations of impact breccias are crucial for furthering our understanding of large meteorite impacts. Thus, an International Continental Scientific Drilling Project (ICDP) recently recovered the Yaxcopoil-1 drill core from the Chicxulub impact crater, associated with the K/T boundary mass extinction. Sampling at the UNAM core-storage facility, Mexico City provided 75, 15-30 cubic centimeter samples. First data presented here regard 1) the petrography of the impactite samples and 2) recommendations to the proposed I.U.G.S. classification.

Derived from text

Cretaceous-Tertiary Boundary; Petrography; Mexico; Boreholes; Hypervelocity Impact; Classifications; Peninsulas

20030110851 Lunar and Planetary Inst., Houston, TX, USA

Photochemistry and Diffusion in Jupiter's Stratosphere

Moses, J. I.; Fouchet, T.; Bezard, B.; Lellouch, E.; Gladstone, G. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Infrared spectra from Jupiter exhibit numerous emission features due to higher-order hydrocarbons produced from methane photolysis in the upper stratosphere. Photochemical models to date have done a poor job of reproducing the observed hydrocarbon abundances, especially if one considers the new high-quality observational constraints provided by ISO, the Infrared Space Observatory. Recent advances in our knowledge of the stratospheric temperature profile, species abundances, and chemical kinetics data have provided important new model constraints and input parameters, and updated photochemical models are needed in order to explain the observed composition. We use the observational constraints provided by ISO to construct new one-dimensional steady-state models of Jovian stratospheric photochemistry. The models include coupled hydrocarbon and oxygen photochemistry, vertical eddy and molecular diffusion, and radiative transport (including multiple Rayleigh scattering by H2, He, and CH4). We focus on determining the eddy diffusion coefficient profile in the stratosphere, as this information is currently poorly constrained or contradictory. We also discuss the implications with regard to hydrocarbon photochemistry on all the giant planets.

Derived from text

Hydrocarbons; Molecular Diffusion; Photochemical Reactions; Jupiter Atmosphere; Turbulent Diffusion

20030110852 Centre National de la Recherche Scientifique, Vandoeure, France

Simulation of Nitrogen and Noble Gases Release During Atmospheric Entry of Micrometeorites

Toppani, A.; Marty, B.; Zimmermann, L.; Libourel, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pulse-heating experiments were carried out using fragments of the Orgueil (CI1) chondrite. Experiments were run in a 1-atm vertical furnace, at a temperature of 1350 C, in air for different run times from 2s to 120s. These run times were chosen according to our previous work in order to sample the different textures of the MMs: the nonvesicular fine-grained MMs (1350 C-2s), the vesicular fine-grained MMs (1350 C-5s), the scoriaceous MMs (1350 C-10s) and the cosmic spherules (1350 C-120s). Unheated Orgueil fragments and heated Orgueil charges (0.1-1 mg) were loaded in a sample holder, baked over night at a mild temperature of 80 C, and were left under pumping for several weeks before analysis for allowing further degassing of terrestrial contamination. Samples were heated to approx. 1600 C using a de-focused CO2 laser beam and analyzed for rare gases and nitrogen by static mass spectrometry. Most steps were duplicated and mean values are used.
Author
Pulse Heating; Micrometeorites; Nitrogen; Rare Gases; Atmospheric Entry; Chondrites

20030110853 Academy of Sciences (USSR), Moscow, USSR
Effects of the Ion Charge States in Lunar Ilmenites
Ustinova, G. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The noble gases in the lunar ilmenites are analyzed with respect to the charge states of their ions in the solar wind and with respect to the shock wave acceleration of the solar energetic particles.
Derived from text
Ilmenite; Rare Gases; Lunar Surface; Ion Charge

20030110854 Arizona State Univ., Tempe, AZ, USA
Oxygen Isotopic Composition of Renazzo Chondrule Olivine and Comparison with Extent of Chondrule Melting
Varley, L. R.; Leshin, L. A.; Guan, Y.; Zanda, B.; Bourot-Denise, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Renazzo contains abundant large, type I chondrules that appear to have undergone various degrees of melting during their formation. The least melted chondrules have convoluted outlines and are typically fine-grained with metal and silicates dispersed throughout. As the extent of melting increases, chondrule outlines become more rounded and the grain size becomes coarser. Chondrule oxygen isotopic compositions have been the result of increased melting for the most O-16-poor chondrules. It was suggested that the more FeO-rich nature of the O-16-poor chondrules lowered their liquidus temperatures, allowing them to remain molten longer and thus exchange more with O-16-poor nebular gas, during their formation. This study utilizes Renazzo to quantify and compare extent of chondrule melting with O-isotopic composition to explore the relationship between these parameters. An initial assessment was reported, and here we report data from 16 additional Renazzo chondrules.
Derived from text
Chondrule; Isotopic Labeling; Melting; Meteoritic Composition; Olivine; Oxygen Isotopes

20030110855 Field Museum of Natural History, Chicago, IL, USA
Trace Element Geochemistry of New Nakhlites from the Antarctic and the Saharan Desert: Further Constraints on Nakhlite Petrogenesis on Mars
Wadhwa, M.; Crozaz, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Although numerous new meteorites of purported martian origin have been found in recent years, most of these have been classified as belonging to the shergottite type. In fact, of the approximately two dozen meteorites thought to have originated on Mars, approximately 70% are shergottite basalts. Therefore, the recent finds of two paired nakhlites from the Antarctic (Y000593 and Y000749) and another two from the Sahara (NWA 817 and NWA 998) have doubled the number of martian pyroxenites available for study. Previously known nakhlites (Nakhla, Governador Valadares and Lafayette) are virtually identical in terms of their petrologic and geochemical characteristics and, thus, constraints on the petrogenesis of new and potentially diverse members of the nakhlite class are anticipated to provide new insights into the magmatic history of Mars. Towards this goal, we have made an investigation of the trace element systematics in each of these new nakhlites. Results of

our work on NWA 817 were presented earlier; here we report new ion microprobe trace element data for the paired Y000593/749 nakhlites and the NWA 998 Saharan nakhlite.
Derived from text
Antarctic Regions; Geochemistry; Nakhlites; Petrogenesis; Trace Elements; Mars Surface; Sahara Desert (Africa)

20030110856 Field Museum of Natural History, Chicago, IL, USA
Magnesium Isotopic Composition of the Juvinas Eucrite: Implications for Concordance of the Al-Mg and Mn-Cr Chronometers and Timing of Basaltic Volcanism on Asteroids
Wadhwa, M.; Foley, C. N.; Janney, P.; Beecher, N. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In recent years, several extinct chronometers have found extensive application towards defining high-resolution time scales of events in early solar system history. However, where sufficient data are available to compare the relative time scales provided by more than one such chronometer, these are not always in agreement. Possible explanations for such discrepancies could be that: (1) the initial abundances of one or more of the extinct radionuclides under consideration may not have been uniform in the early solar system; (2) the radiometric systems under consideration may have different closure temperatures; (3) one or more of these chronometers may have been reset at a later time by secondary reheating events such as impacts. It is important to establish which of the above may be responsible since this has implications for the sources and distributions of short-lived radionuclides in the early solar system, and consequently for obtaining the precise timing of events in the early solar system. In this work, we report new high precision Mg isotopic data for Juvinas.
Derived from text
Asteroids; Basalt; Chronometers; Magnesium Isotopes; Volcanology; Manganese; Chromium; Aluminum; Meteorites

20030110857 Southwest Research Inst., Boulder, CO, USA
Type II Migration and Giant Planet Survival
Ward, William R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Type II migration, in which a newly formed large planet opens a gap in its precursor circumstellar nebula and subsequently evolves with it, has been implicated as a delivery mechanism responsible for close stellar companions. Large scale migration is possible in a viscously spreading disk of surface density sigma (r,t) when most of it is sacrificed to the primary in order to promote a small portion of the disk to much higher angular momentum orbits. Embedded planets generally follow its evolution unless their own angular momentum is comparable to that of the disk. The fraction of the starting disk mass, M (sub d) = 2pi integral rsigma(r,0)dr, that is consumed by the star depends on the distance at which material escapes the disk's outer boundary. If the disk is allowed to expand indefinitely, virtually all of the disk will fall into the primary in order to send a vanishingly small portion to infinity. For such a case, it is difficult to explain the survival of any giant planets, including Jupiter and Saturn. Realistically, however, there are processes that could truncate a disk at a finite distance, r(sub d). Recent numerical modeling has illustrated that planets can survive in this case. We show here that much of these results can be understood by simple conservation arguments.
Derived from text
Gas Giant Planets; Migration; Mathematical Models; Protoplanetary Disks

20030110858 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Size Distribution of Jupiter-Family Cometary Nuclei
Weissman, Paul R.; Lowry, Stephen C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: We are continuing our program to determine the size distribution of cometary nuclei. We have compiled a catalog of 105 measurements of 57 cometary nuclei, drawn from the general literature, from our own program of CCD photometry of distant cometary nuclei (Lowry and Weissman), and from unpublished observations by colleagues. We model the cumulative size distribution of the nuclei as a power law. Previous determinations of the size distribution slope do not agree. Fernandez et al. found a slope of alpha = 2.65+/-0.25 whereas Lowry et al. and Weissman and Lowry each found a slope of alpha = 1.60+/-0.10.
Derived from text
Size Distribution; Comet Nuclei; Charge Coupled Devices; Photometry

20030110859 Freie Univ., Berlin, Germany

The End of the Heavy Bombardment as Reflected in the Ages of Martian Impact Basins

Werner, S. C.; Neukum, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Global stratigraphic schemes for planetary bodies usually are based on the most common resurfacing process: the impacts of planetesimals, which remain as craters and basins or related features (e. g. ejecta) on planetary surfaces. Through this random impact cratering process, the counting of the superimposed number of impact craters on planetary surface units offers a valuable procedure in understanding the chronostratigraphic relationships of the impact structures.For the interpretation of the ages of Martian basins we remapped the ejecta blankets of the largest 20 impact basins (larger than 250 km) on Viking imagery. Additional information for the interpretation of important geological units was obtained using MOLA topographic data. For these 20 basins with detectable ejecta blankets the measured ages are within the expected range of 3.7 to 4.1 Gyr. A few basins, where no ejecta could be identified because of obvious resurfacing processes are suspected to be even older. A relatively young age of 3.4 billion years was obtained for the fresh looking crater Lyot, which resembles a basin but could be classified also just as a large crater with a peak ring.

Derived from text

Mars Craters; Geochronology; Structural Basins

20030110860 Freie Univ., Berlin, Germany

The Erosional History of Athabasca Valles, Mars

Werner, S. C.; vanGasselt, S.; Neukum, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As one of the candidate Mars Exploration Rover (MER) landing sites a landing ellipse in the Athabasca Valles was under consideration. The erosional history of the proposed area is complex and diverse.

Author

Erosion; Mars Surface

20030110861 Witwatersrand Univ., Johannesburg, South Africa

Impact-related Structures in the Central Uplift of the Vredefort Impact Structure, South Africa

Wieland, F.; Gibson, R. L.; Reimold, W. U.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A structural investigation of the well-exposed northern and western parts of the Vredefort dome has established the geometry and chronology of pre-, syn- and post-impact deformation features. The strata display a crude polygonal geometry with zones of complex monoclinal or symmetric folding, and radial oblique-slip faulting separating relatively straight segments. Pseudotachylitic breccia is ubiquitous, but shows a morphological and volumetric correlation with rock type, in addition to an overall decrease in abundance outwards from the center of the dome. Multiple joint sets are intensely developed in all rock types and include sets displaying normal-slip displacements, which are consistent with radial and tangential collapse of the central uplift. These joints may postdate pseudotachylitic breccia veins.

Derived from text

Structural Properties (Geology); Geomorphology; Veins (Petrology); Igneous Rocks; Craters; Impact Damage

20030110862 Brown Univ., Providence, RI, USA

The Effect of Rotation on the Deposition of Terrestrial Impact Ejecta

Wrobel, K. E.; Schultz, P. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The distribution of distal ejecta on the Earth differs from that of the Moon due to the presence of an atmosphere and rapid rotation. Previous studies demonstrated the significant effects of planetary rotation on ejecta deposition with application to Mars and Earth. The effects of rotation on ejecta emplacement on the Earth differ slightly from the effects observed on Mars due to the much larger size of the Earth.

Author

Ejecta; Planetary Rotation; Trajectory Analysis

20030110863 Arizona State Univ., Tempe, AZ, USA

THEMIS Observations of Low-Albedo Intracrater Materials and Wind Streaks in Western Arabia Terra

Wyatt, M. B.; McSween, H. Y., Jr.; Moersch, J. E.; Gorelick, N. S.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Thermal infrared day and night images (100m/pixel) from the Mars Odyssey Thermal Emission Imaging System (THEMIS) are used for thermophysical and spectral analyses of low-albedo intracrater materials and wind streaks in Western Arabia Terra. THEMIS data are compared with Mars Global Surveyor (MGS) Thermal Emission Spectrometer (TES) derived surface compositions and Mars Orbiter Camera (MOC) observations to constrain origin hypotheses for these materials.

Author

Albedo; Mars Craters; Wind Effects

20030110864 Southwest Research Inst., San Antonio, TX, USA

Distribution, Morphology and Structural Associations of Martian Pit Crater Chains

Wyrick, D. Y.; Ferrill, D. A.; Sims, D. W.; Colton, S. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We systematically mapped large regions of the western hemisphere of Mars using Mars Orbiter Camera (MOC) wide angle and narrow angle images. The wide angle images have a resolution of 232 m per pixel and were used to map regional distribution and orientation of pit chains. In the study area approximately 1000 pit chains were mapped with an additional 270 possible pit chains. The MOC narrow angle images, with a resolution of 5 m per pixel, were used to study detailed pit morphology.

Author

Mars Surface; Landforms

20030110865 Tokyo Univ., Japan

New Method of Photometric Correction for Lunar UVVIS Images

Yokota, Y.; Honda, R.; Iijima, Y.; Mizutani, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An accurate phase function is necessary for precise photometric correction of the Clementine lunar UVVIS images. Although several researchers have proposed photometric models for Clementine UVVIS images using empirical phase functions additional work is required for correction of the data at small phase angle (<20 degrees), because the phase function at small phase angle is significantly dependent on both the wavelengths and the geology. We propose the iterative method of photometric correction, in which automatic clustering of multi-band spectrum by Self-Organizing Map (SOM) method, and determination of phase function for each spectral group are successively performed.

Derived from text

Correction; Photometry; Lunar Surface; Image Processing; Imaging Techniques

20030110867 Arizona State Univ., Tempe, AZ, USA

Electron Energy-Loss Spectroscopy (EELS) of Fe-bearing Sheet Silicates in CM Chondrites

Zega, Thomas J.; Garvie, Laurence A. J.; Buseck, Peter R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-9352; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The primitive character and hydrated mineralogy of the CM chondrites offers insight into some of the earliest reactions between solids and water. Such reactions profoundly affected the matrices and fine-grained rims (FGRs) [1-4], two of the most significant components of these meteorites [5]. We are using EELS combined with a transmission electron microscope (TEM) to investigate the compositions of Fe-bearing minerals, with emphasis on determining oxidation states and quantification of oxidation-state ratios. Iron is among the most abundant elements in the solar system and it can occur naturally in three oxidation states: Fe0, Fe2+, and Fe3+. Determination of oxidation- state ratios is useful because they can be used to infer the redox conditions under which the minerals formed or were last equilibrated [6, 7]. We are particularly interested in

understanding how the oxidation state of Fe was affected by the aqueous reactions of the CM chondrites.
Author
Chondrites; Mineralogy

20030110868 Washington Univ., Saint Louis, MO, USA
The Apollo 16 Mare Component: Petrography, Geochemistry, and Provenance
Zeigler, R. A.; Haskin, L. A.; Korotev, R. L.; Jolliff, B. L.; Gillis, J. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-10485; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The A16 (Apollo16) site in the lunar nearside highlands is 220 km from the nearest mare. Thus it is no surprise that mare basalt samples are uncommon at the site. Here, we present the petrography and geochemistry of 5 new mare basalt samples found at the A16 site. We also discuss possible provenances of all A16 mare basalt samples using high-resolution global data for the distribution of Fe and Ti on the lunar surface derived from Clementine UV-VIS data [1-2].
Author
Basalt; Geochemistry; Petrography

20030110869 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Berlin, Germany
Extension Across Valles Marineris and the Thaumasia 'Rift', Mars
Zuschneid, W.; Hauber, E.; Kronberg, P.; Jaumann, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We calculate the amount of crustal stretching across the Valles Marineris and a large graben structure in the western Thaumasia region. We measure vertical offsets in a set of transects using data obtained by the MOLA laser altimeter. Assuming a fault dip angle of 60 degrees, correcting for landslide deposits, but ignoring other sediment cover, we obtain extension values from 9 km in western Ius Chasma to 20 km in eastern Melas Chasma, decreasing toward eastern Coprates Chasma. The Thaumasia graben in the Claritas Fossae region shows extension of 0.5 to 4.5 kilometers. An interpretation and discussion of the results will be given.
Derived from text
Geological Faults; Mars Surface; Topography; Tectonics

20030110870 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
An Automated Approach for Acquiring Onboard Rover Science
Anderson, R. C.; Castano, R.; Decoste, D.; Mazzoni, D.; Dohm, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Rover traverse distances are increasing at a faster rate than downlink capacity is increasing. As this trend continues, the quantity of data that can be returned to Earth per meter traversed is reduced. The capacity of the rover to collect data, however, remains high. This circumstance leads to an opportunity to increase mission science return by carefully selecting the data with the highest science interest for downlink. We have developed an onboard science analysis technology for increasing science return from missions. Our technology evaluates the geologic data gathered by the rover. This analysis is used to prioritize the data for transmission, so that the data with the highest science value is transmitted to Earth. In addition, the onboard analysis results are used to identify additional science gathering opportunities. A planning and scheduling component of the system enables the rover to take advantage of the identified science opportunity.
Author
Data Transmission; Lunar Rocks; Image Analysis

20030110871 NASA Johnson Space Center, Houston, TX, USA
A Critical Examination of Relative Concentrations of Volume-correlated and Surface-correlated Submicron Globules of Pure Fe-0 in Lunar Soils
Basu, A.; McKay, D. S.; Wentworth, S. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-9369; RTOP 344-31-00; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impacts on lunar soils produce melt and vapor in an approximate proportion of 7:1. The melt scavenges soil grains of diverse size, quenches and forms agglutinates, thereby converting surface correlated components of soil grains as volume correlated components; simultaneously, parts of the vapor may condense or escape. Cumulative small impacts increase the maturity of the soils, increase the abundance of agglutinates, and increase the concentration of vapor condensated material. Since the discovery of vapor deposited crystalline Fe-0 in vugs of regolith breccias and the theoretical anticipation of amorphous vapor deposits of diverse composition coating lunar soils grains, empirical evidence is gathering in support of such deposits, now commonly called vapor deposited patina (VDP). In addition, submicron globules of Fe-0 are seen to be ubiquitous in VDP. The amorphous VDP lowers the albedo of lunar soils, affects magnetic properties of soils, changes the slopes of uv-vis-ir reflectance spectra, and potentially also alters the gamma and x-ray spectra of lunar soils, compromising compositional inferences from remote sensing.
Derived from text
Globules; Lunar Soil; Iron Alloys; Vapor Deposition; Agglutination

20030110872 University of Northern Arizona, Flagstaff, AZ, USA
Martian South Polar Deformation and Sublimation Processes
Brightwell, S. N.; Kargel, J. S.; Titus, T. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first glacial deformations of an extraterrestrial ice sheet have been discovered and documented at the Martian south polar cap in Mars Orbital Camera (MOC) images. Within the south polar cap various structural deformational features have been found, including boudinage, folds, and faults. These features are also found in terrestrial glaciers. Each of the mapped classes of features has a distribution related to geologic units, material properties, and topographic features within the South Polar deposits. We are investigating the specific relationships, which are being explored with a combination of MOC, MOLA, TES, and THEMIS data. We expect this study to yield clues to polar processes and the origins of these features and their relationships to ice composition.
Derived from text
Mars (Planet); Mars Surface; Polar Regions; Sublimation; Deformation

20030110873 Hawaii Univ., Honolulu, HI, USA
Feldspathic Clasts in Polymict Ureilites
Cohen, B. A.; Goodrich, C. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ureilites are ultramafic meteorites composed mainly of magnesian (mg#=76-95) olivine and pyroxene, with minor carbon-bearing phases and metal. Ureilite characteristics suggest that monomict ureilites are residues of partial melting on a carbonaceous chondrite-like asteroidal parent body. Basaltic meteorites complementary to the monomict ureilites are currently unknown, but would provide compositional, isotopic, and geochronologic information critical to constraining the composition and evolution of the ureilite parent body (UPB).
Derived from text
Carbonaceous Chondrites; Basalt; Mineralogy; Pyroxenes; Ureilites; Meteorites; Breccia

20030110874 Rutherford Appleton Lab., Chilton, UK
Mapping of the Lava Flows in Oceanus Procellarum Using Clementine Multispectral Data
Dunkin, S. K.; Heather, D. J.; Crawford, I. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this abstract we outline our continuing work to map the mare basalts across the lunar surface using the Clementine UVVIS dataset. Oceanus Procellarum represents the most widespread continuous deposit of mare basalts on the Moon, and an understanding of the nature of the materials within this mare is therefore of key importance to our understanding of the volcanic history and thermal evolution of the Moon. The region contains several unsampled basalts so a comprehensive compositional study of all units in the region is vital if we are to fully understand the way in which lunar volcanism has shaped

the Moon, and the ways in which lunar magmas and the lunar crust evolved through time.
Derived from text
Fluid Flow; Lava; Lunar Surface; Lunar Maria; Lunar Crust

20030110877 Space Science Inst., Boulder, CO, USA
Analysis of MGS TES Data over Acidalia Planitia and Cydonia Mensae: Compositional Evidence for Hydrovolcanic Activity?
Farrand, W. H.; Gaddis, L. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-10577; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For this study, Mars Global Surveyor (MGS) Thermal Emission Spectrometer (TES) emissivity data for Acidalia Planitia and Cydonia Mensae (Figure 1) were assembled and used to examine the surface mineralogy of these areas. Analyzing TES data for high latitude locales such as Acidalia presents a challenge since the surface temperatures over these regions is inherently lower than for equatorial locales. In this report, analyses of TES data are described and results are evaluated for potential compositional evidence for hydrovolcanic activity in Acidalia and Cydonia.
Author
Mars Surface; Mineralogy; Volcanoes

20030110879 New Mexico Univ., Albuquerque, NM, USA
Numerical Simulations of Cosmogenic Neutron Production and Transport in Planetary Surfaces
Kim, Kyeong J.; Drake, Darrell M.; Reedy, Robert C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The numerical simulation code MCNPX was used to calculate the production and transport of cosmic-ray-produced neutrons in Mars and meteorites. These calculations help to understand the processes involved and the parameters that control the neutron fluxes. Results are presented here for neutrons in Mars and for the distribution of cosmic-ray neutrons and protons in a 50 cm-radius L-chondrite.
Author
Neutrons; Radiation Transport; Mars (Planet); Meteorites

20030110880 Academy of Sciences (USSR), Moscow, USSR
Petrochemical Comparision of Venus' Rocks with Terrestrial Oceanic Igneous Rocks Using the Discriminant Method
Abdrakhimov, A. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Five Venus surface materials were measured in only K, U, and Th by GRS and three were measured in major petrochemical elements without Na2O by XRF, all close in their chemistry to basalts. The goal of this work is to compare the analyzed Venus rocks and terrestrial igneous rocks to search for similariries/dissimilarities in their chemistry, which at some degree is correlated with geodynamic environment. With the aim of planetological geochemical comparisons databases of their chemical analyses were compiled for each considered geodynamic enviroment.
Derived from text
Igneous Rocks; Venus (Planet); Venus Surface; Petrology; Extraterrestrial Oceans; Discriminant Analysis (Statistics)

20030110881 Tokyo Univ., Japan
The Effect of Obliquity and Surface Condition on the Freezing Condition of a Planet: Implications for Paleo-Mars Climate and Habitable Condition
Abe, Yutaka; Abe-Ouchi, Ayako; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The condition for the occurrence of a completely frozen state (a 'snow-ball' state) is investigated with a general circulation model for both a land planet case (a wet planet without fixed ocean) and an aqua planet (a planet entirely covered by an ocean) with a particular reference to the obliquity.The condition of the complete freezing is an important indicator for

the planetary climate, because it restricts the habitability of the planet. Though the complete freezing does not sterilize the planet, as some types of life may survive on a completely ice-covered planet, it will give restrictions on the types of life. Recent studies suggest a chaotic change of planetary obliquity. Therefore, the effect of obliquity on the complete freezing is an interesting issue on the condition of habitable exoplanets.
Derived from text
Extrasolar Planets; Freezing; Planetary Surfaces; Paleoclimatology; Mars Environment; Obliqueness

20030110883 Oulu Univ., Finland
Fluvial Processes Modifications of the Impact Craters in the Greater Hellas Region, Mars
Aittola, M.; Kostama, V.-P.; Lahtela, H.; Raitala, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The way how each of the impact crater appear on the Mars surface has been effected by numerous factors beginning from the size, mass, velocity, type, and impact angle of the approaching projectile. These all have effected the impact energy delivered into the surface. The bedrock properties have then resulted in additional effects. Pre-existing faults and fractures have contributed to the formation of an amount of polygonal craters . Permafrost-saturated layers are melted to splash around the crater to form rampart ejectas instead of usual ejecta fields and secondary craters. Some impacts may even have hit into shallow water areas resulting in almost immediate rim erosion due to the back-surge forces. In addition to these major phenomena there may have been numerous more delicate variations due to local projectile-bedrock combinations. Various post-impact deformation processes may then have changed the appearance of an impact crater even in an amount which may make it difficult to identify any original crater characteristics in great details. The changes in the crater appearances can, however, be looked in a positive way to provide crucial information of the local surface geology, bedrock properties and, more generally, of the whole post-impact geological evolution of the area studied. This is why we have characterized and studied in details the various crater deformation types found from within the large Hellas area. It is one of the possible previous water body areas on Mars and lies also close to the southern permafrost and the south pole environment. Craters modified by recent fluvial processes: A liquid material has been found important in deforming layered crater rims even rather recently. Such flow features may begin from within alcove depressions or source wells, resulting in lengthy channel-like downslope erosion, and ending in apron-like cumulation pilings.
Derived from text
Mars Surface; Mars Craters; Surface Properties; Erosion; Geology

20030110884 Consiglio Nazionale delle Ricerche, Rome, Italy, NASA Johnson Space Center, Houston, TX, USA
OMEGA Observations of Mars Analogue Rocks
Bonello, G.; Bibring, J. P.; Morris, R. V.; Mustard, J. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the last 20 years, imaging spectrometry in the visible and near infrared onboard spacecraft has become an essential technique to study surfaces and atmospheres of planetary objects, prior and in addition to in-situ analyses. Remote sensing experiments analyzing the sunlight reflected by planetary surfaces can be used to derive the mineralogical composition and physical properties of the natural surfaces and atmospheres observed. This technique was successfully used on Mars with ISM instrument. As an improvement of ISM, OMEGA onboard MARS-EXPRESS will play a key role in the mineralogical mapping of the Martian surface. We present the reflectance measurements made with OMEGA during on ground calibration sessions on natural slabs of rocks and minerals part of a database which will be used on similar future American instruments (as CRISM onboard MRO). We discuss the implication on the scientific capabilities of OMEGA instrument.
Author
Mars Surface; Mineralogy; Rocks; Mars Atmosphere

20030110885 Rensselaer Polytechnic Inst., Troy, NY, USA
Physical Characteristics of Asteroid-like Comet Nucleus C/2001 OG108 (LONEOS)
Abell, P. A.; Fernandez, Y. R.; Pravec, P.; French, L. M.; Farnham, T. L.; Gaffey, M. J.; Hardersen, P. S.; Kusnirak, P.; Sarounova, L.; Sheppard, S. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-10345; NAG5-7598; A3003204; 205-99-0255; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For many years several investigators have suggested that some portion of the near-Earth asteroid population may actually be extinct cometary nuclei. Evidence used to support these hypotheses was based on: observations of asteroid orbits and associated meteor showers (e.g. 3200 Phaethon and the Geminid meteor shower); low activity of short period comet nuclei, which implied nonvolatile surface crusts (e.g. Neujmin 1, Arend-Rigaux); and detections of transient cometary activity in some near-Earth asteroids (e.g. 4015 Wilson-Harrington). Recent investigations have suggested that approximately 5-10% of the near- Earth asteroid population may be extinct comets. However if members of the near-Earth asteroid population are extinct cometary nuclei, then there should be some objects within this population that are near their final stages of evolution and so should demonstrate only low levels of activity. The recent detections of coma from near-Earth object 2001 OG108 have renewed interest in this possible comet-asteroid connection. This paper presents the first high quality ground-based near-infrared reflectance spectrum of a comet nucleus combined with detailed lightcurve and albedo measurements.
Derived from text
Asteroids; Comet Nuclei; Near Earth Objects; Physical Properties

20030110886 NASA Johnson Space Center, Houston, TX, USA
Mars Hematite Site: Potential for Preservation of Microfossils
Allen, Carlton C.; Westall, Frances; Longazo, Teresa; Schelble, Rachel; Probst, Luke; Flood, Beverly; Lunar and Planetary Science XXXIV; March 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Defining locations where conditions may have been favorable for life is a key objective for the exploration of Mars. Of prime importance are sites where conditions may have been favorable for the preservation of evidence of pre-biotic or biotic processes. Areas displaying significant concentrations of the mineral hematite (alpha-Fe2O3) have been identified from orbit by thermal emission spectrometry. The largest such deposit, in Sinus Meridiani, is a strong candidate landing site for one of the twin Mars Exploration Rovers, scheduled to launch in 2003. The Martian hematite site may have significance in the search for evidence of extraterrestrial life. Since iron oxides can form as aqueous mineral precipitates, the potential exists for preserving microscopic evidence of life in ecosystems that deposit iron oxides. Terrestrial hematite deposits proposed as possible analogs for the hematite sites on Mars include massive (banded) iron formations, iron oxide hydrothermal deposits, iron-rich laterites and ferricrete soils, and rock varnish. We are engaged in a systematic effort to document the evidence of life preserved in iron oxide deposits from each of these environments.
Derived from text
Hematite; Mars Exploration; Mars Surface; Iron Oxides; Extraterrestrial Life

20030110887 NASA Johnson Space Center, Houston, TX, USA
Exploring the Solar System Activities Outline: Hands-On Planetary Science for Formal Education K-14 and Informal Settings
Allen, J. S.; Tobola, K. W.; Lindstrom, M. L.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Activities by NASA scientists and teachers focus on integrating Planetary Science activities with existing Earth science, math, and language arts curriculum. The wealth of activities that highlight missions and research pertaining to the exploring the solar system allows educators to choose activities that fit a particular concept or theme within their curriculum. Most of the activities use simple, inexpensive techniques that help students understand the how and why of what scientists are learning about comets, asteroids, meteorites, moons and planets. With these NASA developed activities students experience recent mission information about our solar system such as Mars geology and the search for life using Mars meteorites and robotic data. The Johnson Space Center ARES Education team has compiled a variety of NASA solar system activities to produce an annotated thematic outline useful to classroom educators and informal educators as they teach space science. An important aspect of the outline annotation is that it highlights appropriate science content information and key science and math concepts so educators can easily identify activities that will enhance curriculum development. The outline contains URLs for the activities and NASA educator guides as well as links to NASA mission science and technology. In the informal setting educators can use solar system exploration activities to reinforce learning in association with thematic displays, planetarium programs, youth group gatherings, or community events. Within formal education at the primary level some of the activities are appropriately designed to excite interest and arouse curiosity. Middle school educators will find activities that enhance thematic science and encourage students to think about the scientific process of investigation. Some of the activities offered

are appropriate for the upper levels of high school and early college in that they require students to use and analyze data.
Derived from text
Planetary Geology; Space Exploration; Education; Earth Sciences; Solar System

20030110888 Lockheed Martin Corp., Houston, TX, USA
A Future Moon Mission: Curatorial Statistics on Regolith Fragments Applicable to Sample Collection by Raking
Allton, J. H.; Bevill, T. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The strategy of raking rock fragments from the lunar regolith as a means of acquiring representative samples has wide support due to science return, spacecraft simplicity (reliability) and economy [3, 4, 5]. While there exists widespread agreement that raking or sieving the bulk regolith is good strategy, there is lively discussion about the minimum sample size. Advocates of consor-tium studies desire fragments large enough to support petrologic and isotopic studies. Fragments from 5 to 10 mm are thought adequate [4, 5]. Yet, Jolliff et al. [6] demonstrated use of 2-4 mm fragments as repre-sentative of larger rocks. Here we make use of cura-torial records and sample catalogs to give a different perspective on minimum sample size for a robotic sample collector.
Author
Robotics; Lunar Rocks; Sampling; Moon

20030110890 Washington Univ., Saint Louis, MO, USA
Continued Study of Presolar Graphite from Murchison Separate KFA1
Amari, S.; Stadermann, F. J.; Zinner, E.; Lewis, R. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Presolar graphite was isolated from the Murchison meteorite [1] only 3 years after the discovery of presolar SiC [2]. Yet it has not been studied as extensively as SiC. One of the reasons is that trace element concentrations in graphite grains are, in general, not high enough to perform isotopic analysis with sufficient precision. A new type of ion microprobe, the NanoSIMS, has recently been installed at Washington University in St. Louis. Its high sensitivity at highmass resolution and its multi-detection capability [3] make it possible to measure isotopic ratios of trace elements with unprecedented precision. We have previously reported C, N, O, and Si isotopic ratios of graphite from the Murchison KFA1 separate (2.05- 2.10g/cm3) [4]. We extended our studies to Mg-Al, K, Ca, and Ti in the same KFA1 graphite grains that we had previously analyzed in order to obtain correlated isotopic ratios.
Author
Graphite; Murchison Meteorite; Isotope Ratios

20030110891 Geological Survey of Canada, Ottawa, Ontario, Canada
Distribution of U, Th, Pb and Nd Between Minerals in Chondrules and CAIs
Amelin, Y.; Stern, R.; Krot, A. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowing the distribution of U, Th and radiogenic Pb in chondrules and refractory inclusions is important for accurate interpretation of U-Pb isotopic dates. For example, the distribution of U between primary and secondary minerals can indicate whether the date corresponds to formation or to alteration of a chondrule or a CAI. In the case of dating equilibrated (i.e. metamorphosed) chondrites, we need to know the host mineral of U in order to apply correct diffusion parameters for estimating closure temperatures.
Derived from text
Uranium; Thorium; Neodymium; Chondrule; Isotopes; Radiogenic Materials; Time Measurement

20030110892 Tennessee Univ., Knoxville, TN, USA
Petrologic Comparisons of Lunar Mare Basalt Meteorites Dh-287A and NWA 032
Anand, M.; Taylor, L. A.; Nazarov, M. A.; Patchen, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recently, two new mare basalt meteorites have been recovered from the hot deserts, and it is the aim of this study to compare their petrogenetic histories in an assessment of possible source-area pairing. Dhofar 287 (Dh-287) and North West

Africa 032 (NWA 032) were recovered from the desert regions of Oman and the Sahara, NW Africa, resp. Dh- 287 consists mainly (> 95%) of a large mare basalt clast (Dh-287A) with a small portion of a breccia (Dh- 287B) attached on one side. To date, these rocks represent two out of only 5 mare basalt meteorites in the entire lunar collection, having fallen only a few thousand kilometers apart.Therefore, they form an important group of samples that provide clues to the magmatic history of the Moon. Both meteorites are akin to low-Ti basalts of A-12 and 15, but have distinct petrogenesis.
Derived from text
Petrogenesis; Meteorites; Mineralogy; Lunar Rocks

20030110893 New Mexico Univ., Albuquerque, NM, USA
HRTEM and EFTEM Observations of Matrix in the Oxidized CV3 Chondrite ALH 84028: Implications for the Origins of Matrix Olivines
Abreu, Neyda M.; Brearley, Adrian J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578 Contract(s)/Grant(s): NAG5-9798; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The determination of the nature, distribution, and origin of organic material in carbonaceous chondrites is fundamental to understanding early solar nebular conditions and the origin of life. Using a variety of extraction techniques, followed by detailed chemical analysis, an extensive suite of organic compounds has been identified in carbonaceous chondrites. These data have provided key information on the diversity and isotopic composition of the organic component in chondrites. However, one disadvantage of extraction techniques is that all information regarding the spatial distribution of the organics on a fine scale is lost. This is especially important for the insoluble macromolecular carbon, which constitutes approximately 70% of the carbon in carbonaceous chondrites such as Murchison. The distribution and mineralogical associations may provide important constraints on the possible origins of the carbonaceous material. Our previous studies of the CV3 chondrites Allende and Vigarano have demonstrated that energy filtered transmission electron microscopy (EFTEM), combined with high resolution TEM (HRTEM) are powerful tools for the in situ characterization of insoluble organic matter in carbonaceous chondrites. In this study, we have used SEM and TEM techniques to characterize the matrix mineralogy of the CV3 chondrite ALH 84028 and examine the distribution and mineralogical associations of carbon. We are especially interested in establishing whether the occurrence of poorly graphitized carbon (PGC), observed in Allende matrix olivines, is common to all oxidized CV3 chondrites or is a unique feature of Allende.
Derived from text
Carbonaceous Chondrites; High Resolution; Mineralogy; Olivine; Transmission Electron Microscopy; Oxidation

20030110894 New Mexico Univ., Albuquerque, NM, USA
Melting of Model Martian Mantle at High-Pressure: Implications for the Composition of the Martian Basalt Source Region
Agee, C. B.; Draper, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

High-pressure melting experiments on the Homestead L5 ordinary chondrite were performed at 5 GPa in a multi-anvil device over a temperature interval that ranged from near solidus to near liquidus conditions. Near solidus silicate liquids of Homestead have higher CaO/Al2O3 and lower Mg# compared to solidus liquids of terrestrial peridotite (e.g.: KLB-1) at this pressure. The silicate portion of Homestead is similar to proposed model Martian mantle compositions and therefore these experiments may place constraints on the nature of melts derived from the Martian interior at high pressure. For example, the super-chondritic CaO/Al2O3 of several proposed shergottite parent magmas fall within the range of the experimental Homestead melts, however the CaO and Al2O3 contents of the shergottite parent magmas are higher than Homestead melts. Thus a model Martian mantle composition can produce shergottite CaO/Al2O3 by partial melting at a depth of approximately 425 km, however a second stage of shallow level magmatism with olivine (low-Ca pyroxene) fractionation is required to match CaO and Al2O3 values. FeO content of Homestead partial melts at 5 GPa are much higher than are those of shergottite parent magmas, implying that the shergottite source mantle could be lower in FeO than the Dreibus and Wanke Martian mantle composition.
Derived from text
Basalt; Chondrites; High Pressure; Mars (Planet); Melting; Composition (Property); Planetary Mantles

20030110895 McGill Univ., Montreal, Quebec, Canada

Paleomagnetic Pole Position of Mars Revisited

Boutin, Daniel; Arkani-Hamed, Jafar; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars has become a one-plate planet since at 4 Gyr. ago, and no pervasive tectonic activities have occurred since, except for giant impact basins such as Hellas, Argyre and Isidis. Small impact craters have only modified upper portions of the crust. The large scale tectonics of Mars possibly occurred in the early history of the planet, before it became a one-plate planet, are more likely preserved in the areas far from the giant basins. These large scale features are expected to resemble the tectonics features of Earth in the Hadean and Early Archean which have been removed by the plate tectonics of the Earth. Studying the tectonic pattern of Mars may provide good information about that of the early Earth.

Derived from text

Magnetic Poles; Paleomagnetism; Planetary Geology; Mars Surface

20030110896 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Depth and Distribution of CO2 Snow on Mars

Aharonson, Oded; Zuber, Maria T.; Smith, David E.; Neumann, Gregory A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The dynamic role of volatiles on the surface of Mars has been a subject of longstanding interest. In the pre-Viking era, much of the debate was necessarily addressed by theoretical considerations. A particularly influential treatment by Leighton and Murray put forth a simple model relying on solar energy balance, and led to the conclusion that the most prominent volatile exchanging with the atmosphere over seasonal cycles is carbon dioxide. Their model suggested that due to this exchange, atmospheric CO2 partial pressure is regulated by polar ice. While current thinking attributes a larger role to H2O ice than did the occasional thin polar coating this model predicted, the CO2 cycle appears to be essentially correct. There are a number of observational constraints on the seasonal exchange of surface volatiles with the atmosphere. The growth and retreat of polar CO2 frost is visible from Earth-based telescopes and from spacecraft in Mars orbit, both at visible wavelengths and in thermal IR properties of the surface. Recently, variations in Gamma ray and neutron fluxes have also been used to infer integrated changes in CO2 mass on the surface. Measurements made by Viking's Mars Atmospheric Water Detector experiment were sensitive to atmospheric H2O vapor abundance. Surface condensates and their transient nature were detected by the Viking landers. The study here is motivated by recent data collected by the Mars Global Surveyor, affording the opportunity to not only detect the lateral distribution of volatiles, but also to constrain the variable volumes of the reservoirs. We elaborate on a technique first employed by Smith et al. By examining averages of a large number of topographic measurements collected by the Mars Orbiter Laser Altimeter (MOLA), that study showed that the zonal pattern of deposition and sublimation of CO2 can be determined. In their first approach, reference surfaces were fit to all measurements in narrow latitude annuli, and the time dependent variations about those mean surfaces were examined. In their second approach, height measurements from pairs of tracks that cross on the surface were interpolated and differenced, forming a set of crossover residuals. These residuals were then examined as a function of time and latitude. The initial studies averaged over longitude to maximize signal and minimize noise in order to isolate the expected small signal. In this follow-up study we now attempt to extract the elevation change pattern also as a function of longitude, and we focus on the crossover approach.

Derived from text

Carbon Dioxide Concentration; Mars Surface; Snow; Volatility; Depth

20030110898 Oxford Univ., Oxford, UK

Gone But Not Forgotten: The Aeolian Modification of Fluvial Surfaces on Mars: Preliminary Results from Central Australia

Bourke, M. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): MDAP-613386; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

MOC images indicate that aeolian ridges may mask and even obliterate primary depositional surfaces on Mars. This modification increases the difficulty in mapping the recent geological history of the planet. An analogue study in central Australia demonstrates how patterns in aeolian dunes, formed over abandoned fluvial surfaces, can be used to detect buried fluvial features.

Author

Mars Surface; Dunes; Geology

20030110899 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Strain Histories Among Alba and Syria Planum, Mars

Anderson, R. C.; Dohm, J. M.; Hare, T.; Haldemann, A. F. C.; Baker, V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The centers work of Anderson et al. (2001) [1] identified two prominent centers in the Tharsis region, Syria Planum and Alba Patera (Stage 2 and Stage 4 respectively). Because of their perceived influence on the geologic and possible paleoclimatic histories of Mars, Mars Orbiter Laser Altimetry (MOLA) along with published stratigraphic and paleotectonic information (including the centers information) were analyzed using Geographic Information Systems (GIS) to perform a comparative investigation of their strain histories through time. This investigation highlights their similarities and distinctions, including their topographic and morphologic signatures, deformational extent, and intensities and durations of activity.

Author

Topography; Mars Volcanoes

20030110900 NASA, Washington, DC, USA

Evidence for a Thick Mantle of Volatile-rich Materials in the Utopia Basin, Mars, Based on Crater Depth/Diameter Measurements

Boyce, Joseph M.; Mouginis-Mark, Peter J.; Garvin, James B.; Garbeil, Harold; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study focuses on the depth/diameter (d/D) relationships of impact craters within Utopia Basin (25 deg. N - 70 deg. N, 88 deg. W - 150 deg. W), Mars. In order to search for spatial variations in the study area, d/D values for a total of 1,430 craters have been grouped by sub-regions based upon their similar d/D characteristics. This has revealed a significant difference in d/D relationship for craters in north central Utopia basin compared with other parts of the basin, and withother areas on Mars. Preliminary measurements have also been collected in four additional test areas (Acidalia, Sinai, Sirenum, and south of Argyre) for comparison purposes.

Derived from text

Mars Surface; Depth Measurement; Diameters

20030110901 Geological Survey, Flagstaff, AZ, USA

Study of Terrestrial Terrains Analogous to Martian Layered, Massive, and Thin-bedded Materials

Chapman, M. G.; Larsen, G.; Lucas, S. G.; Russell, A. J.; Tanner, L. H.; Thordarson, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

High-resolution (2-5 m/pixel) images from the Mars Orbiter Camera (MOC) have generated new views of possible widespread, layered sediments, some as thick as 4 kilometers, at near-equatorial latitudes, now known as the layered, massive, and thin-bedded (LMT) materials. Outcrops of this material showing layered bedding have led to the suggestion that the LMT unit may be lacustrine. Alternatively, the LMT materials have also been suggested to be widespread 'tephra' or volcanic ash deposits. Study of the layered material is important as its origin is contentious, it contains concentrated crystalline hematite deposits, which may be related to bacterial deposition, and one layered hematite site is a prime candidate for a future landed mission on Mars.

Author

Ashes; Volcanoes; Terrain; Sediments; Mars (Planet); Deposits

20030110903 Academy of Sciences (USSR), Moscow, USSR

Depth Dependence of Ne-22/Ne-21 in Ordinary Chondrites and Ablation of Meteorites

Alexeev, V. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For a correct interpretation of cosmogenic nuclide data in meteorites, the depth and size dependence of the production rates have to be known. The detailed modeling has been carried out by Leya et al. [1]. The authors have irradiated isotropically two spherical targets and have calculated the production rates of the large number of radionuclides and stable isotopes of inert gases. We have analyzed these data and have presented the formula for the account of cosmogenic isotope ratios of

Ne-22/Ne(sub c)-21 depending on the depth d in a meteorite with the radius R.
Derived from text
Isotope Ratios; Neon Isotopes; Ablation; Chondrites; Cosmology; Meteorites; Depth

20030110904 NASA Ames Research Center, Moffett Field, CA, USA
A Test of Maxwell's Z Model Using Inverse Modeling
Anderson, J. L. B.; Schultz, P. H.; Heineck, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-3877; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In modeling impact craters a small region of energy and momentum deposition, commonly called a 'point source', is often assumed. This assumption implies that an impact is the same as an explosion at some depth below the surface. Maxwell's Z Model, an empirical point-source model derived from explosion cratering, has previously been compared with numerical impact craters with vertical incidence angles, leading to two main inferences. First, the flowfield center of the Z Model must be placed below the target surface in order to replicate numerical impact craters. Second, for vertical impacts, the flow-field center cannot be stationary if the value of Z is held constant; rather, the flow-field center migrates downward as the crater grows. The work presented here evaluates the utility of the Z Model for reproducing both vertical and oblique experimental impact data obtained at the NASA Ames Vertical Gun Range (AVGR). Specifically, ejection angle data obtained through Three-Dimensional Particle Image Velocimetry (3D PIV) are used to constrain the parameters of Maxwell's Z Model, including the value of Z and the depth and position of the flow-field center via inverse modeling.
Derived from text
Craters; Energy Transfer; Cratering; Explosions

20030110905 Northwestern Univ., Evanston, IL, USA
Densities and Porosities of Ordinary Chondrites; Do High Porosity Meteorites Represent Regolith Materials?
Andre, S. L.; McCoy, T. J.; McCamant, J. E.; Robinson, M. S.; Britt, D. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Densities and porosities of meteorites provide information about the physical properties of their parent bodies (asteroids). Recent studies report the densities and porosities of approximately 40 ordinary chondrite (OC) meteorites. In this study, we present 42 additional measurements of OC densities and porosities, and provide a rigorous analysis of the errors in the method. Additionally, we investigate potential controls on OC porosity, examine the range of heterogeneity among stones of a single fall, and consider if friable OCs could be potential analogs for low-density asteroids or secondary products from higher-density asteroids.
Derived from text
Chondrites; Meteorites; Regolith; Density (Mass/Volume); Microporosity

20030110906 Black Hills State Univ., Spearfish, SD, USA
The Spatial Distribution of Lava Flow Surface Features on Earth and Mars
Anderson, S. W.; Glaze, L.; Stofan, E.; Baloga, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lava flow surface morphology results from processes that occur during emplacement. Features such as tumuli and lava rises are indicators of flow inflation. Tumuli in particular have been identified as possible indicators of lava tube location, indicating that their distribution on the surface of a lava flow is a function of the internal pathways of lava present during flow emplacement. However, the distribution of tumuli on lava flows has not been examined in a statistically thorough manner, nor have these features been positively identified on other terrestrial planets. In order to more rigorously examine the spatial distribution of tumuli, we examined 3 different flows: two on Earth that display numerous lava rises and tumuli, and another south of Elysium Mons with features morphologically similar to tumuli. The terrestrial flows include a discrete lobe of the 1969-1974 Mauna Ulu flow at Kilauea, Hawaii. The lobe is located in the distal portion of the flow below Holei Pali, and is characterized by hummocky pahoehoe flows emplaced from tubes. This flow allows complete mapping of surface morphologies because of its well-defined boundaries, well-constrained emplacement parameters, and known flow thicknesses. In addition, tube locations for this flow were mapped by Holcomb during flow emplacement. We also examine the distribution

of tumuli on the distal portion of the hummocky Thrainsskjoldur flow field from maps provided in Rossi and Gudmundsson. Author

Planetary Geology; Earth Surface; Mars Surface; Mars Volcanoes; Lava; Fluid Flow; Volcanic Eruptions; Spatial Distribution

20030110907 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Exploring Asteroid Interiors: The Deep Interior Mission Concept

Asphaug, E.; Belton, M. J. S.; Cangahuala, A.; Keith, L.; Klaasen, K.; McFadden, L.; Neumann, G.; Ostro, S. J.; Reinert, R.; Safaeinili, A., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Deep Interior is a mission to determine the geophysical properties of near-Earth objects, including the first volumetric image of the interior of an asteroid. Radio reflection tomography will image the 3D distribution of complex dielectric properties within the ~1 km rendezvous target and hence map structural, density or compositional variations. Laser altimetry and visible imaging will provide high-resolution surface topography. Smart surface pods culminating in blast experiments, imaged by the high frame rate camera and scanned by lidar, will characterize active mechanical behavior and structure of surface materials, expose unweathered surface for NIR analysis, and may enable some characterization of bulk seismic response. Multiple flybys en route to this target will characterize a diversity of asteroids, probing their interiors with non-tomographic radar reflectance experiments. Deep Interior is a natural follow-up to the NEARShoemaker mission and will provide essential guidance for future in situ asteroid and comet exploration. While our goal is to learn the interior geology of small bodies and how their surfaces behave, the resulting science will enable pragmatic technologies required of hazard mitigation and resource utilization.

Derived from text

Asteroids; Geophysics; Surface Properties; Dielectric Properties

20030110908 Universidad Complutense, Madrid, Spain

Rocks and Landscapes of the Solar System: An Activity for the Teaching and Spreading of the Planetary Geology

Castilla, Gabriel; AngeldePablo, Miguel; Lopez, Concha; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The spatial exploration is providing us a large quantity of information about the composition of the planets and satellites crusts. However, most of the experiences that are proposed in the guides of activities in Planetary Geology are based exclusively on the images utilization: photographs, maps, models or artistic reconstructions. That things help us to recognize shapes and to deduce geological processes, but they says us little about the materials that they are implicated. In order to avoid this dicotomy between shapes and materials, we have designed an experience in the one which, employing of rocks and landscapes of our geological environment more next, the pupils be able to do an exercise of compared planetology analyzing shapes, processes and material of several planetary bodies of the Solar System.

Derived from text

Solar System; Rocks; Planetary Geology

20030110909 NASA Ames Research Center, Moffett Field, CA, USA

The Formation of Life-sustaining Planets in Extrasolar Systems

Chambers, J. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The spatial exploration is providing us a large quantity of information about the composition of the planets and satellites crusts. However, most of the experiences that are proposed in the guides of activities in Planetary Geology are based exclusively on the images utilization: photographs, maps, models or artistic reconstructions [1,2]. That things help us to recognize shapes and to deduce geological processes, but they says us little about the materials that they are implicated. In order to avoid this dicotomy between shapes and materials, we have designed an experience in the one which, employing of rocks and landscapes of our geological environment more next, the pupils be able to do an exercise of compared planetology analyzing shapes, processes and material of several planetary bodies of the Solar System.

Derived from text

Planetary Composition; Planetary Geology; Planetology

20030110910 Toronto Univ., Ontario, Canada

Analysis of Mathematical Models for Reflectance Absorption Spectra

Antonenko, I.; Cloutis, E. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Reflectance spectroscopy is a useful planetary exploration technique, particularly for quantitative geological mapping of planetary surfaces. However, it's full potential has not yet been realized because of two major limitations. 1) Hyperspectral imagers can acquire more data than accommodated by available data transmission techniques, even with existing compression algorithms. As a result, trade-offs in terms of spectral resolution vs spatial resolution vs temporal coverage often occur. 2) Current spectrum analysis algorithms are labor-intensive and require user intervention to perform tasks such as baseline fitting and optimization of number of absorption bands to be modeled. For this reason, many spectral data sets have not been fully analyzed, even years after their acquisition (e.g., Phobos 2 ISM data). Both these limitations could be addressed by novel algorithms that simultaneously provide automated analysis of hyperspectral data (yielding information relating to end member abundances and compositions) as well as an order of magnitude reduction in data volume. Such algorithms could be implemented on board spacecraft, allowing for the development of intelligent hyperspectral sensors, which are programmed to seek out and focus on geologically (and biologically) interesting regions on planetary surfaces such as Mars. As a first step to such an automated process, we are investigating the mathematics of absorption features. At present there is no consensus concerning which functions best represent absorption bands. Candidates include Gaussian, modified Gaussian, and Lorentzian functions. In this study, we attempt to determine which functions are appropriate for which type of feature (e.g. crystal field transitions vs intervalence charge transfers) by using an empirical approach.

Author

Planetary Mapping; Planetary Surfaces; Reflectance; Absorption Spectra; Mathematical Models

20030110911 Aspler (L. B.), Ottawa, Ontario, Canada

Dyke-induced Graben on Venus and Mars: Analogues for Earth's Rock Record?

Aspler, L. B.; Ernst, R. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Graben on Earth are generally attributed to regional extension from plate motions ('lithosphere-activated') or from doming above magma plumes ('mantle-activated'). However, widespread graben, fissure, and fracture systems on Venus and Mars are thought to have formed during, and as a consequence of, the near-horizontal injection of magma in dykes. These structures appear to trace the paths of subsurface dykes that propagated laterally under high magma pressure and established the near-surface horizontal extension conducive to normal faulting. Throughout its history, Earth has witnessed magmatic events that produced giant dyke swarms resembling those of Venus and Mars. Nonetheless, few examples of dyke-induced graben have been reported from Earth s rock record, although such graben have been observed in modern settings (e.g., Hawaii, Iceland, Long Valley, Afar, Mt. Etna, Juan de Fuca Ridge). Herein we describe four such examples, ranging in age from Paleoproterozoic to Tertiary. Dyke-induced graben may be more commonly preserved on Earth than hitherto appreciated, constituting a unique class of extensional structure analogous to those on Venus and Mars.

Derived from text

Geological Faults; Fissures (Geology); Rocks; Fracturing; Mid-Ocean Ridges

20030110912 Northwestern Univ., Evanston, IL, USA

An Innovative Light Scattering Technique for Characterizing Martian Soil

Backman, V.; Chen, K.; Ulmer, M. P.; Wessels, B. W.; Robinson, M. S.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Utilizing a propriety technique we have designed and prototyped a new remote sensing instrument called the Light Scattering Spectroscopy Micro-Organism Probe (LSSMOP). This instrument detects DNA, protein, and virus-like organisms as well as gives basic morphologic information at the scale of 30-300 nanometers. This instrument is ideally suited for characterizing martian geologic samples as part of a landed science payload. Not only does the LSSMOP directly address key exobiology science goals, it can be used to characterize grain sizes and shapes of geologic materials over a broad range of scales. The basic design parameters include a mass of 2 kg, peak power of 100 Watts in 10-second bursts, with up to 10 measurements per day. The duty cycle between samples is approximately 1 hr with a data rate of 10bit/sec-100bits/sec. Currently the LSSMOP is at a TRL-3 for the basic instrument and with proper funding, it will be at TRL-6 by 2006. The experiment is designed for longevity and can readily measure up to 10 samples per day. To acquire a reading the LSS requires

a sample area of only 1 square milllimeter to 1 square centimeter that is located within 3 millimeters of the probe. The reading can be made in a few minutes and thus does not interfere with other science operations onboard a lander or rover. We are currently testing the prototype on a variety of martian analog samples (basalt, sandstone, mudstone, siltstone) and meteorites to establish detection levels and operational limits.
Derived from text
Light Scattering; Mars (Planet); Mars Surface; Remote Sensing; Soils; Spectroscopy; Planetary Geology

20030110913 Cornell Univ., Ithaca, NY, USA
Searching for Surficial Deposits on Venus Using Multi-Polarization Radar
Carter, Lynn M.; Campbell, Donald B.; Campbell, Bruce A.; Margot, Jean-Luc; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction. The Magellan spacecraft returned hundreds of images of craters, radardark halos, and wind features on Venus. It is clear that surficial layers are associated with some of these features; for example, 59 of the craters have parabolic shaped deposits that are thought to be a few centimeters to a meter in thickness. Magellan also revealed about 400 radar dark 'splotches' that may be places where a smooth rubble layer was formed when the shock wave from an impactor hit the surface and crushed the rock. Two dune fields and several areas of microdunes were identified in Magellan data, as well a few thousand windstreaks, so it is clear that dust is transported and redeposited by wind. Thin surficial layers that are not clearly visible in the Magellan imagery may be present in other regions as well. In fact, many surfaces on Venus that were imaged by Magellan SAR may look much different when viewed at optical wavelengths, since radar waves penetrate surface layers and show details of the underlying terrain. A good example is the L-Band (24 cm wavelength) shuttle imaging radar (SIRA) observations by McKauley et al. who detected buried river valleys in the Arbain Desert in southern Egypt.
Derived from text
Deposits; Surface Layers; Venus (Planet)

20030110914 Academy of Sciences (USSR), Moscow, USSR
The Smerdyachee Lake: A Possible Impact Crater near Moscow, Russia
Badjukov, D. D.; Brandstaetter, F.; Ivanova, M. A.; Korochantsev, A. V.; Kurat, G.; Lorents, C. A.; Nazarov, M. A.; Ntaflos, T.; Raitala, J.; Sadilenko, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Smerdyachee Lake has been suggested as a possible meteorite crater in 1987. The assumption was based on a circular shape of the lake and its unusual depth. This year our group carried out field works at this lake. New data support the possible impact origin of this structure.
Derived from text
Meteorite Craters; Lakes; Depth

20030110915 NASA Marshall Space Flight Center, Huntsville, AL, USA
Three Dimensional Characterization of the Mundrabilla Meteorite
Gillies, Donald C.; Engel, H. Peter; Carpenter, P. K.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The differentiated meteorite, Mundrabilla, exhibits a rare structure of primary kamacite/taenite, and at least 25 volume % of sulfide (troilite and daubreelite). The structure has been investigated in three dimensions using the technique of gamma-ray computed tomography (CT) with a radioactive (60)Co isotope as the source of the flux. Using CT, a 50 kg slab with dimensions 12.6 x 8.2 x approx. 70 cm has been sectioned at 1 mm intervals over 50 cm length, and the three dimensional structure is at present being evaluated. These data revealed, in addition to the metallic and troilite-rich phases, the presence and distribution of graphite-rich cones (up to 5 cm long), and small (1-2 mm), low density particles. The graphite cones are readily visible on the surfaces of many of the sections of Mundrabilla, while the smaller phases have a density (determined from CT) of approximately 2.9 g/cc, and are assumed to be silicate inclusions. CT spatial resolution is not adequate to elucidate the shapes of these particles. One can only state that they show no directionality and are equiaxed.
Author
Meteorites; Meteoritic Composition; Tomography; Kamacite; Sulfides; Troilite; Graphite

20030110919 Carnegie Institution of Washington, Washington, DC, USA

Gas Giant Protoplanet Formation: Disk Instability Models with Detailed Thermodynamics and Varied Artificial Viscosity

Boss, A. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Three dimensional (3D) hydrodynamical models of the evolution of marginally gravitationally unstable protoplanetary disks have shown that such disks are likely to form self-gravitating clumps that could become gas giant protoplanets, even when detailed thermodynamics is included. Vertical convective motions appear to be crucial for providing a means of cooling the disk midplane sufficiently for clump formation. Clump survival to form gas giant planets seems possible, provided that the clumps are sufficiently well-resolved. However, calculations where artificial viscosity is employed generally have not found robust clump formation in either fully 3D or thin disk models. The lack of clump formation in the latter models may be due to the prohibition against vertical convection in thin disk models. Here we show that when artificial viscosity is included in 3D disk models with radiative and convective cooling, the tendency to form clumps reduced somewhat, but not eliminated, unless the artificial viscosity is increased by a factor of ten. This result suggests that disk instability remains as a possible means for forming the giant planets of our Solar System.

Derived from text

Protoplanets; Gas Giant Planets; Formation; Thermodynamics; Viscosity

20030110920 Arizona Univ., Tucson, AZ, USA

Very Recent Hydroclimatic Change on Mars?

Baker, V. R.; Dohm, J. M.; Ferris, J. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The geomorphology and geology of Mars, for at least the last 20 years, has presented a consistent, coherent picture of that planet as water-rich, such that aqueous activity has occurred, sporadically at least, on its surface throughout its history. The robustness of this conclusion is evidenced in its persistence, despite difficulties of reconciliation with geophysical and geochemical theory, and numerous nonaqueous hypotheses applied to restricted subsets of the interrelated evidence for aqueous activity on Mars. More recently, the role of water on the Martian landscape has been confirmed by striking discoveries of (a) exceptionally young, water-related landforms interpreted as part of a whole assemblage of very recent, water-related activity, and (b) neutron and gamma-ray signatures of a near-surface zone of high water-ice abundance at high Martian latitudes. What do these discoveries mean for past hydroclimatic change on Mars?

Derived from text

Geomorphology; Mars Surface; Planetary Geology; Geophysics

20030110921 Eotvos Lorand Univ., Budapest, Hungary

Mud Volcanism as Model for Various Planetary Surface Processes

Bradak, B.; Kereszturi, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this work we review our current knowledge on the two basic kinds of mud volcanism on Earth and their possible application to planetary environments. Mud volcanic processes differs from magmatic volcanism but realize under such physical factors which are present in many planetary bodies.

Derived from text

Mud; Planetary Surfaces; Volcanology; Earth Surface; Planetary Geology

20030110922 Southwest Research Inst., Boulder, CO, USA

On an Impact Origin of Pluto-Charon

Canup, R. M.; Asphaug, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Pluto-Charon system shares key commonalities with the Earth-Moon system, e.g., its large satellite-to-planet mass ratio, high system angular momentum and a potentially reduced satellite density relative to that of the planet. In both cases an impact origin is favored. However until recently no quantitative simulations of potential Pluto-Charon forming impacts had

been performed. Unlike the relatively well-constrained situation for the formation of Earth's Moon, key properties of Pluto and Charon - their rock/ice fractions, mass ratio, and total system angular momentum - are somewhat uncertain. However, a primary challenge to an impact origin is obtaining a sufficient yield of material in bound orbit: Charon likely contains approx. 10% of Pluto's mass, whereas the Moon has only approx. 1% of the Earth's mass. Previous impact simulations involving rocky objects have found a maximum yield of material placed in orbit of only approx. 3 to 4% of the total colliding mass. Here we report on simulations of potential Pluto-Charon forming impacts using smoothed-particle hydrodynamics and a variety of rock-ice compositions.
Derived from text
Pluto (Planet); Charon; Impact; Rocks; Hydrodynamics

20030110924 Arizona State Univ., Tempe, AZ, USA
Spectroscopic Identification of Carbonates in the Martian Dust
Bandfield, J. L.; Glotch, T. D.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Carbonates play a significant role in determining the history of the Martian atmosphere, geology, and hydrology. Their presence and properties can give useful information about the specific environment in which they formed in the past. The work presented here demonstrates that the spectral character of Mars is consistent with and unique to the presence of small amounts of carbonates within a fine particulate dust.
Derived from text
Carbonates; Dust; Mars Atmosphere; Mars Surface; Hydrology; Geology

20030110925 NASA Johnson Space Center, Houston, TX, USA
The Osmium Isotopic Composition of Tagish Lake and Other Chondrites, Implications for Late Terrestrial Planetary Accretion
Brandon, A. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The goals of this investigation are twofold. First, obtain high-precision Os isotope measurements of Tagish Lake and other chondrites by TIMS. Second, measure Re, Os, Pt, and other HSE concentrations by isotope dilution using TIMS and ICPMS. These measurements will determine whether this meteorite does in fact represent C-chondrite material with timeintegrated elevated Re/Os and Pt/Os with the implications to late accretion material characteristics.
Derived from text
Terrestrial Planets; Osmium Isotopes; Carbonaceous Chondrites; Solar System; Accretion Disks

20030110926 South Dakota School of Mines and Technology, Rapid City, SD, USA
Layered Mafic Intrusive Complexes, Possible Terrestrial Analogues of Venusian Coronae
Campbell, M. M.; Campbell, T. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Preliminary investigations by these authors concerning the comparison and contrast of characteristics associated with terrestrial layered mafic intrusives (LMI s) and Venusian coronae indicate some similarities in morphology and possibly origin. Our premise is that coronae, and processes related to their formation, may not be unique to Venus and that mantle plumes could have been one of the prevalent forms of heat transfer on Earth during the Archean and Proterozoic Eons. Mantle plumes may have also been instrumental in the initiation of primitive plate tectonic processes during the Archean on Earth.
Derived from text
Venus (Planet); Tectonics; Morphology; Coronas

20030110927 Arizona State Univ., Tempe, AZ, USA
Ion Microprobe Measurements of Carbon Isotopes in Martian Phosphates: Insights into the Martian Mantle
Goreva, J. S.; Leshin, L. A.; Guan, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The history of carbon reservoirs on Mars is complex and differs from Earth due to the planet s complicated atmospheric

evolution, plausible lack of long-lived oceans and the absence of plate tectonics. The isotopic characteristics of C reservoirs are of a great interest because of their implications to the overall carbon inventory of the planet as well as to the evolution of the carbon cycle through time. Moreover, these signatures are indispensable as potential biomarkers for the future sample return from Mars. However, the isotopic characteristics of the specific C reservoirs are still controversial and are the subject of intense debate. Most information about the isotopic composition of martian C reservoirs comes from studies of martian meteorites.
Derived from text
SNC Meteorites; Phosphates; Magma; Carbon Isotopes

20030110928 Colorado Univ., Boulder, CO, USA
Protalus Ramparts and Transverse Ridge Moraines on Mars: Indicators of Surface Ice Depositional Processes
Arfstrom, J. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ridges resembling terrestrial protalus ramparts and transverse ridge moraines, which are ridges of debris that form through a variety of surface ice depositional processes, are associated with some gullies and alcoves on Mars. At least two types of ridges appear to exist on Mars including a rare non-sinuous variety with a broad profile, and a more common narrow and sinuous variety. The objective of this abstract is to illustrate that these ridges could be indicators of surface ice depositional processes and that a thorough understanding of the terrestrial forms is required to interpret them.
Author
Mars Surface; Planetary Geology; Topography; Terrain; Land Ice

20030110929 Tennessee Univ., Knoxville, TN, USA
The Gulliver Mission: Sample Return from the Martian Moon Deimos
Britt, D. T., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Gulliver Mission proposes to directly collect up to 10 kilograms of Deimos regolith and return it to Earth. This sample will contain up to 9 kilograms of primative material and up to 1000 grams of Martian material. The spacecraft instrument suite is tightly focused to the requirements of finding a safe and scientifically interesting sampling location, collecting a sample, and returning to Earth safely. They include a high-resolution imaging camera for navigation and sampling site selection, a radar altimeter for closed-loop approach maneuvering, and a wide-angle descent imager to record the sampling site and the actual sampling process. Deimos is also by far the safest small body for sample return yet imaged. A comparison of the surfaces of Deimos and 433 Eros is shown. The NEAR-Shoemaker mission succeeded in landing on Eros with a spacecraft not designed for landing and proximity maneuvering. Deimos is significantly less rough at 5-10 meter scales than Eros, as described in this paper. The inherent robustness of Earth-based cosmochemical laboratory analysis, along with the diversity of the sample, allows the mission scientific goals to be both ambitious and comprehensive: (1) Determine the geochemistry of the accretion zones for the primative D-type asteroids found in the outer asteroid belt and near Juipiter. (2) Study pre-biotic materials in primative asteroids for their implications on the chemistry and astrobiology of outer solar system objects. (3) Search for isotopic biomarkers in the early crust of Mars. (4) Determine the composition, diversity, and crystallization history of the Martian crust. (5) Date and characterize the era of Martian heavy bombardment After initial processing these samples will be made available as soon as possible to the international cosmochemistry community for detailed analysis. The mission management team includes Lockheed Martin Astronautics (flight system, I&T) and JPL (payload, mission ops, and mission management).
Derived from text
Deimos; Mars (Planet); Moon; Space Missions; Cosmochemistry; Planetary Geology

20030110930 University of Northern Arizona, Flagstaff, AZ, USA
Has the Volatile Content of the Martian Substrate Varied over Time?
Barlow, N. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The martian substrate is proposed to be volatile-rich based on analysis of geologic features such as channels, gullies,

fluidized crater ejecta morphologies, and possible thermokarst features as well high-latitude terrain-softened features. But has the volatile content of these subsurface reservoirs changed over time? Commonly accepted models of the hydrologic evolution of Mars suggest warm, wet periods were concentrated during the planet s earliest history (i.e., the Noachian), with the possibility of only short-lived warm, wet episodes in more recent times. One might expect that without continuous replenishment the volatile content of the subsurface reservoirs would gradually decline with time. We are utilizing the record of impact craters with fluidized ejecta morphologies to investigate this question.
Derived from text
Mars Surface; Structural Properties (Geology); Craters; Terrain

20030110931 Southwest Research Inst., San Antonio, TX, USA
Minimum Times to Form Clay in Martian Surface and Near-Surface Environments
Browning, L.; Taylor, G. J.; Pickette, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Clay minerals are the most common alteration products of water-rock-gas interactions on Earth. Because these hydrous alteration minerals are thermodynamically stable over a wide range of P-T-x conditions, significant amounts of clay may have also formed in Martian environments where liquid water or water vapor was present. It has been speculated that liquid water or vapor may have persisted for weeks to thousands of years in diverse surface and near-surface Martian environments, ranging from an ocean and channelized surface flows, to the potentially higher temperature environments associated with volcanic or impact-induced hydrothermal systems. If true, then a significant fraction of the surface of early Mars experienced water-rock-gas interactions that could have resulted in the formation of extensive clay deposits. Clay deposits are inferred to exist on Mars, based on orbital measurements of spectra at or near the detection limits of the instrument. The duration of aqueous alteration on Mars can be estimated by evaluating the time required to form secondary alteration products. In this work, we estimate the minimum time required to produce detectable amounts of clay by aqueous alteration of volcanic glasses under different sets of idealized Martian surface and near-surface conditions.
Derived from text
Clays; Mars Surface; Minerals; Planetary Geology; Mars Environment

20030110932 Washington Univ., Saint Louis, MO, USA
A Study of Olivine Alteration to Iddingsite Using Raman Spectroscopy
Kuebler, K. E.; Wang, Alian; Haskin, L. A.; Jolliff, B. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-12114; NAG5-10703; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A crucial task of Mars surface science is to determine past environmental conditions, especially aqueous environments and their nature. Identification of mineral alteration by water is one way to do this. Recent work interprets TES spectra as indicating altered basalt on Mars. Olivine, a primary basaltic mineral, is easily altered by aqueous solutions. Alteration assemblages of olivine may be specific to deuteric, hydrothermal, surface water, or metamorphic environments. Raman spectra are produced by molecular vibrations and provide direct means for studying and identifying alteration products. Here, we present a combined study of changes in the chemical composition and Raman spectra of an olivine as it alters to iddingsite. Iddingsite is found in some SNC meteorites and is presumably present on Mars. The term 'iddingsite' has been used as a catch-all term to describe reddish alteration products of olivine, although some authors ascribe a narrower definition: an angstrom-scale intergrowth of goethite and smectite (presumably saponite) formed in an oxidizing and fluid-rich environment. Alteration conserves Fe (albeit oxidized) but requires addition of Al and H2O and removal of Mg and Si. The smectite that forms may be removed by continued alteration. Dehydration of the goethite forms hematite. Our purpose is to study the mineral assemblage, determine the structural and chemical variability of the components with respect to the degree of alteration, and to find spectral indicators of alteration that will be useful during in-situ analyses on Mars.
Author
Igneous Rocks; Olivine; Mars Environment; Chemical Composition; Raman Spectra; Solvation; Planetary Geology

20030110933 Tokyo Univ., Japan
A New Method to Measure the Pressure of Impact-induced Vapor Clouds
Hamano, K.; Sugita, S.; Kadono, T.; Matsui, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact vaporization process may have played an important role in the formation and evolution of the atmospheres and oceans of planets e.g.[1,2] and have had significant consequences to planets surface environment e.g.[3,4]. Although a mechanical aspect of this process has been investigated extensively, its chemical aspect has not been studied to a great depth. One of the reasons for this is that there has been no method to measure the pressure of an impact vapor cloud in a laboratory. Temperature, line-of-sight column density, the degree of ionization, and chemical composition can be measured by existing methods [5], but a thermodynamic state of a vapor cloud cannot be determined only from these parameters. For complete thermodynamic description of a vapor cloud, measurement of pressure is indispensable. In this study, we propose a method of pressure measurement using spectral broadening and examine its feasibility. Laser Experiments: We used a high-energy pulse laser (Nd:YAG, 1064 nm) to simulate the impact vaporization process.
Author
Pulsed Lasers; Vapors; Pressure Measurement

20030110934 NASA Johnson Space Center, Houston, TX, USA
Mn Carbonates in the Martian Meteorite Nakhla: Possible Evidence of Brine Evaporation
Bailey, J. V.; McKay, D. S.; Wentworth, S. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The importance of secondary phases in martian meteorites lies in their potential to provide clues about the martian environments responsible for their formation. During this study, we analyzed a number of carbonate-bearing fracture surfaces from the Nakhla meteorite. Here we describe the physical and chemical properties of several manganese-calcium-rich siderites. Additionally, we describe a potential model for the formation and alteration of these carbonates, and we suggest constraints on the conditions responsible for their precipitation. Nakhla is an olivine-bearing clinopyroxenite with minor amounts of feldspar, FeS, and Fe oxides. Secondary mineral assemblages include vein filling clay with embedded iron oxides, a calcium sulfate, amorphous silica, chlorapatite, halite and carbonates. Bridges and Grady suggested that the carbonates in Nakhla formed from brine evaporation. Isotope studies of the Mn rich siderite are also consistent with formation from hydrothermal fluids with an upper T constraint of ~170 C.
Derived from text
SNC Meteorites; Meteoritic Composition; Siderophile Elements; Brines

20030110935 Open Univ., Milton Keynes, UK
The Oxygen Isotopic Composition of Water Extracted from Unequilibrated Ordinary Chondrites
Baker, L.; Franchi, I. A.; Wright, I. P.; Pillinger, C. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The lack of high temperature metamorphism of the unequilibrated ordinary chondrites (UOCs) means they offer a unique insight into the origin and evolution of the ordinary chondrite parent bodies. However, some thermal modification of these meteorites has occurred, and it has become increasingly apparent that fluids, most likely water, have played an important role in the alteration process. For example, alteration products in chondrule mesostasis and in the general matrix have been identified and suggest that the dominant hydrated mineral in such matrix was a smectite, possibly resembling terrestrial nontronites. The conditions under which the ordinary chondrites were aqueously altered and the role this played on the oxygen isotopic variation in the ordinary chondrites remains poorly understood. Studies of magnetites in Semarkona and density separates (i.e. mesostasis and anhydrous silicate) from a range of unequilibrated ordinary chondrites provide evidence for the fluid phase being considerably enriched in O-17. As an extension of work completed using examples of carbonaceous chondrites, samples of the UOCs Semarkona and Bishunpur were subjected to stepped pyrolysis in order to measure directly the oxygen isotopic composition of water evolved from hydrated minerals. Density separated samples of mesostasis contained a mixture of phyllosilicates together with glassy or feldspathic material which may have experienced partial isotopic exchange with unaltered mesostasis. Measurement of water offers the opportunity to obtain isotopic data from the phyllosilicates alone. Initial results indicate that these alteration products do indeed retain a significant positive delta O-17 anomaly. The magnitude of this anomaly, in excess of twice that measured in the silicate portions of these meteorites, is also greater than that observed in any carbonaceous chondrites.
Derived from text
Chondrites; Metamorphism (Geology); Meteoritic Composition; Water; Oxygen Isotopes

20030110936 Johns Hopkins Univ., Laurel, MD, USA

Comparing Run-Out Efficiency of Fluidized Ejecta on Mars with Terrestrial and Martian Mass Movements

Barnouin-Jha, O. S.; Baloga, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We broadly characterize the rheology of fluidized ejecta on Mars as it flows during its final stages of emplacement by using the concept of run-out efficiency. Run-out efficiency for ejecta can be obtained through an energy balance between the kinetic energy of the excavated ejecta, and the total work lost during its deposition. Such an efficiency is directly comparable to run-out efficiency (i.e., L/H analyzes where L is the run-out distance and H is onset height) of terrestrial and extraterrestrial mass movements. Determination of the L/H ratio is commonly used in terrestrial geology to broadly determine the type and rheology of mass movements

Derived from text

Ejecta; Rheology; Planetary Surfaces; Meteorite Craters; Earth Movements

20030110937 Academy of Sciences (USSR), Moscow, USSR

Crater Fields on Venus, Earth and Mars

Artemieva, N.; Bland, P. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): RFBR Proj. 01-05-64564a; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Meteoroids that are disrupted and dispersed in the atmosphere may give rise to crater fields at the surface. For lower mass objects fragmentation may produce a strewn field of meteorite fragments, and then (with increasing mass) meteorites plus impact pits; small meter- to tens m-sized well separated craters; craters whose rims overlap; and finally single craters produced by a swarm of poorly separated fragments. The masses that define the transition from one type of fragmented impact to another depend on atmospheric properties and projectile type. The disruption of impactors in the Earth's atmosphere was initially studied by Passey and Melosh. The cross-range spread is probably produced by the interaction of bow shocks after breakup, spreading velocity U (two identical fragments with density rb, trajectory velocity V disrupted at the altitude with atmospheric density ra) is defined as U=CV(ra/rb)0.5 with C=0.01-1 from the analysis of the Earth s strewn fields. The idea is confirmed in 3D modeling of disrupted meteoroid motion and the coefficient of repulsion C is defined as 0.45. Similar estimates are known for Venus and Mars. Here we use the model of separated fragments (SF) to investigate disruption of impactors in the very different atmospheres of Earth, Venus and Mars.

Author

Cratering; Meteorite Craters; Atmospheric Effects; Venus Atmosphere; Earth Atmosphere; Mars Atmosphere; Venus Surface; Earth Surface; Mars Surface

20030110938 New Mexico Univ., Albuquerque, NM, USA

A Petrological Model for the Origin of Martian Shergottite Magmas Based on their Major Element, Trace Element, and Isotopic Compositions

Borg, L. E.; Draper, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Defining the mineralogy and composition of martian mantle source regions has proved to be a difficult task because: (1) the martian sample set does not include samples of the mantle, and (2) many of the samples are either cumulates or are highly fractionated and therefore not in equilibrium with the mantle. Despite these complexities, isotopic evidence suggests that Mars had a magma ocean that crystallized at approx.4.53 Ga, and that melting of magma ocean cumulates between approx.175-575 Ma produced the shergottite parental magmas. This scenario has permitted the Rb/Sr, Sm/Nd, and Lu/Hf ratios of the martian magma sources to be estimated from their initial Sr, Nd, and Hf isotopic compositions. Below we estimate the relative abundances of additional incompatible elements in the magma source regions using a magma ocean crystallization model.

Derived from text

Magma; Petrology; Planetary Mantles; Shergottites; Mineralogy; Isotopes

20030110939 Ecole Normale Superieure, Lyon, France

Nd-142 Evidence for Early Earth Differentiation

Boyet, M.; Rosing, M.; Blichert-Toft, J.; Storey, M.; Albarede, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is widely accepted that the lunar mantle went through a stage of generalized melting, the so-called magma ocean, which gave rise to the radial mineralogical layering of the planet. Similar evidence is totally missing on Earth for which no remnants of a very early crust are known and mostly indirect arguments. Because of the large Earth s radius, the amount of energy liberated by impactors and by core differentiation seems to have been sufficient to melt the terrestrial mantle down do several hundreds of kilometers. The Earth's strong gravity field and the higher water contents of the terrestrial mantle restrict the presence of plagioclase on the liquidus of basaltic melts to shallower levels than on the Moon. The petrological nature (anorthosite vs granite) of a buoyant crust blanketing a molten terrestrial upper mantle, and even its very existence, therefore remains problematic.

Derived from text

Neodymium Compounds; Magma; Mineralogy; Earth Surface; Petrology

20030110940 Colorado Univ., Boulder, CO, USA

Numerical Simulations of Non-Newtonian Convection in Ice: Application to Europa

Barr, A. C.; Pappalardo, R. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NGT5-50337; NCC2-1340; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Numerical simulations of solid state convection in Europa's ice shell have so far been limited to consideration of Newtonian flow laws, where the viscosity of ice is strongly dependent upon temperature, predicting that a stagnant lid should form at the top (10-40%) of a convecting ice shell. Such large thicknesses seem to contradict estimates of the effective elastic thickness of Europa s ice shell during its geologically active period. Recent laboratory experiments characterize the rheology of ice as the sum of contributions from several temperature and strain rate-dependent creep mechanisms. We present the results of numerical simulations of convection within Europa s ice shell using the finite-element model Citcom, applying the non-Newtonian rheology of grain boundry sliding. Our calculations suggest a shallower brittle/ductile transition and larger interior convective velocities compared to Newtonian rheology. The flow field is time-dependent, with small, localized upwellings and downwellings at the thermal boundary layers that have minimal topographic expression at the surface.

Derived from text

Convection; Europa; Ice; Rheology; Simulation; Mathematical Models; Planetary Geology

20030110941 Arizona State Univ., Tempe, AZ, USA

Shield Volcano Slope Distributions: An Approach for Characterizing Martian Volcanic Provinces

Bleacher, J. E.; Greeley, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Terrain analyses are commonly used to study the geomorphic processes that have modified surfaces. Our approach is based on analysis of slopes, which are the irregular surface expressions of the processes responsible for shaping landscapes. Slope distributions likely represent unique surface forming processes and can be used to characterize entire landscapes at a given scale. Because terrestrial slopes are constantly changing due to the influence of exogenic agents this approach is typically used to examine erosional processes. However, it is reasonable to utilize slope distributions to identify different lava flow emplacement processes and therefore volcanic style, when the overall surface construction rate is higher than the surface modification rate or when the opposing processes are separable upon analysis. The final form of a lava flow is dependent, in part, on the physical properties of the lava and the effusion conditions. Thus the slope distributions displayed by different volcanic terrains should be unique to their emplacement conditions. We present slope distributions for the shield volcanoes on the island of Hawaii as a possible comparative approach to characterize martian volcanic provinces.

Derived from text

Topography; Mars Volcanoes; Mars Surface

20030110942 New Mexico Univ., Albuquerque, NM, USA

Nanophase, Low-Ni Metal Grains in Fine-grained Rims in the Murchison CM2 Chondrite: Insights into the Survival of Metal Grains During Aqueous Alteration

Brearley, Adrian J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-9798; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Aqueous alteration has played a significant role in the geological evolution of almost all the chondrite groups and attests to the importance of water during the earliest history of the solar system. Among the chondrites that show evidence of aqueous alteration the CM chondrites, in particular, have received considerable attention, because of their primitive composition and the fact that they preserve a record of incomplete hydration. Petrologic studies of this group of meteorites have helped provide important insights into aqueous alteration processes and the nature of the alteration products. However, due to the complex history of these chondrites, important details of the alteration remain enigmatic. Among the major problems to be resolved are the location and timing of aqueous alteration as well as the relationship between alteration and brecciation. Although many authors favor aqueous alteration within a parent body environment, there is also evidence that some of the components of CM chondrites may have experienced aqueous alteration prior to accretion. One of the key lines of evidence for alteration in a pre-accretionary environment is the presence of unaltered metal grains associated with hydrated phases. Low-Ni metal (kamacite) is typically one of the first phases in CM chondrites that alters in the presence of water. However, in some CM chondrites, such as Yamato 791198, micron-sized metal grains are present within the hydrated fine-grained rim material around chondrules. In addition, nanometer-sized grains that have been interpreted as being unaltered metal particles have been reported in the relatively heavily altered CM chondrite, ALH 81002. In most cases, these occurrences have been interpreted as being the result of mixing of anhydrous and hydrous materials prior to accretion. According to this hypothesis, the metal grains remain unaltered because little or no post-accretionary alteration took place. Whilst such a scenario is plausible, no alternative explanations such as the presence of submicron protective layers or a minor element chemistry that might inhibit oxidation have been investigated in detail. During a study of the distribution of carbonaceous material in fine-grained rims on chondrules in Murchison, previously unidentified, nanometer-sized metal grains were observed. These grains were characterized in detail using high resolution TEM and energy filtered TEM (EFTEM) and provide important insights into how metal grains in CM chondrites may survive aqueous alteration.

Derived from text

Metal Particles; Nickel; Carbonaceous Materials; Meteoritic Composition; Meteorites; Breccia

20030110943 Universidad Complutense, Madrid, Spain

Thermal Isostasy on Mars

Ruiz, Javier; Fairen, Alberto G.; DePablo, Miguel A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A relation exists between Earth s surface elevation and the thermal state of the lithosphere. The warmer the lithosphere, the lower its mean density, and the higher its buoyancy with respect to the fluid material underneath. This relation allows us to use topography and superficial thermal flux data to constrain Earth's continental lithospheric thermal structure. This same relation may be valid for Mars. Here we use a simple model of thermal structure of the martian lithosphere to show that local and/or temporal changes in the thermal state may drive to significant local and/or temporal changes in the martian topography. In addition, we use our results to suggest these processes as capable to affect the topography of a putative early coastline.

Author

Planetary Geology; Mars (Planet); Lithosphere; Isostasy; Temperature Distribution

20030110944 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Martian and Terrestrial Rock Abrasion from Wind Tunnel and Field Studies

Bridges, N. T.; Greeley, R.; Eddlemon, E.; Laity, J. E.; Meyer, C.; Phoreman, J.; White, B. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Earth and Mars exhibit ventifacts, rocks that have been abraded by saltating sand. Previous theoretical and laboratory studies have determined abrasion susceptibilities of rocks as a function of sand type and impact angle and rock material strengths. For the last two years we have been engaged in wind tunnel and field studies to better understand the fundamental factors which control and influence rock abrasion and ventifact formation on Earth and Mars. In particular, we are examining:

1) What types of rocks (composition, texture, and shape) preferentially erode and what are the relative rates of one type vs. another? 2) What are the controlling factors of the aeolian sand cloud (flux, particle speed, surface roughness, etc) which favor rock abrasion?, 3) How do specific ventifact characteristics tie into their mode of formation and rock properties? We find several important factors: 1) Initial rock shape controls the rate of abrasion, with steeper faces abrading faster than shallower ones. The relationship is partly dependent on angle-dependent flux (proportional to sin[theta]) but exhibits additional non-linear effects from momentum transfer efficiency and rebound effects that vary with incidence angle. 2) Irregular targets with pits or grooves abrade at greater rates than targets with smooth surfaces, with indentations generally enlarging with time. Surfaces become rougher with time. 3) Targets also abrade via slope retreat, which is roughly dependent on the slope of the front face. The formation of basal sills is common, as observed on terrestrial and Martian ventifacts.
Derived from text
Planetary Geology; Wind Effects; Surface Roughness; Sediment Transport; Momentum Transfer; Mars Surface; Abrasion

20030110946 Arizona State Univ., Tempe, AZ, USA
Are Current TEM Techniques Adequate to Resolve the ALH84001 Life-on-Mars Controversy?
Buseck, P. R.; Weyland, M.; Mudgley, P. A.; Dunin-Borkowski, R. E.; Frankel, R. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Great significance has been ascribed to the supposed similarity or identity (both terms have been used) between the shapes of some magnetite crystals from the Martian meteorite ALH84001 and terrestrial magnetotactic bacteria, and specifically those from strain MV-1. An implied presupposition is that those shapes are sufficiently well known for measurements of such similarities or identities to be reliable. Bright-field imaging using transmission electron microscopy (TEM) is the major instrumental method that has been used to determine the shapes. We recently introduced the use of high-angle annular dark-field (HAADF) electron tomography to determine the three-dimensional shapes of magnetite nanocrystals with greater accuracy, and we showed that there is sufficient uncertainty to be skeptical about morphological conclusions.
Derived from text
Mars (Planet); Meteoritic Composition; SNC Meteorites; Nanocrystals

20030110947 Aberdeen Univ., UK
Hot and Cold Spring Deposits as a Source of Palaeo-Fluid Samples on Mars
Baron, M.; Pentecost, A.; Parnell, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study of fluid inclusions in terrestrial hot and cold spring deposits shows that this type of deposit will be a valuable target for astrobiological sampling on Mars because: (i) they preserve palaeofluids samples, (ii) in at least some cases they are not altered by recrystallization, (iii) the fluids were entrapped at low temperature, so complex organic molecules should survive in them, and (iv) the association of spring deposits with flourishing biotas suggests that entrapped fluids should be rich in biomolecules.
Derived from text
Mineral Deposits; Paleontology; Exobiology; Fluids; Cold Weather; Hot Weather; Mars Surface Samples; Spring (Season)

20030110948 Academy of Sciences (USSR), Moscow, USSR
Impact Craters of Venus with D Greater Than 5 km Classified Based on Degree of Preservation of the Associated Radar-Dark Deposits
Basilevsky, A. T.; Head, J. W.; Setyaeva, I. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This is a further continuation of work, which studied craters greater than or equal to 30 km in diameter. That work subdivided craters based on character of the associated radar dark deposits. It was suggested and then confirmed that the most pristine deposits of that sort are radar-dark parabolas. Non-parabolic radar-dark halos represent the next stage of the deposit evolution and then with time they disappear. So presence and character of crater-associated dark deposit can be used for estimates of the crater age and then for dating other features. Previous work classified craters into: 1) craters with dark parabola (DP), 2) with clear dark halo (CH), 3) with faint halo (FH) and 4) with no dark halo (NH). It was found that abundances of craters superposed on regional plains (whose mean age is close to the planet mean surface age T) and belonging to DP, CH,

FH and NH classes were correspondingly 15, 30, 30 and 25%. From that it was concluded that DP craters are not older than 0.1-0.15T; CH craters formed during the time interval from approx. 0.5T until 0.1-0.15T ago, and the FH and NH craters formed prior to approx. 0.5T ago. It was shown that the DP, CH, FH and NH percentages show only slight apparent dependence on the crater geographic latitudes and no noticeable dependence on the crater size. The present study analyzes a much larger population (all D greater than or equal to 5 km craters) to investigate better the latitude effect and to study if within this larger crater population the size effect exists.
Author
Meteorite Craters; Size Distribution; Venus Surface; Planetary Geology; Geochronology

20030110949 Washington Univ., Seattle, WA, USA
Disaggregating IDPs
Brownlee, D. E.; Joswiak, D. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the highly significant aspects of IDPs is the simple fact that some of them are microporous weakly consolidated materials. Preservation of the original pore spaces between grains can be a subtle but highly significant indicator of the primitive nature of early solar system materials. A subset of IDPs seem to be simply porous aggregates of sub-micron and larger components that accreted by gentle processes. Unlike chondrites they are not strong relatively compact materials, their original void spaces have not been diminished by compression and they have not had significant closure of inter-grain spaces by heating, aqueous alteration or other internal parent body processes. Some IDPs seem to be simply collections of original accreting grains with the pores perhaps originally occupied with ice. If these particles can be appropriately disaggregated the liberated components are likely to be early generation grains from the solar nebula.
Derived from text
Microporosity; Porous Materials; Solar Nebula; Aggregates; Chondrites

20030110950 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Search for Chemically Bound Water in the Surface Layer of Mars Based on HEND/Mars Odyssey Data
Basilevsky, A. T.; Litvak, M. L.; Mitrofanov, I. G.; Boynton, W.; Saunders, R. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study is emphasized on search for signatures of chemically bound water in surface layer of Mars based on data acquired by High Energy Neutron Detector (HEND) which is part of the Mars Odyssey Gamma Ray Spectrometer (GRS). Fluxes of epithermal (probe the upper 1-2 m) and fast (the upper 20-30 cm) neutrons, considered in this work, were measured since mid February till mid June 2002. First analysis of this data set with emphasis of chemically bound water was made. Early publications of the GRS results reported low neutron flux at high latitudes, interpreted as signature of ground water ice, and in two low latitude areas: Arabia and SW of Olympus Mons (SWOM), interpreted as 'geographic variations in the amount of chemically and/or physically bound H2O and or OH...'. It is clear that surface materials of Mars do contain chemically bound water, but its amounts are poorly known and its geographic distribution was not analyzed.
Author
Planetary Geology; Mars Surface; Ground Water; Surface Layers; Surface Properties; Geographic Distribution

20030110951 Arizona Univ., Tucson, AZ, USA
Temporary Ponding of Floodwater in Athabasca Vallis, Mars
Burr, D. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Athabasca Vallis is the youngest known outflow channel on Mars, dated by crater counting at 2-8 Ma. In-channel geomorphic features indicative of flooding include streamlined forms, longitudinal lineations, and transverse dunes. The streamlined forms have been hypothesized to be primarily depositional, i.e. composed of sediment deposited out of the floodwater behind in-channel obstacles such as impact craters or resistant knobs of bedrock. This hypothesis is based on: 1) the difference in morphology between the flatter streamlined form surfaces and the rougher surface of the surrounding terrain, and 2) the strong prevalence of obstacles at the streamlined forms upslope ends. Examination of MOC and MOLA data during hydraulic modeling of Athabasca Vallis showed evidence consonant with this idea of the streamlined forms being depositional.

This evidence suggests their formation during a period of slow flowing or temporary ponding of the floodwater in the channel. Derived from text
Floods; Mars Craters; Geomorphology

20030110955 Museum of Natural History, London, UK
Revised Target Coordinates for the Beagle 2 Lander
Bridges, J. C.; Seabrook, A. M.; Rothery, D. A.; Pillinger, C. T.; Sims, M. R.; Wright, I. P.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

The Beagle 2 Mars Lander will be launched as part of the Mars Express mission from May 23rd 2003. It will land in Isidis Planitia on Dec. 26th 2003 and is planned to operate for 180 sols (L(sub s) 322deg to 53deg). The landing site s geology, topography, slopes, wind speeds, thermal inertia and rock abundances are described in together with the target co-ordinates. Since publication of the calculated landing ellipse dimensions have been revised and the target location is now available in IAU 2000 co-ordinates. The revised aerocentric IAU 2000 target coordinates are 11.6degN, 90.75degE. The 3-sigma ellipse is 114 x 46 km with a 75deg azimuth for a flight path angle of 16.5deg.
Author
Mars Missions; Targets; Coordinates; Flight Paths; Landing Sites

20030110956 Johns Hopkins Univ., Laurel, MD, USA
Permanent Shadow in Simple Craters near the Lunar Poles
Bussey, D. B.; Lucey, P. G.; Robinson, M. S.; Spudis, P. D.; Edwards, K. D.; Steutel, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Simulation of illumination conditions at the lunar poles permits the investigation of lighting scenarios for which imaging and high quality topographic data do not exist. Using this technique with realistic crater topographic profiles makes it possible to model the amount of permanent shadow in impact craters surrounding the lunar poles. Knowledge of the extent of permanently shadowed regions has important ramifications for the location of cold traps and possible deposits of water ice. Derived from text
Lunar Craters; Position (Location); Illuminating

20030110957 Image Again, Middletown, NJ, USA
Proposed High-Level Regional Focal Points for Lunar Geography
Byrne, Charles J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is difficult to grasp a good mental image of the major features of the moon in terms of their global distribution and relationships. There is no equivalent of the organization of terrestrial geography in terms of continents and oceans that are so useful in establishing a mental and visual image of Earth. This paper proposes a set of focal points and associated regions for the organization of images of the moon.
Derived from text
Moon; Geography

20030110958 Arizona Univ., Tucson, AZ, USA
Debris Aprons, Channels, and Volcanoes in the Reull Vallis Region of Mars
Berman, D. C.; Hartmann, W. K.; Crown, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The highlands to the east of the Hellas impact basin in the southern hemisphere of Mars contain a variety of complex, interacting geo-logic structures. The older highland terrain is inter-mixed with younger, smoother plains; it is dotted with mountains, volcanoes, massifs with debris aprons, and is intersected by several outflow channels. This work includes a comprehensive survey of im-ages from the Mars Global Surveyor (MGS) Mars Orbiter Camera (MOC) of the Reull Vallis region, shown. Through crater counts and stratigraphic analyses, the precise interactions of these various terrains is studied. It is clear that the same processes affect these terrains and their histories are inter-related. By studying not only the youngest surface features, but the geologic history of the entire region, we can gain a better understanding of the continuing

activity in the area. Water plays a primary role in the geologic history of this region. Aside from the outflow channels, water has also influenced the evolution of the volca-noes and the debris flows. We hope to gain a better understanding of the sources of the water, as well as any present content, through this study.
Derived from text
Debris; Volcanoes; Mars Surface; Structural Basins; Paleontology; Craters

20030110959 Raytheon Missile Systems Co., Tucson, AZ, USA
The Relative Abundance of Recently-Launched Meteorites from the Moon and Mars
Head, J. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has been known for over 20 years that certain meteorites originated on the moon and Mars. The launch and delivery of these stones is understood qualitatively as a consequence of impact events on those bodies. One of the puzzling features of the sample population is the relative abundance of lunar vs. Martian meteorites. One would think that lunar meteorites should be much more common than Martian meteorites. The moon has a much lower escape velocity, meaning many more fragments are launched from a given impact event. Smaller events can launch enough fragments to expect to find one on the Earth; hence, lunar meteorite-liberating events must be much more common than Martian meteorite-launching events. Moreover, the delivery efficiency from the moon to the Earth is higher by a factor of 10. Finally, the delivery time is shorter, meaning that the liberated lunar material from a given impact arrives at a much faster rate than comparable Martian material. However, the total number of meteorites from the moon and Mars are comparable. The number of source craters represented by these samples appears to be of the same order of magnitude as well. For the reasons cited above, this has been difficult to understand. What I show in this work is that these arguments have missed a significant point and the observed relative abundances of lunar and Martian meteorites are just what one would expect if they are launched in relative small, frequent, impact events.
Derived from text
Mars Surface; Meteorites; Moon; Abundance

20030110960 Brown Univ., Providence, RI, USA
Cold-based Mountain Glaciers on Mars: Western Arsia Mons Fan-shaped Deposits
Head, J. W.; Marchant, D. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Arsia Mons is one of the three Tharsis Montes shield volcanoes that cap the broad Tharsis Rise, a huge center of volcanism and tectonism spanning almost the entire history of Mars. Each of the Tharsis Montes, although largely constructed of effusive and explosive volcanic deposits, contains a distinctive and unusual lobe, or fan-shaped deposit on their western flanks. These deposits, as exemplified by those on Arsia Mons usually contain three facies and various hypotheses have been proposed for their origin including one or more of the following: lahars, debris avalanches, landslides, pyroclastic flows, and/or generally related to the advance and retreat of ice. Two new developments are the basis for the research reported in this analysis. First, new Mars Orbiter Laser Altimeter (MOLA) altimetry and Mars Orbiter Camera (MOC) images from the Mars Global Surveyor mission have permitted us to characterize the fan-shaped deposit on Arsia Mons and its relationship to the rest of the volcano in much more detail. Second, on-going research on polar glaciers in Antarctica has resulted in depositional models that are of sufficient detail to provide a framework for investigating glacier ice on Mars. On the basis of present surface temperatures on Mars and those of the recent past, any mountain glaciers on Arsia Mons and nearby volcanoes were likely to be cold-based and most similar to the slow-moving, cold-based glaciers of the Dry Valleys region of Antarctica. We outline here the deposit characteristics and use Antarctic Dry Valley analogs to aid in their interpretation.
Derived from text
Glaciers; Mars Volcanoes; Mountains; Mineral Deposits; Mars Surface; Tectonics; Cold Weather

20030110961 Georgia Univ., Athens, GA, USA
Re-Evaluating the Origin of an Upper Eocene Diamictite in the Coastal Plain of East-Central Georgia: An Impactoclastic Layer?
Harris, R. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An Upper Eocene diamictite, unique in the Coastal Plain stratigraphy of east-central Georgia, has been described as an altered volcaniclastic deposit resulting from widespread ashfall or pyroclastic flows. While the breccia bed does appear

strikingly similar to weathered silicic tuffs, previous authors have never speculated where the Late Eocene volcanic source might have been. Gibson and Towe suggest that Mid- American or Caribbean volcanoes contributed some volcanic components to Coastal Plain sediments during the Eocene, but such sources seem insufficient to produce a relatively thick (0.5 to 1.5 m) deposit off the eastern shores of Georgia. Prior to the early 1990 s, most stratigraphers were unaware of the 35 Ma Chesapeake Bay Impact and the Late Eocene cataclysm that must have had major consequences up and down the Atlantic seaboard. The conspicuous diamictite should be re-evaluated to determine if it could have had an impact-related origin. Where roadcuts and mines expose the diamictite, along the 60 km from Gibson to Augusta, it overlies the massive commercial kaolin deposits of the Middle Eocene Huber Formation. Huddlestun and Hetrick assign the diamictite and related sediments (the Albion Member) to the Clinchfield Sand Formation, too early to be associated with the impact. Pickering asserts that the Albion Member actually represents the basal portion of the Dry Branch Formation, exactly where Albin and Wampler predict that a Chesapeake Bay impact horizon might be found. Recent reconnaissance in active mines seems to support Pickering s claim and suggests that the breccia correlates 8 km up-dip with the coarse sand horizon in which Harris et al. and Schroeder et al.have identified possible shocked quartz. Here I report the initial results of my investigation of the diamictite.
Derived from text
Coastal Plains; Georgia; Minerals; Stratigraphy; Volcanology

20030110963 Academy of Sciences of the Ukraine, Kharkov, Ukraine
Formulas of the Perspective Cartographic Projection for Planets and Asteroids of Arbitrary Shape
Shalygin, E. V.; Velikodsky, Yu. I.; Korokhin, V. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Formulas of transformation between coordinates on image plane, planetocentric coordinates and photometric conditions of observation for arbitrary planet have been obtained. An example with ellipsoidal planet has been considered.
Author
Shapes; Planetocentric Coordinates; Mapping; Asteroids

20030110964 Kingston Univ., Kingston-Surrey, UK
Cryptoendolith Communities in Antarctic Dry Valley Region Sandstones: Potential Analogues of Martian Life-Forms
Blackhurst, Rebecca L.; Verchovsky, A.; Jarvis, K.; Grady, M. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cryptoendolithic communities colonizing sandstones in the Dry Valleys of Antarctica have been the subject of much research over recent years, owing to their potential as analogues of Martian life-forms. Interest in them stems from the similarities between the Antarctic cold desert ecosystems, representing some of the most extreme of terrestrial environmental habitats, and the conditions pertaining at the Martian surface. Cryptoendolithic microbial communities occur in the interstitial spaces of certain translucent sandstones and extend down to 10mm below the rock surface. They primarily consist of symbiotic or free living lichen and cyanobacteria and their presence is identified by three coloured zones in the profile of the substratum: 1) black pigmented lichen; 2) white lichen, predominantly hyaline fungi; and, 3) microalgae (green algae and/or cyanobacteria).
Derived from text
Sandstones; Analogies; Microorganisms; Mars Surface; Fungi

20030110966
Trace Element Variation in Carbonaceous Chondrite Matrix
Bland, P. A.; Alard, O.; Gounelle, M.; Rogers, N. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chondrite matrix is defined as the fine-grained, predominantly silicate, material interstitial to macroscopic, whole or fragmented, entities such as chondrules, inclusions and large isolated mineral (i.e., silicate, metal, sulphide and oxide) grains. Matrix materials are derived from a wide variety of sources: presolar grains, solar-nebular condensates, and finely ground lithic material from chondrules and inclusions. These fine-grained components were subsequently lithified following accretion with varying amounts of inclusions (chondrules, CAIs, DIs, AOAs etc) on asteroid parent bodies, where they experienced variable aqueous, thermal, and impact processing. The fine-grained nature of chondrite matrix, and the often substantial

secondary processing that it has experienced, has made unraveling the origins and abundances of specific matrix components extremely difficult. There remains little consensus on the origin of matrix materials, even within one chondrite group.
Derived from text
Carbonaceous Chondrites; Trace Elements; Meteoritic Composition; Matrix Materials; Chondrites

20030110968 Geological Survey, Flagstaff, AZ, USA
Volcanic Features in Valles Marineris Reexamined with MGS Data
Lucchitta, B. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Viking images showed possible young volcanic deposits inside the Valles Marineris. Some of these features are now covered by Mars Observer Camera (MOC) narrow-angle images at resolutions of only a few meters per pixel, and a new look is warranted. The features were dark spots or bands at the base of trough walls, rimless craters, and a late hummocky, light colored deposit locally associated with flow lobes.
Author
Mars Surface; Mars Volcanoes; Mars Photographs; Valleys

20030110969 Brown Univ., Providence, RI, USA
Metasomatising the Lunar Mantle with TiO2-rich Melts: A Disequilibrium Porous Flow Model
Beck, A. R.; Hess, P. C.; Liang, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The picritic glass beads, found at every Apollo sampling site, have the most primitive compositions among the lunar volcanic rocks. Even though these glasses have undergone a certain degree of shallow level olivine crystallization, the bulk of the lunar volcanic glass suite can be acceptably modeled as the partial melting products of an olivine + orthopyroxene source region deep within the lunar mantle. Interestingly, the melts are all undersaturated with respect to ilmenite (and clinopyroxene) at all pressures thus investigated. A source region of primitive LMO olivine and orthopyroxene, even when melted in small degrees cannot account for these compositions. A TiO2-enriched source is required to explain basalts with higher TiO2 contents. Among the models proposed include the overturn model, which predicts that the cumulate pile must redistribute itself. The gravitationally unstable, Fe-Ti rich cumulates sink deep into the lunar mantle, displacing the more Mg-rich crystals to shallower levels. This is an appealing model, as it provides the lunar mantle with an infusion of incompatible heat producing elements that may provide heat needed to instigate partial melting at depth. Elkins-Tanton et al, modeled cumulate overturn in the LMO and found that redistribution of the solid ilmenite cumulate layer was unlikely due to the high viscosity of the layer at the temperatures investigated. They proposed instead that the most feasible mechanism for sinking the high TiO2 material was to re-melt the clinopyroxene and ilmenite cumulate layer through radiogenic or shock heating. This would create ilmenite rich liquids which are significantly denser than the underlying mantle, and could sink into and fertilize the mantle. In order to further explore the overturn models we compare the geochemical consequences of sinking a solid ilmenite-bearing layer and downward percolation of a TiO2-rich liquid into the underlying cumulates. Solid-state overturn will result in simple mechanical mixing between the ilmenite-rich rocks and the underlying cumulates. Downward percolation of a TiO2-rich melt through a porous cumulate pile will inevitably lead to melt-rock reaction because the through-going melt is not in chemical equilibrium with its host matrix. One of the widely recognized features of melt-rock reaction in a porous rock is the chromatographic fractionation among the compatible and incompatible elements. Due to their smaller crystal-melt partition coefficients and finite crystal-melt exchange rates, the highly incompatible elements have an effectively larger percolation velocity than the more compatible elements. Hence it is quite possible to distinguish source regions that experienced mechanic mixing or melt-rock reaction from their compatible and incompatible element compositions.
Derived from text
Lunar Mantle; Titanium Oxides; Lunar Rocks; Olivine; Melts (Crystal Growth); Flow Characteristics

20030110970 Maryland Univ., College Park, MD, USA
Molybdenum Isotopic Composition of Iron Meteorites, Chondrites and Refractory Inclusions
Becker, H.; Walker, R. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-4769; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent Mo isotopic studies of meteorites reported evidence for differences in isotopic compositions for whole rocks of some primitive and differentiated meteorites relative to terrestrial materials. Enrichments of r- and p-process isotopes of up to 3-4 units (e unit = parts in 10(exp 4) over s-process dominated isotopes are the most prominent features. Certain types of presolar grains show large enrichments in s-process isotopes, however, it was concluded on grounds of mass balance that incomplete digestion of such grains cannot explain the enrichments of r- and p-process isotopes in whole rocks of primitive chondrites. If the reported variability in r- and p-process isotope enrichments reflects the true isotopic characteristics of the whole rocks, the implications are quite profound. It would suggest the presence of large scale Mo isotopic heterogeneity within the solar accretion disk with likely collateral effects for other elements. However, such effects were not found for Ru isotopes, nor for Zr isotopes. Another recent Mo isotopic study by multi collector ICP-MS could not confirm the reported deviations in Allende, Murchison or iron meteorites. Here, we present new results for the Mo isotopic composition of iron meteorites, chondrites and CAIs obtained by negative thermal ionization mass spectrometry (NTIMS). We discuss analytical aspects and the homogeneity of Mo isotopic compositions in solar system materials.
Author
Molybdenum Isotopes; Meteoritic Composition; Iron Meteorites; Chondrites; Inclusions

20030110971 Carnegie Institution of Washington, Washington, DC, USA
Sulfide-Oxide Assemblage in Tagish Lake Carbonaceous Chondrite
Boctor, N. Z.; Kurat, G.; Alexander, C.M.O.D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tagish Lake, an observed fall in the year 2000, was classified by as a type 2 carbonaceous chondrite. It bears similarity to CI 1 and CM chondrites but is distinct from both noted that the overall trace elements abundance pattern in Tagish Lake is similar to those of CM chondrites indicating that Tagish Lake and CMs experienced very similar nebular processes. The mineralogy of Tagish Lake was studied by [1], who identified two lithologies a dominant carbonate-poor lithology and a less abundant carbonate lithology. Abundant phyllosilicate indicates that aqueous alterations affected both lithologies. Aqueous fluids were abundant during the alteration process as suggested by the oxygen isotope data of [3], which requires a water/rock ratio of 2.This is higher by a factor of 2 than estimates for CM or CI. In this investigation, we report on sulfide and oxide minerals in Tagish Lake and assess their origin.
Derived from text
Carbonaceous Chondrites; Trace Elements; Sulfides; Oxides; Chondrites; Carbonates

20030110972 Geological Survey, Flagstaff, AZ, USA
Comparative Study of 3-Dimensional Renderings of the Valles Marineris Interior Layered Deposits on Mars and Terrestrial Sub-Ice Volcanoes in Iceland
Chapman, M. G.; Lucchitta, B. K.; Skilling, I. P.; Smellie, J. L.; Thordarson, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many Valles Marineris chasmata contain mounds and mesas of interior layered deposits (ILDs). Although the origin of the layered interior deposits remains controversial, mapping indicates that the ILDs formed at different times [1] and adjacent deposits have distinct edifice morphologies and sequences of deposits, suggesting different depositional histories [2].that the ILDs are analogous to terrestrial sub-ice volcanic forms, such as tuyas and hyaloclastic ridges. However, as there is a paucity of planetary-applicable research on sub-ice volcanoes and on MOC-related studies of the ILDs, we are mapping the ILDs and constructing models with which to test the sub-ice volcanic hypothesis, and to place limits, if possible, on contributions of multiple processes that may have delivered materials to the ILDs.
Derived from text
Mars Surface; Volcanoes; Petrogenesis

20030110973 Kharkov Astronomical Observatory, Kharkov, Ukraine
Estimates of the Lunar Surface Composition with Clementine Images and LSCC Data
Shkuratov, Yu.; Pieters, C.; Omelchenko, V.; Stankevich, D.; Kaydash, V.; Taylor, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-10469; INTAS-2000-0792; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There have been several approaches to develop remote sensing technique to estimate composition of the lunar surface using multispectral observations. We present a new approach based on statistical analysis of spectral and compositional data for lunar samples by the Lunar Soil Characterization Consortium (LSCC) and using the UVVIS Clementine data with 1 km resolution. This technique allows us to estimate and map the abundance of TiO2, SiO2, and FeO, pyroxene and plagioclase content, and maturity degree (Is/FeO).
Derived from text
Lunar Soil; Remote Sensing; Statistical Analysis; Lunar Surface; Lunar Composition

20030110975 Idaho Univ., Moscow, ID, USA
Comparison Between Terrestrial Explosion Crater Morphology in Floating Ice and Europan Chaos
Billings, S. E.; Kattenhorn, S. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Craters created by explosives have been found to serve as valuable analogs to impact craters, within limits. Explosion craters have been created in floating terrestrial ice in experiments related to clearing ice from waterways. Features called chaos occur on the surface of Europa s floating ice shell. Chaos is defined as a region in which the background plains have been disrupted. Common features of chaos include rafted blocks of pre-existing terrain suspended in a matrix of smooth or hummocky material; low surface albedo; and structural control on chaos outline shape by pre-existing lineaments. All published models of chaos formation call on endogenic processes whereby chaos forms through thermal processes. Nonetheless, we note morphological similarities between terrestrial explosion craters and Europan chaos at a range of scales and consider whether some chaos may have formed by impact. We explore these similarities through geologic and morphologic mapping.
Derived from text
Geomorphology; Craters; Europa; Chaos; Structural Properties (Geology); Ice

20030110978 National Museum of Natural History, Washington, DC, USA
Vesiculation in Ordinary Chondrites Due to Impact Melting: The 'PAT' 91501 Answers
Benedix, G. K.; Ketcham, R. A.; McCoy, T. J.; Wilson, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Vesicular meteorites are rare among the world s collections. Of the few that exist, most are basaltic in composition. In these basaltic meteorites the presence and distribution of vesicles is used to unravel differentiation processes on their parent bodies. The question has been raised whether impact processes can form vesicular basalts on differentiated asteroids. We undertook this study to determine if vesicular impact melts resemble vesicular basaltic meteorites. Vesicles have been reported in three ordinary chondrite impact melts: Shaw, Cat Mountain, and PAT 91501. These studies focused on bulk chemistry and textural features of these meteorites, but did not delve into the formation of the vesicles. Understanding the formation mechanism of vesicles in these meteorites is important. What is the volatile species that could form the bubbles? Why do the bubbles stay in these particular impact melts? This abstract is a preliminary report of an effort to try to answer these questions.
Derived from text
Chondrites; Impact Melts; Meteoritic Composition; Bubbles

20030110979 Arkansas-Oklahoma Center for Space and Planetary Sciences, USA
Grain Size and Density Separation on Asteroids: Comparison of Seismic Shaking and Fluidization
Benoit, P. H.; Hagedorn, N. L.; Kracher, A.; Sears, D. W. G.; White, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the most important discoveries of the NEAR Shoemaker mission to Eros was the ponds, flat regions (relative to surrounding terrain) inside craters that exhibit a slightly bluer reflectance spectra than most of the asteroid. Ponds have been interpreted as being composed of finer-grained material than the rest of the asteroid surface. Formation processes for ponds include electrostatic levitation, seismic shaking, and fluidization. In each case, a force (charging from solar wind, shaking from meteoroid impacts, or gas flow from the interior, respectively) results in a separation of fine-grained material on the surface which, due to down-slope movement, results in formation of accumulation of fine-grained material in depressions. Here, we present results of experiments assessing the effects of shaking and fluidization on chondritic-like analogs. We have previously

conducted laboratory and micro-gravity fluidization experiments on chondrite analogs. Freely moving/flowing particles exhibit behavior intermediate between solids and liquids. One result is that grain-size sorting can occur in shaken or flowing groups of particles, analogous to grain-size sorting that occurs in more dilute aqueous systems such as lakes and rivers. However, particle-based systems exhibit some unusual properties, including inverse size-sorting, where large particles can be preferentially sorted to the top of a particle flow (sometimes called the Brazil nut effect). Importantly, grain-size sorting in these systems solely reflects the movement of particles, and thus does not require any pore gas or fluid, and thus could occur on anhydrous bodies.
Derived from text
Asteroids; Grain Size; Size Separation; Particle Size Distribution

20030110980 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fullerenes and the Nature of Planetary Gases
Becker, Luann; Poreda, Robert J.; Nuth, Joe; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past several decades, two issues have dominated the discussion of planetary noble gas patterns: 1) the general resemblance of the noble gas abundances in carbonaceous chondrites to those measured in the Earth s atmosphere and; 2) atmospheric inventories of argon and neon that fall off significantly with increasing distance from the Sun. The recognition of the latter has led to the conclusion that the planetary component is not found on planets. In particular, the inability to explain the missing xenon reservoir, once thought to be sequestered in crustal rocks has been extremely troublesome. Some models have focused on various fractionations of solar wind rather than condensation as the process for the evolution of noble gases in the terrestrial planets. However, these models cannot explain the observed gradient of the gases, nor do they account for the similar Ne/Ar ratios and the dissimilar planetary Ar/Kr ratios. More recent studies have focused on hydrodynamic escape to explain the fractionation of gases, like neon, in the atmosphere and the mantle. Escape theory also seems to explain, in part, the isotopically heavy argon on Mars, however, it does not explain the discrepancies observed for the abundances of argon and neon on Venus and the Earth. This has led to the assumption that some combination of solar wind implantation, absorption and escape are needed to explain the nature of planetary noble gases.
Derived from text
Fullerenes; Planetary Atmospheres; Rare Gases; Gas Evolution

20030110981 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA
The Influence of Glassy Coatings on Volcanic Rocks from Mauna Iki, Hawaii and Applications to Rocks on Mars
Bishop, Janice L.; Minitti, Michelle E.; Lane, Melissa D.; Weitz, Catherine M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Yellow and orange glassy coatings have been observed on volcanic rocks in the Mauna Iki region of Hawaii. We have characterized these as part of a larger study to understand rock coatings on Mars. The coatings on these Mauna Iki samples are comprised of two layers - an SiO2 layer and an Fe-Ti-rich pigmenting layer. Reflectance and emittance spectra have been analyzed and are discussed in relation to spectra of rocks on Mars. Both visible/NIR and mid-IR spectra exhibit properties due to SiO2 coatings.
Derived from text
Igneous Rocks; Glass; Silicon Dioxide; Infrared Radiation

20030110982 NovaSol, Honolulu, HI, USA
New Ground-based Spectral Observations of Mercury and Comparison with the Moon
Blewett, D. T.; Warell, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NASW-02007; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spectroscopic observations (400-670 nm) of Mercury were made at La Palma with the Nordic Optical Telescope (NOT) in June and July of 2002. Extensive observations of solar analog standard stars and validation spectra of 7 Iris and a variety of locations on the Moon were also collected. The 2002 Mercury data were also combined with previous observations (520-970 nm) from the Swedish Solar Vacuum Telescope (SVST). A spectrum (400-970 nm) calibrated to standard bidirectional geometry (alpha=i=30deg, e=0deg) was constructed based on the spectral slopes from 2002. The combined

spectrum permits analysis with the Lucey lunar abundance relations for FeO and TiO2.
Derived from text
Mercury (Planet); Spectrum Analysis; Iron Oxides; Moon; Titanium Oxides

20030110983 American Museum of Natural History, New York, NY, USA
An Oxygen Isotope Mixing Model for the Northwest Africa 011 Basaltic Achondrite
Bosenberg, Joseph S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The eucrites lie on an oxygen isotopic mass fractionation line that is sub-parallel to the terrestrial fractionation line in the oxygen three isotope diagram. Several estimates of the eucrite parent body (EPB) composition have been made over the last few decades. Parent body estimates try to approximate a bulk composition for the asteroid, so that when melted, magmas consistent with the compositions of the meteorite samples are generated. [5] were the first to do this based on oxygen isotopic constraints, as well as, petrologic and compositional factors. Within their model, different chondritic components were mixed in specific proportions so the final composition had an oxygen isotopic signature identical to the eucrites. The proportions were determined using the distances between the oxygen isotopic composition of the chondritic components and the eucrite fractionation line. Only binary models were tried but, more complex models involving three or more components could be employed, such as those done later by [8]. The only implicit requirement for such binary models is that the two components lie on opposite sides of the eucrite fractionation line, so that the final calculated composition equals the oxygen isotopic composition of the eucrites.
Derived from text
Achondrites; Oxygen Isotopes; Stellar Models; Meteoritic Composition; Chondrites; Asteroids

20030110984 Museum of Natural History, London, UK
Different Degrees of Aqueous Alteration in Sulphides Within the CI1 Chondrites
Bullock, E. S.; Gounelle, M.; Grady, M. M.; Russell, S. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has been well documented that all of the CI1 chondrites have undergone extensive aqueous alteration, which has modified the texture and composition of the minerals present. In this study, we look at the effect of aqueous alteration on Fe-Ni sulphides in four different CI1 chondrites, with a view to identifying variable degrees of aqueous alteration within CI1 chondrites.
Derived from text
Chondrites; Sulfides; Morphology; Chemical Composition; Petrology; Aqueous Solutions

20030110985 Academy of Sciences (USSR), Moscow, USSR
Venus Nomenclature 2002: New Names and the Website's Changed Look
Burba, G. A.; Blue, J.; Marov, M. Ya.; Stofan, E. R.; Soltesz, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 2002, the Task Group for Venus Nomenclature introduced 34 new names of 10 feature types on the planet Venus. These names were subsequently approved by the Working Group for Planetary System Nomenclature (WGPSN), a working group of the International Astronomical Union (IAU). With WGPSN approval, the names became official international nomenclature with provisional status, and as such, they should be marked in publications as provisional names until full adoption by the forthcoming General Assembly of the IAU in 2003. The 34 new names include 2 chasmata, 11 coronae, 1 dorsa, 1 fossa, 5 montes, 2 paterae, 2 plana, 1 tessera, 6 tholi, and 3 valles. The new names are derived from the following different continents: Europe 11 names, Asia 11, Africa 4, North America 4, South and Central America 1, and Oceania 3 names. A list of the new names are presented.
Derived from text
Astronomy; Nomenclatures; Venus (Planet); Planetary Systems; Websites

20030110986 Imperial Chemical Industries Ltd., London, UK
Topographic Mapping of Venusian Craters Using Artificial Neural Networks
Bond, T.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

SAR data available from NASA s Magellan mission gives high resolution RADAR images of the Venusian surface in three cycles of data coverage. In the absence of direct measurements or global high resolution altimetry the use of stereo pairs of SAR data allows topographic maps of the Venusian surface to be generated. Of particular interest to this work is the generation of topographic maps of impact craters. Areas with data coverage from both cycle one and cycle three Magellan passes are suitable candidates for stereopair mapping. Due to mission operational difficulties some areas of the planetary surface only have data coverage from either cycle one or cycle three ruling out the generation of topographic maps from a measured stereopair. In these areas alternative approaches must be taken to produce a topographic analysis of surface features.
Derived from text
Synthetic Aperture Radar; Topography; Relief Maps; Neural Nets; Planetary Surfaces

20030110987 Bern Univ., Bern, Switzerland
Solar Noble Gases in Enstatite Chondrites and Implications for the Formation of the Terrestrial Planets
Busemann, H.; Baur, H.; Wieler, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In a companion abstract, we report evidence for tiny amounts of - most likely primordial - noble gases with solar-like elemental and isotopic composition admixed to Q-type primordial noble gases in an E chondrite. Here, we discuss possible implications of this finding for terrestrial planet formation.
Derived from text
Chondrites; Enstatite; Planetary Evolution; Rare Gases; Terrestrial Planets; Solar Atmosphere

20030110988 North Dakota Univ., Grand Forks, ND, USA
Formation of Martian Paterae: Insights from Terrestrial Ignimbrite Shields
Byrnes, Jeffrey M.; deSilva, Shanaka L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The formation of Martian paterae is poorly understood. Typical paterae are considered to be constructed primarily of pyroclastic deposits (e.g. Tyrrhena Patera, Hadriaca Patera, and Apollinaris Patera, whereas others are suggested to be constructed primarily of numerous lava flows (e.g. Biblis and Ulysses Paterae and Uranius Patera. Alba Patera is interpreted to have significant components of both pyroclastic and lava flows, whereas volcanism may not have been significant in the formation of Orcus Patera. One commonality to all paterae is the feature for which they are named, a shallow summit crater. The lack of observed resurgent doming at paterae along with the model of basalt dominated volcanism on Mars has lead to comparisons between paterae and calderas formed on terrestrial basaltic shield volcanoes. However, it remains unclear if this is the most valid terrestrial analog. Calderas in basaltic shields are built upon a large edifice dominated by lavas, whereas this is clearly not the case for pyroclastic-dominated paterae. We suggest that a better paterae analog may be ignimbrite shields, which have received comparatively little attention. These are large-volume pyroclastic shields that show neither significant collapse nor resurgent doming. Herein, we consider morphologic similarities between Martian paterae and terrestrial ignimbrite shields in order to further explore the processes responsible for the formation of the paterae.
Derived from text
Calderas; Igneous Rocks; Mars Surface; Planetary Geology; Terrestrial Planets; Volcanology; Bedrock

20030110989 NASA Johnson Space Center, Houston, TX, USA
Carbonaceous Chondrite Fragments in the Polymict Eucrite Yamato 791834
Buchanan, P. C.; Zolensky, M. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Buchanan et al. and Zolensky et al. described carbonaceous chondrite fragments in a variety of howardites and concluded that the majority are CM2 and CR2 materials. Gounelle et al. also described similar, but very small, fragments in these meteorites. These clasts are important because they represent materials that were in orbital proximity to the HED parent body (4 Vesta) and they may be similar to the primitive materials that originally accreted to form this body. The present study describes two carbonaceous chondrite clasts in the Yamato 791834 (Y791834) polymict eucrite.
Derived from text
Carbonaceous Chondrites; Vesta Asteroid; Achondrites; Meteoritic Composition

20030110990 Alaska Univ., Fairbanks, AK, USA

Atmospheric Effects and the Record of Small Craters on Mars

Chappelow, J. E.; Sharpton, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact crater populations, together with size-frequency isochrons derived for Mars, are currently used to estimate the absolute ages of Martian surfaces. These isochrons were originally developed for the Moon, and later transposed to Mars by attempt-ing to estimate the cratering rate for Mars relative to that of the Moon. In the process, however, many idealizations are made in order to simplify the problem, one of which is to neglect the effects of Mars' current 6.1 mBar atmosphere. The presence of this atmosphere influences cratering efficiency by decelerating, ablating, and breaking up incident impactors. Each of these processes may affect cratering rates significantly but differently. Mars' average surface pressure also varies, both spatially and temporally. Several workers have found that changes in Mars' obliquity may cause its surface pressure to vary between zero and approximately 35 mBar on timescales of 10(exp 5)-10(exp 6) years, variations which might be detectable in the record of small craters that are resolvable with current MOC NA imagery and with upcoming capabilities of even higher spatial resolution. In addition, Martian topography results in surface pressures that currently span an order of magnitude from approximately 10 mBar in Hellas to less than 1 mBar on Olympus Mons; vast regions of Mars lie under surface pressures of approximately 4.5 mBar (southern highlands) and approximately 7.5 mBar (northern lowland plains). The purpose of this work is to investigate how the presence of the martian atmosphere, and its variations, affect small (less than 250 m) impact cratering rates, and surface ages derived therefrom, and how its variations may be expressed in the cratering record.

Derived from text

Atmospheric Effects; Mars Craters; Mars Surface; Mars Atmosphere; Planetary Geology

20030110991 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Thermal Modeling of Permafrost Melt by Overlying Lava Flows with Applications to Flow-associated Outflow Channel Volumes in the Cerberus Plains, Mars

Chase, Z. A. J.; Sakimoto, S. E. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-11150; NAG5-12287; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Cerberus region of Mars has numerous geologically recent fluvial and volcanic features superimposed spatially, with some of them using the same flow channels and apparent vent structures. Lava-water interaction landforms such as psuedocraters suggest some interaction of emplacing lava flows with underlying ground ice or water. This study investigates a related interaction type a region where the emplaced lava might have melted underlying ice in the regolith, as there are small outflow channel networks emerging from the flank flows of a lava shield over a portion of the Eastern Cerberus Rupes. Specifically, we use high-resolution Mars Orbiter Laser Altimeter (MOLA) topography to constrain channel and flow dimensions, and thus estimate the thermal pulse from the emplaced lava into the substrate and the resulting melting durations and refreezing intervals. These preliminary thermal models indicate that the observed flows could easily create thermal pulse(s) sufficient to melt enough ground ice to fill the observed fluvial small outflow channels. Depending on flow eruption timing and hydraulic recharge times, this system could easily have produced multiple thermal pulses and fluvial releases. This specific case suggests that regional small water releases from similar cases may be more common than suspected, and that there is a possibility for future fluvial releases if ground ices are currently present and future volcanic eruptions in this young region are possible.

Derived from text

Fluid Flow; Lava; Permafrost; Planetary Geology; Mars Volcanoes; Mars Surface

20030110992 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Early Results from the Odyssey THEMIS Investigation

Christensen, Philip R.; Bandfield, Joshua L.; Bell, James F., III; Hamilton, Victoria E.; Ivanov, Anton; Jakosky, Bruce M.; Kieffer, Hugh H.; Lane, Melissa D.; Malin, Michael C.; McConnochie, Timothy, et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Thermal Emission Imaging System (THEMIS) began studying the surface and atmosphere of Mars in February, 2002 using thermal infrared (IR) multi-spectral imaging between 6.5 and 15 m, and visible/near-IR images from 450 to 850 nm. The infrared observations continue a long series of spacecraft observations of Mars, including the Mariner 6/7 Infrared

Spectrometer, the Mariner 9 Infrared Interferometer Spectrometer (IRIS), the Viking Infrared Thermal Mapper (IRTM) investigations, the Phobos Termoscan, and the Mars Global Surveyor Thermal Emission Spectrometer (MGS TES). The THEMIS investigation's specific objectives are to: (1) determine the mineralogy of localized deposits associated with hydrothermal or sub-aqueous environments, and to identify future landing sites likely to represent these environments; (2) search for thermal anomalies associated with active sub-surface hydrothermal systems; (3) study small-scale geologic processes and landing site characteristics using morphologic and thermophysical properties; (4) investigate polar cap processes at all seasons; and (5) provide a high spatial resolution link to the global hyperspectral mineral mapping from the TES investigation. THEMIS provides substantially higher spatial resolution IR multi-spectral images to complement TES hyperspectral (143-band) global mapping, and regional visible imaging at scales intermediate between the Viking and MGS cameras.
Derived from text
Mars Atmosphere; Mars Surface; Mineral Deposits; Thematic Mapping; Thermophysical Properties

20030110993 Ecole Nationale Superieure de Chimie, Paris, France
New Extraterrestrial Signature of the Insoluble Organic Matter of the Orgueil, Murchison and Tagish Lake Meteorites as Revealed by Electron Paramagnetic Resonance
Binet, L.; Gourier, D.; Derenne, S.; Robert, F.; Ciofini, I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Carbonaceous chondrites are known to contain up to 3% of carbon, most of which occuring as macromolecular insoluble organic matter (IOM). This IOM, with complex and largely unknown structure, is considered as a record of interstellar synthesis and may contain precursors of prebiotic molecules which could have been deposited on Earth by meteoritic bombardments. The knowledge of the structure of this IOM is necessary to better understand its genesis and its possible implication in the production of prebiotic molecules. The IOM of the carbonaceous meteorites contains radicals, i.e. molecular moieties with unpaired electron spins. Radicals are paramagnetic species and can be studied by Electron Paramagnetic Resonance (EPR). This spectroscopic technique is based on the absorption of an electromagnetic radiation in the microwave range by an electron spin submitted to an applied static magnetic field. The absorption spectrum reflects the interactions of the spin with its environment and therefore provides information on the chemical and electronic structure of the surrounding matter. In this contribution we show that the radicals in the IOM possess several specific features which could be the consequence of its chemical history and which make this IOM clearly distinguishable from the terrestrial type III kerogens, to which they are often compared.
Author
Extraterrestrial Matter; Organic Compounds; Carbonaceous Chondrites; Macromolecules; Meteoritic Composition

20030110995 Massachusetts Inst. of Tech., Cambridge, MA, USA
SMASS Near-Earth Object Survey: An Album of Results
Binzel, R. P.; Harris, A. W.; Bus, S. J.; Rivkin, A. S.; Burbine, T. H.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-12355; NSF AST-02-05863; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Small Main-Belt Asteroid Spectroscopic Survey (SMASS) undertaken at MIT has produced and published visible spectra for more than 1300 main-belt asteroids. The infrared extension of this program (SMASSIR) has produced near-infrared spectra for about 200 main-belt asteroids. In this poster we present visible and near-infrared spectral results for more than 300 near-Earth objects (NEOs) measured during the SMASS and SMASSIR programs and through ongoing observations at Kitt Peak, Palomar, IRTF, and Magellan observatories. The scientific goals for this sample are to deduce the compositional distribution of the near-Earth object population. Knowledge of this distribution will allow the origin and relative hazard of the NEO population to be better understood and will provide the basis for gaining further insights to asteroid-meteorite and asteroid-comet relationships. While a portion of our NEO sample has been published, spectral measurements are newly presented here for more than 250 NEOs. All published SMASS spectra are available at our website http://smass.mit.edu/. These new near-Earth object spectra will also be made available at the SMASS website at the time they are submitted for publication.
Author
Asteroids; Populations; Sky Surveys (Astronomy); Astronomical Spectroscopy; Near Earth Objects; Infrared Astronomy

20030110996 American Geophysical Union, USA

Groundwater Recharge in an Epoch of Climax Lakes in the Valles Marineris, Mars

Coleman, Neil M.; Dinwiddie, Cynthia L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Liquid water was once abundant near the surface of Mars, at least for limited times. Evidence for this includes valley networks, outflow channels, shorelines and deposits in craters, and a possible sea in Argyre, which overflowed to become a source for Ares Vallis. Ice-covered lakes may have existed in the Valles Marineris (VM). There is also evidence for a northern ocean based on similar elevations of channel termini, the extreme smoothness of the northern plains, possible subaqueous alteration of basalts, and polygonal ground possibly formed by ice wedging.

Derived from text

Ground Water; Lakes; Mars Surface; Ice

20030110997 National Air and Space Museum, Washington, DC, USA

Thermal Conductivity Studies of Sedimentary Materials from Central Australia and the Implications for Mars

Craddock, Robert A.; Presley, Marsha A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NAG5-12180; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the search for life on Mars, investigating fluvial deposits will be a high priority for future landers. Although there is abundant evidence that fluvial processes worked with great intensity in the past (e.g., outflow channels, valley networks, and modified impact craters), aeolian processes dominate under the current environmental conditions. In fact there is evidence that extensive aeolian deposits may have filled in valley networks [1] and even shallow depressions where water may have ponded [2]. Thus, quite often there may be a disparity between the geology identified by orbital data and the geology accessible to a lander. Determining where fluvial deposits occur on the surface is important for addressing NASA's goal to 'follow the water.' In order to do that, however, existing remote sensing data must be evaluated and a set of diagnostic criteria for recognizing fluvial deposits must be established. To that end, we are conducting a first order analysis of the thermal characteristics of fluvial and aeolian materials collected from central Australia.

Author

Planetary Geology; Mars (Planet); Australia; Extraterrestrial Life

20030110998 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands

Europe Goes to Mars and Venus: The Mars and Venus Express Missions

Chicarro, A. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The European Space Agency has undertaken an ambitious planetary exploration programme aiming at Mars, the Moon, Titan, comet Wirtanen and Mercury, with a series of missions arriving at their destination in the coming years (Mars Express in 2003, Smart-1 in 2004, Huygens in 2005, Rosetta in 2011 and BepiColombo in 2014, respectively). Realizing there was a substantial gap in the return of scientific data and a timely financial envelope available in the programme, a new mission to Venus has recently been approved by ESA's Advisory Bodies that would re-use both the Mars Express bus and many of its instruments, hence its name of Venus Express. The Mars Express mission includes an orbiter spacecraft and a small lander module named Beagle-2 in remembrance of Darwin s ship Beagle. The orbiter instruments will focus on the surface, subsurface and atmosphere of Mars, recovering some of the lost scientific objectives of the Russian Mars-96 mission, while the lander will concentrate on the detection of life. The Venus Express mission comprises an orbiter to study the various layers of the atmosphere in great detail and also the surface and space environment of the planet. Various scientific payloads and specific scientific objectives of the Mars Express orbiter and the Venus Express mission are described.

Derived from text

Venus (Planet); NASA Space Programs; Space Exploration; European Space Agency; Mars Missions; Mars (Planet)

20030110999 Tennessee Univ., Knoxville, TN, USA

Spectroscopic Observations of Subresolved Targets: Applications to the MER Mini-TES and RAT Experiments

Ciccolella, S. M.; Moersch, J. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In January, 2004, the twin Mars Exploration Rovers (MER) will begin their exploration of the Martian surface. Among the payload of instruments carried by each rover is the Miniature Thermal Emission Spectrometer (Mini-TES) and the Rock Abrasion Tool (RAT). One challenge in exploring the mineralogy of Mars via remote sensing is the presence of dust that pervasively mantles many areas of the planet s surface. The Mini-TES aperture is located on the rover s Pancam Mast Assembly (PMA), and the RAT is mounted on the rover s Instrument Deployment Device arm. The purpose of the RAT is to remove thin weathering surfaces and/or dust on rock samples to reveal their interiors for analysis by other instruments on the rover, including Mini-TES. The minimum field of view for Mini-TES is 6.35 cm, defined by the diameter of the mirror used in the rover s PMA Cassegrain telescope. The area abraded by the RAT, however, is only 4.5 cm in diameter, meaning that freshly exposed surfaces are subresolved, filling =50% of the Mini-TES field of view. As a result, each spectrum obtained by Mini- TES will represent a combination of the 'RAT-hole' (exposed surface) target and the surrounding background of weathered or coated surface. Here we investigate different techniques for determining the spectrum of a target that incompletely fills the spectrometer s field of view.
Derived from text
Spectroscopy; Observation; Mars Surface; Mineralogy; Dust; Thermal Emission

20030111000 University of Central Florida, Orlando, FL, USA
Terrestrial Planets are Rare
Clarke, T. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The discovery of many massive, Jovian and larger, extrasolar planets in recent years can lead to the expectation that these systems will contain a comparable number of terrestrial-size planets based on analogy with the solar system. This paper suggests that even in systems where large planets have formed, the formation of smaller terrestrial sized planets is not inevitable. The formation of terrestrial planets may depend on the presence of Al26 in the solar nebula to provide heat to melt planetesimals and facilitate planetary accretion. Since presence of significant Al26 is dependant on a nearby supernova occurring within the half life of Al26, the probability of terrestrial planet formation would be substantially reduced.
Derived from text
Terrestrial Planets; Expectation; Gas Giant Planets; Planetary Evolution

20030111001 NASA Ames Research Center, Moffett Field, CA, USA
Mound Spring Complexes in Central Australia: An Analog for Martian Groundwater Fed Outflow Channels?
Clarke, J. D. A.; Stoker, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The arid inland of Australia contains a diversity of landscapes and landscape processes, often of great antiquity, extending back to the Mesozoic and Paleozoic. The potential of this landscape as a source of Mars analogs has, however, been little explored. The few examples studied so far include radiation-tolerant microbes in thermal springs and hematite-silica hydrothermal alteration near Arkaroola in the Finders Ranges, and aeolian landforms at Gurra Gurra water hole the north east of Arkaroola. Further Australian Mars analog studies were provided by the studies of Bourke and Zimbelman of the paleoflood record of the Todd and Hale Rivers in central Australia. To facilitate study of such analogues, Mars Society Australia has embarked on a project to construct a Mars Analog Research Station near Arkaroola. The international scientific community will soon have the opportunity to participate in Mars analog studies in central Australia utilizing this facility. An area of considerable Mars analog potential is the mound spring complexes that occur at the margins of the Great Artesian Basin (GAB) which underlies 22% of the Australian continent and covers 1.7 million km2. The mound springs are formed when ground water flows to a topographic low, and subsurface strata dips up causing a hydrological head at the surface. Minerals precipitated at the spring discharge zone form low mesas or 'mounds', the height of which are controlled by the hydrological head. This paper describes the Dalhousie Mound Spring Complex (DMC) in the northern part of South Australia (Figure 1), and its potential as a Mars analog. Hydrogeology: The DMC consists of a cluster of more than 60 active springs formed by natural discharge from the GAB). Total measured discharge from the GAB is 1.74 GL per day, estimated unfocussed natural leakage through the aquaclude is thought be approximately equal to this figure. Some 54 ML per day are currently discharged by the DMC, 3% of the measured total. The discharged artesian waters are of low to moderate salinity (700 - 9400 ppm), near neutral pH (6.8-7.3) and warm (20-46 C). The elevated temperatures are due to passage of the groundwater through deeply buried (up to 3 km) aquifers in an region of high heat flow, rather than magmatic heating. The waters also contain high levels of dissolved iron and H2S and less than 1 ppm dissolved oxygen. The water is carried in the Late Jurassic Algebuckina Sandstone beneath the aquaclude of the Bulldog Shale. It is brought near the surface by the mid-Cenozoic Dalhousie anticline

and the ground water flow focused along a series of faults that breach the anticline's crest.
Derived from text
Analogs; Aquifers; Arid Lands; Australia; Mars Surface; Water Flow

20030111004 Los Alamos National Lab., NM, USA
Water-bearing Minerals on Mars: Source of Observed Mid-Latitude Water?
Bish, D. L.; Carey, J. W.; Fialips, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Odyssey spacecraft documented the existence of heterogeneously distributed hydrogen at martian mid-latitudes, suggesting that large areas of the near-equatorial highlands contain near-surface deposits of chemically and/or physically bound H2O and/or OH in amounts up to 3.8% equivalent H2O. Shallow occurrences of water ice are not stable near the martian equator, making the hydrogen deposits at these latitudes somewhat enigmatic. Clay minerals and zeolites have both been proposed as possible water-bearing constituents on Mars, and both are common terrestrial alteration products of hydrovolcanic basaltic ashes and palagonitic material comparable to those that may be widespread on Mars. Smectites within martian meteorites, attributed to hydrous alteration on Mars rather than on Earth, provide direct evidence of clay minerals from Mars. In addition, new thermal emission spectrometer (TES) data provide good evidence for unspecified zeolites in martian surface dust. The nature of the hydrogen-containing material observed in the equatorial martian regolith is of particular importance to the question of whether hydrous minerals have formed in the past on Mars. Also, whether these minerals exist in a hydrated (i.e., containing H2O molecules in their structures) or dehydrated state is a crucial question. The existence of hydrous minerals is also important in connection with their possible role in affecting the diurnal variation of the martian atmosphere, in their potential role in unraveling the paleohydrology and paleobiology of Mars, and in their possible use as a water resource to support exploration of the martian mid-latitudes. Little, if any, data are available allowing prediction of the hydration state of these minerals under the low- T and low-P(H2O) conditions existing on the surface of Mars. As chabazite is a common alteration product in the types of rocks presumed to occur on Mars, we have used a combination of thermogravimetric methods to quantify the hydration energetics of chabazite and determine whether this representative zeolite would contain H2O under martian mid-latitude near-surface conditions. The structure of chabazite (Ca2Al4Si8O24 dot 12H2O) is made up of four- and eight-membered rings, giving a structure with large elliptical extraframework sites that can contain both exchangeable cations and H2O molecules.
Author
Mars Surface; Water; Hydrates; Zeolites

20030111005 NASA Johnson Space Center, Houston, TX, USA
Successful Capture, Extraction and Identification of Hypervelocity CM2 Meteorite Fragments Shot by Light-Gas Gun
Snead, C.; Westphal, A. J.; Dominguez, G.; Zolensky, M. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Here we report the successful capture, extraction and identification of two fragments of a CM2 meteorite (ALH83100) into lowdensity aerogel. The shot was carried out at the AVGR at NASAARC. A mixture of powdered ALH83100 and borosilicate glass microspheres was shot at 4.55.0 km/sec into 50 mg cm silicate aerogel.
Author
Meteorites; Images

20030111006 Louisiana Univ., Monroe, LA, USA
Grain-Size Analysis of Maumee and Vedra Channel Sediments (Mars) Using Equilibrium Sediment Transport Theory
Thibodeaux, C. J.; Washington, P. A.; DeHon, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Catastrophic outflows are one agent responsible for the redistribution of martian surface material. The late Hesperian, Maja Valles outflow stretches 1200 km from Juvenate Chasma into western Chryse Planitia. The initial outflow ponded on Lunae Planum before spilling across Xanthe Terra highlands to debouche into the Chryse basin. The material moved by the

outflow is dependent upon the sediment transport rate and the flow rate. This paper examines the probable grain-size moved in channels across Xanthe Terra.
Derived from text
Grain Size; Mars Surface; Sediment Transport; Transport Theory; Equilibrium; Channel Flow

20030111007 Waseda Univ., Tokyo, Japan
Possibility of H and S Detection on the Moon by SELENE Mission
Berezhnoy, A. A.; Hasebe, N.; Hiramoto, T.; Miyachi, T.; Yamashita, N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): JSPS-P02059; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The possible existence of water ice in permanently shadowed regions near the lunar poles has been postulated by Watson et al. The delivery rate of water into the cold lunar polar craters due to degassing from the lunar interiors, micrometeorite bombardment, solar wind, and comet impacts was investigated. Some experiments have been made to search for the existence of water in the polar regions. Areas with ice-like radar echoes were detected during the Clementine-Deep Space Network bistatic experiment. Another attempt to detect hydrogen-containing compounds near the lunar poles was made using Lunar Prospector neutron data. The SELENE project is a Japanese lunar polar orbiter scheduled to be launched in 2005. This spacecraft will study the Moon during one year at a nominal altitude of 100 km.
Derived from text
Lunar Surface; Hydrogen Compounds; Sulfur Compounds; Lunar Radar Echoes; Selenology; Spectroscopic Analysis

20030111008 NASA Ames Research Center, Moffett Field, CA, USA
First Results of the Expedition to the Highest Lake on Earth: Studying a Martian Paleolake in Bolivia and the Survival Strategies Developed by Living Organisms
Cabrol, N. A.; Grin, E. A.; McKay, C. P.; Friedmann, I.; Diaz, D. Chong; Demergasso, C.; Kisse, K.; Grigorszky, I.; Friedmann, R. Ocampo; Murbach, M. S., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Between October 16th and November 9th 2002, the first NASA Ames DDF Licancabur multidisciplinary expedition initiated the investigation of the biology and environment for life in the highest lake on Earth located at the summit of the Licancabur volcano (6017 m/20,056 ft) at the boundary of Chile and Bolivia. The low oxygen, low atmospheric pressure, high-UV radiation, average temperature, volcano-tectonic and hydrothermal environment make the site a close analog to Martian paleolakes 3.5 billion years ago. The overall goal of the project is to understand through a series of high altitude scientific expeditions what strategies life is using to defend itself against killer-level UV radiation and environmental extreme conditions at this altitude. Several other lakes are located at 4300 m at the foot of the Licancabur volcano (hereafter named laguna Blanca and Laguna Verde). They were also investigated using identical experiments and methods as for the summit lake in order to compare the results and better understand the evolution of survival strategies at transitioning elevations. The lagunas are geothermally heated and many springs provide water at various temperatures. Sources of heat are also suspected for the summit lake as its surface water temperature was measured during the successful ascent at +6 C in a -9 C ambient crater environment (with a wind chill factor of -25 C with a wind blowing almost constantly). Results of this project are expected to provide critical keys to help searching and identifying potential sites for life (extant/extinct) on Mars and developing instruments, experiments and technologies for future missions.
Derived from text
Lakes; Low Pressure; Atmospheric Pressure; Ultraviolet Radiation; Volcanoes; Extraterrestrial Life

20030111009 Centre de Recherches Petrographiques et Geochimiques, Nancy, France
Variations of Apparent Be-10/Be-9 Ratios in Leoville MRS-06 Type B1 CAI: Constraints on the Origin of Be-10 and Al-26
Chaussidon, M.; Robert, F.; Russel, S. S.; Gounelle, M.; Ash, R. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The in situ decay of Be-10 (half-life =1.5My) has been demonstrated in many Ca-Al-rich refractory inclusions (CAIs) of primitive meteorites by the positive correlations observed between B-10/B-11 and Be-9/B-11 ratios. These correlations

indicate that the Be1-10/Be-9 ratios at the time of formation of these CAIs varied from ~10(exp -3) to 4 x 10(exp -4). Because Be-10 was most likely produced during irradiation of the protosolar nebula by the young Sun in its T-Tauri phase, it is important to assess whether a fraction (or all) of the Al-26 (half-life-0.7My) and/or Ca-41 (half-life=0.1My) observed in CAIs might have the same irradiation origin. In this respect it is necessary to elucidate (i) whether the range of Be-10/Be-9 ratios observed in CAIs reflects primary features (e.g. differences in the fluences of irradiation) or secondary processes (e.g. redistribution of trace B and/or Be in the CAI) and (ii) whether there is some kind of correlation between Be-10/Be-9 and Al-26/Al-27 ratios which could argue for or against a synchronicity between the two radioactive systems. Previous attempts to look for such a synchronicity were not decisive because of the still limited data set and of the error bars on the two isotope ratios. We have thus looked at the Li-Be-B systematics in a Type B1 CAI (MRS-06 from the Leoville CV3 chondrite) for which previous studies by laser ablation MC-ICP-MS demonstrated the occurrence of strong perturbations of the Mg-Al system.
Derived from text
Meteoritic Composition; Chondrites; Isotope Ratios; Beryllium 9; Beryllium 10; Aluminum 26

20030111010 NASA Johnson Space Center, Houston, TX, USA
Compositions of Partly Altered Olivine and Replacement Serpentine in the CM2 Chondrites QUE93005 and Nogoya: Implications for Scales of Elemental Redistribution During Aqueous Alteration
Velbel, M. A.; Tonui, E. K.; Zolensky, M. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Some phyllosilicates in CM carbonaceous chondrites formed by aqueous alteration of anhydrous precursor phases. Although broad trends in the compositions of hydrous phyllosilicates are recognized and believed to be related to trends in degree of aqueous alteration, details of the reactions that formed specific secondary minerals remain obscure. This paper reports compositional relationships between remnants of partially pseudomorphically replaced silicates and their alteration products (serpentine) in the CM2 chondrites QUE93005 and Nogoya and compares both with previously published results for Allan Hills 81002. By focusing on serpentine formed from known reactants (olivines), and on only those instances in which some of the reactant silicate remains, direct compositional relationships between reactants and products, and the elemental mobility required by the reactions, can be established.
Derived from text
Carbonaceous Chondrites; Olivine; Serpentine; Silicates; Chemical Composition

20030111012 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Noble Gases in Allende Fluffy and Compact CAIs
Vogel, N.; Wieler, R.; Baur, H.; Bischoff, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Ne and Ar isotopic composition of Allende CAIs can consistently be explained by cosmogenically produced Ne and Ar. Thereby, the extraordinary chemistry of CAIs and the large pre-atmospheric size of Allende, which may cause significant cosmogenic production of Ar-36 from Cl, were taken into account. In contrast to earlier workers, we conclude that no trapped noble gas components are needed to explain the Ne and Ar signatures of Allende CAIs.
Author
Rare Gases; Allende Meteorite; Calcium; Aluminum; Inclusions; Cosmology

20030111013 Michigan Univ., Ann Arbor, MI, USA
A GCMS Instrument for the Detection of Organics on Mars
Waite, J. H.; Dissly, R.; Sacks, R.; Block, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Future missions to Mars will offer the opportunity to continue the search for organic molecules accessible from the surface. This paper describes an analytical instrument suite that is designed to measure potential organic and isotopic signatures contained in near surface reservoirs on Mars, using a pyrolysis/extraction system coupled to a gas chromatograph (GC) and time-of-flight mass spectrometer (TOF-MS).
Derived from text
Gas Chromatography; Detection; Mars Surface; Mass Spectrometers; Organic Materials

20030111014 California Univ., Los Angeles, CA, USA

Bulk Composition of the Moon as Constrained by Thorium Data: Comparison of Lunar Prospector Versus Apollo GRS Results

Warren, Paul H.; Humphrys, Teri L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Lunar Prospector gamma-ray spectrometry (LP-GRS) data set for thorium distribution across the global lunar surface provides key constraints on the composition of the Moon's crust, with major implications for the bulk composition and gross igneous evolution of the Moon. Lawrence et al. chose to derive the calibration between count rate and concentration without reference to ground truth information, referring only to the processes involved in the creation and detection of lunar rays. This was in essence a highly commendable approach, as the data set can be trusted to be completely unbiased by preconceived notions or other extraneous constraints. However, as noted previously, additional constraints are available to test the calibration. Two of the Apollo missions flew GRS detectors, which altogether mapped about 1/5 of the lunar surface. In this work, we have integrated LPGRS data for 38 regions defined by the Apollo GRS team, in order to compare the two calibrations.

Derived from text

Gamma Ray Spectrometers; Lunar Prospector; Moon; Thorium; Apollo Project

20030111015 Massachusetts Univ., Amherst, MA, USA

Assessing the Geomorphic Development of Putative Shorelines Contiguous to Northern Arabia Terra, Mars

Webb, Valerie E.; McGill, George E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

If Mars' Late Hesperian outflow channels were eroded by catastrophic flooding, it is likely that the water ponded in the northern lowlands. The surface of the ponded water would correspond to an equipotential surface. To test this hypothesis, Head et al. executed a global-scaled topographic study of putative shorelines mapped by Parker et al. evaluating elevation constancy. More recent results have conflicted with both the Head et al. and the Parker et al. studies. Clearly, the existence of an ancient northern hemispheric ocean exhibiting identifiable shorelines is still a controversial hypothesis and requires further investigation. Detailed, small-scale analysis is needed to supplement and compare to the published global scale studies. Here, we evaluate an approximately 400,000 square kilometer study area within and contiguous to northern Arabia Terra in order to shed new light on this controversy. We conclude that, within this area, both the Deuteronilus and the Arabia shorelines mapped by Parker et al. could be zones of coastal erosion, while the Acidalia shoreline does not adequately depict an equipotential surface nor a coastal geomorphic landscape.

Derived from text

Geomorphology; Mars Surface; Topography; Shorelines; Catastrophe Theory; Arabian Sea

20030111016 Smithsonian Institution, Washington, DC, USA

The Spatial and Azimuthal Distribution of Lobate Scarps and High-Relief Ridges on Mercury

Watters, T. R.; Robinson, M. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An understanding of the spatial and azimuthal distribution of lobate scarps on Mercury is important in constraining thermal history models and models for the origin of tectonic stresses. Existing models involve either global (radial) contraction due to secular cooling of the interior, tidal despinning, or a combination of the two. A comprehensive database of tectonic features on the hemisphere of Mercury imaged by Mariner 10 is being compiled to rigorously test these models.

Derived from text

Azimuth; Spatial Distribution; Tectonics; Escarpments; Mercury (Planet); Geological Faults

20030111017 Arizona State Univ., Tempe, AZ, USA

Estimating Shock Pressures from High-Pressure Minerals in Shock-induced Melt Veins of the Chondrites

Xie, Zhi-Dong; Sharp, Thomas G.; Decarli, Paul; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Shock metamorphism, resulting from hypervelocity collisions, is a fundamental process in the early solar system. Shock-induced melt veins contain two lithologies. One consists of polycrystalline grains that transformed from host rock fragments by solid-state mechanisms. The other consists of quenched silicate and metal-sulfide grains that crystallized from shock-induced melts. Both lithologies commonly contain high-pressure mantle minerals such as ringwoodite, majorite and akimotoite. The crystallized mineral-assemblages can be used to constrain the crystallization pressure of the melt based on the phase equilibrium data. If a melt vein in a given sample quenched during the equilibrium shock pressure pulse, the crystallization pressure is the shock pressure. Based on a simple thermal model for the cooling of a dike, melt-vein quench times can be estimated as a function of vein thickness. Thus the duration of the pressure pulse can be constrained by the size of the shock veins. The purpose of this study is to test the hypothesis that melt-vein crystallization can be used to estimate shock pressure. We have examined melt veins in chondrites of shock stage S3 to S6 to determine crystallization pressures and see how these pressures are related to the shock pressures inferred from the calibration of Stoffler et al.
Derived from text
Chondrites; High Pressure; Metamorphism (Geology); Mineral Deposits; Veins (Petrology); Shock

20030111019 Arizona Univ., Tucson, AZ, USA
Stable Isotope Record of Post-Impact Fluid Activity in the Chicxulub Crater as Exposed by the Yaxcopoil-1 Borehole
Zurcher, Lukas; Kring, David A.; Dettman, David; Rollog, Mark; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NSF EAR-01-26055; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cavities of secondary calcite and veins of secondary anhydrite and quartz in the Yucatan- 6 borehole drilled into the Chicxulub structure suggested the impact generated a hydrothermal system. Based on work at other craters, mostly Siljan and Puchezh-Katunki, we estimate this system could be several kilometers deep in the center of the crater and may extend to the rim, albeit at potentially shallower depths and cooler temperatures. Calculations of conductive cooling suggest the system may have been long-lived, up to 10(exp 5) to 10(exp 6) years. The first continuous core through impactites within the crater was recently recovered by the Chicxulub Scientific Drilling Project, providing a new opportunity to evaluate postimpact hydrothermal activity between the peak ring and rim of the crater. The Yaxcopoil-1 borehole recovery, and the analyses of Oxygen and carbon isotopes are discussed.
CASI
Boreholes; Hydrothermal Systems; Veins (Petrology); Lunar Craters; Isotope Ratios

20030111020 Carnegie Institution of Washington, Washington, DC, USA
Magnesium Isotopes in Presolar Spinel
Nittler, L. R.; Hoppe, P.; Alexander, C. M. O'D.; Busso, M.; Gallino, R.; Marhas, K. K.; Nollett, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Variable Mg isotopic compositions are expected for the parent stars of presolar grains in meteorites, due both to galactic chemical evolution (GCE) and to nuclear processing in the stars themselves. The vast majority of previous Mg isotopic studies of presolar grains have focused on Mg-26 excesses from in situ decay of Al-26, and little variation in Mg-25/Mg-24 ratios has been observed. However, Mg contents are low in most studied phases (e.g., SiC, graphite and Al2O3), making precise measurements difficult and terrestrial contamination a significant concern. To avoid contamination problems, it is preferable to study Mg-rich presolar phases like spinel (MgAl2O4). Here we report Mg isotopic data for seven presolar spinel grains from a mixed acid-resistant residue of the unequilibrated ordinary chondrites Krymka, Semarkona and Bishunpur.
Derived from text
Galactic Evolution; Magnesium Isotopes; Spinel; Meteoritic Composition

20030111021 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Use of an Ultrasonic/Sonic Driller/Corer to Obtain Sample Powder for CHEMIN, a Combined XRD/XRF Instrument
Chipera, S. J.; Bish, D. L.; Vaniman, D. T.; Sherrit, S.; Bar-Cohen, Y.; Sarrazin, P.; Blake, D. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A miniature CHEMIN XRD/XRF (X-Ray Diffraction/X-Ray Fluourescence) instrument is currently being developed for definitive mineralogic analysis of soils and rocks on Mars. One of the technical issues that must be addressed in order to enable

XRD analysis on an extraterrestrial body is how best to obtain a representative sample powder for analysis. For XRD powder diffraction analyses, it is beneficial to have a fine-grained sample to reduce preferred orientation effects and to provide a statistically significant number of crystallites to the X-ray beam. Although a 2-dimensional detector as used in the CHEMIN instrument will produce good results with poorly prepared powders, the quality of the data will improve if the sample is fine-grained and randomly oriented. An Ultrasonic/Sonic Driller/Corer (USDC) currently being developed at JPL is an effective mechanism of sampling rock to produce cores and powdered cuttings. It requires low axial load (< 5N) and thus offers significant advantages for operation from lightweight platforms and in low gravity environments. The USDC is lightweight (<0.5kg), and can be driven at low power (<5W) using duty cycling. It consists of an actuator with a piezoelectric stack, ultrasonic horn, free-mass, and drill bit. The stack is driven with a 20 kHz AC voltage at resonance. The strain generated by the piezoelectric is amplified by the horn by a factor of up to 10 times the displacement amplitude. The tip impacts the free-mass and drives it into the drill bit in a hammering action. The free-mass rebounds to interact with the horn tip leading to a cyclic rebound at frequencies in the range of 60-1000 Hz. It does not require lubricants, drilling fluid or bit sharpening and it has the potential to operate at high and low temperatures using a suitable choice of piezoelectric material. To assess whether the powder from an ultrasonic drill would be adequate for analyses by an XRD/XRF spectrometer such as CHEMIN, powders obtained from the JPL ultrasonic drill were analyzed and the results were compared to carefully prepared powders obtained using a laboratory bench scale Retsch mill.
Derived from text
Mineralogy; X Ray Diffraction; Mars Surface; Core Sampling; X Ray Fluorescence; Ultrasonics; Drills; Rocks; Soils

20030111022 New Mexico Univ., Albuquerque, NM, USA
Mineralogy and Textural Characteristics of Fine-grained Rims in the Yamato 791198 CM2 Carbonaceous Chondrite: Constraints on the Location of Aqueous Alteration
Chizmadia, Lysa J.; Brearley, Adrian J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578 Contract(s)/Grant(s): NAG5-9798; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Carbonaceous chondrites provide important clues into the nature of physical and chemical processes in the early solar system. A question of key importance concerns the role of water in solar nebular and asteroidal processes. The effects of water on primary mineral assemblages have been widely recognized in chondritic meteorites, especially the CI and CM carbonaceous chondrites. These meteorites have undergone extensive aqueous alteration that occurred prior to their arrival on Earth. In the case of the CM chondrites, this alteration has resulted in the partial to complete replacement of the primary nebular phases with secondary alteration phases. Considerable controversy exists as to the exact location where the alteration of the CM chondrites occurred. Several textural lines of evidence have been cited in support of aqueous alteration prior to the accretion of the final parent asteroid. An important line of evidence to support this hypothesis is the dis-equilibrium nature of fine-grained rims and matrix materials. [2] also noted the juxtaposition of micron-sized Fe-Ni metal grains and apparently unaltered chondrule glass against hydrated rim silicates. Conversely, there is a large body of evidence in favor of parent body alteration such as the occurrence of undisturbed Fe-rich aureoles and the systematic redistribution of elemental components over millimeters, e.g., Mg(+2) into the matrix and Fe(+2) into chondrules etc.
Derived from text
Carbonaceous Chondrites; Mineralogy; Chemical Reactions; Meteoritic Composition; Asteroids

20030111023 Arizona Univ., Tucson, AZ, USA
The Frequency of Compound Chondrules and Implications for Chondrule Formation
Ciesla, F. J.; Hood, L. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Among the many properties of chondrules, compound chondrules, two chondrules fused together, have been studied to gain clues as to what the environment that chondrules formed in was like. Two methods have been proposed for forming compound chondrules: collisions among individual chondrules while they were plastic and melting of porous aggregates on an already existing primary chondrule. If we can distinguish between these two scenarios, we will be able to gain further insight into how chondrules formed.
Author
Meteoritic Composition; Chondrule; Meteoritic Microstructures; Meteorites

20030111024 NASA Johnson Space Center, Houston, TX, USA

A Method of Estimating Transient-Cavity Diameters for Impact Craters Formed in Dry Sand

Cintala, M. J.; Barnouin-Jha, O. S.; Hoerz, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analyses of impact craters formed in laboratory experiments historically have been the source of many fundamental observations and interpretations of the impact-cratering process itself. Due to its ready availability, ease of handling, and lack of strength, dry sand of various types has been the target material of choice in the majority of such experiments. A consequence of its lack of intrinsic strength, however, is dry sand's inability to maintain slopes above its angle of repose. Evidence from field observations of simple terrestrial craters and laboratory craters formed in more cohesive granular media suggests that transient cavities are similar to paraboloids in shape. Cross-sections of craters formed in dry sand, however, are nearly conical with the wall slopes at or near the angle of repose, indicating that the original crater form has been modified by one or more processes, among which is simple slope failure. Because the dimensions and shape of the transient cavity reflect the detailed conditions of a given impact event, its characterization has long been a desired goal in experimentation. A means of estimating the position of the transient cavity's rim is suggested below, relying on determination of velocities of material ejected from the growing cavity.

Author

Meteorite Craters; Projectile Cratering; Sands; Diameters; Experimentation

20030111026 Max-Planck-Inst. fuer Chemie, Mainz, Germany

Chemical and Isotopic Constraints for the Martian Crust

Dreibus, G.; Jagoutz, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Martian meteorite whole rock Rb-Sr isotopic compositions and the initial Pb data from plagioclase separates suggest strongly that the crust of their parent body originated from an ancient planetary global differentiation process about 4.5 Ga ago. The absence of plate tectonic activity on early Mars excludes a crustal recycling and preserves the isotopic systems derived from the early crustal differentiation. Together with geophysical and geochemical data from spacecraft missions, the Martian meteorites provide constraints on the nature of the crust. Based on element correlations observed in the Martian meteorites and the measured K content of the Martian surface we propose an estimate of the Rb-Sr systematics of the crust.

Derived from text

Composition (Property); Mars Surface; Isotopic Labeling; Planetary Crusts

20030111027 Max-Planck-Inst. fuer Chemie, Mainz, Germany

Comparison of the Chemistry of Y-000593 and Y-000749 with Other Nakhlites

Dreibus, G.; Huisl, W.; Spettel, B.; Haubold, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nakhlites are a small group among the Martian meteorites (SNC) with until today altogether 5 meteorites: Nakhla, Lafayette, Governador Valadares, NWA 817, and the paired samples Y-000593 and Y-000749. Nakhlites are augite and olivine cumulates of similar chemical composition and ages (1.3 Ga). We have studied with different methods the two paired nakhlites recently discovered in Antarctica by one of the Japanese Antarctic expeditions. The chemical composition of the two paired samples is much more uniform compared to Nakhla.

Derived from text

Chemical Composition; Nakhlites

20030111028 Engineering and Economics Research, Inc., Chantilly, VA, USA

Understanding the Nature of Metal Segregation in Asteroid Regolith

Clark, P. E.; Killen, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The process of regolith formation on an asteroid normally results in the sorting of the asteroid's regolith, a process that would involve segregation of the denser, less brittle metallic from silicate particles. It has been proposed that, as a result of mobilization of volatiles, the position of this particle layer in the regolith would depend on initial size and abundance of metal

particles, as well as availability of volatiles for fluidization. According to this model, less abundant, smaller diameter metal particles, present in L and LL Chondrites, would tend to rise to the surface, whereas more abundant, larger diameter particles, present in H Chondrites, would tend to sink. We discuss here how segregating a metallic component in this way would modify the apparent element and mineral abundance ratios relative to the parent material. We also discuss the impact such a process would have on X-ray and other remote spectral measurements, as well as on the availability of Fe or volatiles such as S for space weathering processes.
Author
Asteroids; Regolith; Separation; Metal Particles; Chondrites

20030111029 Geological Survey, Flagstaff, AZ, USA
Mineral Mapping in Valles Marineris, Mars: A New Approach to Spectral Demixing of TES Data
Gaddis, L. R.; Staid, M. I.; Johnson, J. R.; Titus, T. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We applied multiple endmember demixing to Thermal Emission Spectrometer (TES) data to determine the composition of geologic units in the Valles Marineris (VM), Mars. The goal is to map the compositions of VM dark deposits and layered units of the walls and interior deposits.
Author
Mars Surface; Mineral Deposits; Thematic Mapping; Thermal Emission; Spectral Mixture Analysis

20030111030 North Dakota Univ., Grand Forks, ND, USA
Observational and Data Reduction Techniques to Optimize Mineralogical Characterizations of Asteroid Surface Materials
Gaffey, M. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-10345; NAG5-7598; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mineralogy is the key to determining the compositional history of the asteroids and to determining the genetic relationships between the asteroids and meteorites. The most sophisticated remote mineralogical characterizations involve the quantitative extraction of specific diagnostic parameters from reflectance spectra and the use of quantitative interpretive calibrations to determine the presence, abundance and/or composition of mineral phases in a surface material. Although this approach is potentially subject to systematic errors, it provides the only consistent set of asteroid surface material characterizations.
Derived from text
Surface Properties; Mineralogy; Meteorites; Data Reduction

20030111032 Lunar and Planetary Inst., Houston, TX, USA
Chicxulub YAX-1 Impact Breccias: Whence They Come?
Dressler, B. O.; Sharpton, V. L.; Marin, L. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Yaxcopoil (YAX-1) drill site had been chosen to investigate a thick unit of impactite predicted, based on seismic profiles, to lie beneath approximately 800 m of Tertiary crater fill in an area just outside the excavation cavity but relatively close to its margin. Approximately 400 m of suevitic fallback breccia were expected to overlie an impact melt body that had been penetrated in a petroleum exploration well at a depth of about 1250 m, at a distance of about 20 km from YAX-1 towards the center of the structure. The drill string was expected to reach a final depth of about 1.8 km, possibly 100 to 200 m in the basement of the crater. The pre-drilling predictions appeared to be right-on when suevitic breccias were reached at a depth of 795 m. After drilling through only 100 m of impact breccias, however, the drill encountered megablocks of Cretaceous target rocks. Drilling stopped at 1511m, still in megablocks of Cretaceous sedimentary rocks. Table1 lists the field names of the six units of impact breccias encountered at YAX-1 and briefly describes them. In the following, a tentative interpretation of the depositional processes is provided. It is based on a still somewhat incomplete documentation of the clast populations and matrices of the breccia units and on an analysis of the six units as a sequence. All breccia units are allogenic and their obvious differences are most likely a result of different depositional processes.
Derived from text
Breccia; Cavities; Craters; Impact Melts; Mineral Exploration

20030111034 Ecole Nationale Superieure de Chimie, Paris, France

Abundance, Size and Organization of Aromatic Moieties in Insoluble Organic Matter of Orgueil and Murchison Meteorites

Derenne, S.; Rouzaud, J.-N.; Maquet, J.; Bonhomme, C.; Florian, P.; Robert, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The primitive carbonaceous chondrites contain substantial amounts of carbon (up to 3%), mostly as macromolecular insoluble organic matter (IOM). This IOM is considered as a record of interstellar synthesis and may contain precursors of prebiotic molecules possibly deposited on earth by meteoritic bombardments.IOM is important to determine the conditions involved in space in their synthesis. Indeed, likely due to their high stability, polyaromatic structures are among the most abundant and widespread organic structures in the universe and may represent a link between the interstellar medium and the solar system. In the present work, we used two non-destructive techniques, namely solid state 13C nuclear magnetic resonance (NMR) and high resolution transmission electron microscopy (HRTEM) to determine the abundance and the main features of the aromatic units in the IOMs isolated from two carbonaceous chondrites, Orgueil and Murchison using the classical HF/HCl treatment.

Derived from text

Carbonaceous Chondrites; Chemical Analysis; Meteorites

20030111035 Colorado Univ., Boulder, CO, USA

Manifestations of Strike-Slip Faulting on Ganymede

DeRemer, Lindsay C.; Pappalardo, Robert T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-11616; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Voyager images of Ganymede suggested that strike-slip faulting may have taken place [1, 2], but the role of this process in shaping grooved terrain was uncertain. In Galileo high-resolution images of Ganymede's surface, we recognize three signature features of strike-slip faulting: (1) en echelon structures, (2) strike-slip duplexes, and (3) offset preexisting features. We have undertaken a study to recognize and map these features, and identify any morphological progressions of strike-slip features. This will allow a better understanding of the structural history of Ganymede, and the formation and evolution of grooved terrain.

Author

Image Analysis; Geological Faults; Ganymede

20030111036 NASA Johnson Space Center, Houston, TX, USA

Evidence for Coordination and Redox Changes of Iron in Shocked Feldspar from Synchrotron MicroXANES

Delaney, J. S.; Dyar, M. D.; Hoerz, F.; Johnson, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NAG5-12148; NAG5-9528; NAG5-10424; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Shock modification of feldspar has been documented and experimentally reproduced in many studies since the recognition of maskelynite in Shergotty. Experimentally shocked feldspar samples have been well studied using chemical and crystallographic techniques. The crystallographic, site-specific characterization of major and minor elements is less well documented. We present early x-ray absorption (XAS) spectral data for a suite of albitite samples that were experimentally shocked at pressures between 17 and 50 Gpa.

Derived from text

Feldspars; Iron; Oxidation-Reduction Reactions; Synchrotrons; Crystallography

20030111037 Universidad Rey Juan Carlos, Madrid, Spain

An Alternative Hypothesis for the Origin and Evolution of Hebes Chasma, Mars

dePablo, M. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hebes Chasma is an small martian canyon located at the North Candor Chasma, of the Valles Marineris canyon system, and near to the North limit of the Tharsis topographic dome. The origin and evolution of that canyon, like happened with the

other martian canyons, are very discussed, but this is a particular case because Hebes Chasma is an entirely enclosed canyon. In the classic bibliography of Mars is excluded to this canyon like a source for water on account of its closed shape and to its interior topography. Here is proposed a preliminary alternative hypothesis about the origin and evolution of Hebes Chasma based on the groundwater circulation and elaborated from the analysis of MOC/MGS images and MOLA/MGS topographic data.
Derived from text
Canyons; Mars Surface; Planetary Geology; Planetary Evolution; Lunar Topography

20030111042 NASA Johnson Space Center, Houston, TX, USA
Ar-39 - Ar-40 Evidence for an Approximately 4.26 Ga Impact Heating Event on the LL Parent Body
Dixon, E. T.; Bogard, D. D.; Rubin, A. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Miller Range 99301 is a type 6, unbrecciated LL chondrite. MIL 99301 is of interest because some compositional and petrographic features suggest it experienced rather high shock grades, whereas other features suggest it is relatively unshocked. Inconsistent shock indicators could be explained if MIL 99301 was shocked but then partly annealed by heat produced by impacts on the parent body. The hypothesis that MIL 99301 experienced high temperature metamorphism (type 6) followed by a later shock event that heated, but did not melt, the constituent feldspar can be evaluated using (39)Ar-(40)Ar chronology. This is because (39)Ar-(40)Ar ages of shocked ordinary chondrites are generally <4.2 Ga, whereas (39)Ar-(40)Ar ages of unshocked meteorites are generally older, and between 4.52 - 4.38 Ga.
Author
Chondrites; Argon Isotopes; Radioactive Age Determination; Meteorite Parent Bodies; Impact Melts

20030111043 Rutherford Appleton Lab., Chilton, UK
X-Ray Spectroscopy of the Lunar Surface Using the D-CIXS Instrument on ESA's SMART-1 Mission to the Moon
Dunkin, S. K.; Grande, M., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The D-CIXS Compact X-ray spec-trometer on ESA's SMART-1 mission will provide the first global coverage of the lunar surface in X-rays, providing absolute measurements of elemental abun-dances. The instrument will be able to detect elemental Fe, Mg, Al and Si under normal solar conditions and several other elements during solar flare events. These data will allow for advances in several areas of lunar science, outlined in this abstract. In combination with information to be obtained by the other instruments on SMART-1 and the data already provided by the Clementine and Lunar Prospector missions, this infor-mation will allow for a more detailed look at some of the fundamental questions that remain regarding the origin and evolution of the Moon. D-CIXS (Figure 1) demonstrates a radically novel approach to building a type of instrument within a re-source envelope far smaller than previously thought possible. It will use new technology which does not require cold running, reducing the associated over-heads to the spacecraft. This makes D-CIXS suitable for many potential and future science targets, including ESA s fifth cornerstone mission, BepiColombo, which will study Mercury.
Derived from text
X Ray Spectroscopy; Solar Activity; Solar Flares; Lunar Surface; Lunar Evolution

20030111044 Graz Univ., Austria
Trace Element Abundances in Micro-Objects from Tieschitz (H3.6), Krymka (LL3.1), Bishunpur (LL3.1) and Mezoe-Madaras (L3.7): Implications for Chondrule Formation
Engler, A.; Kurat, G.; Sylvester, P. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): FWF Proj. P14938; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Crypto-crystalline to fine-grained and radiating pyroxene and pyroxene/olivine chondrules are particular chondrules, which occur in all chondrites. Their textures imply that they represent quickly quenched liquids. The origin of the liquids, however, still remains unresolved. There are several possible ways to generate these liquids; the most popular process is melting of solid precursors in either a nebular or planetary set-up. Another possible way to create in particular the liquids of quench-textured chondrules is to condense them directly out of the solar nebula. Bulk major, minor and trace element

abundances in chondrules should allow us to distinguish between these different possibilities. Unfractionated relative solar abundances of trace elements indicate that the precursors consist of primitive matter, possibly solar nebula condensates. In some cases certain fractionated refractory lithophile element abundances in chondrules have been reported to suggest that they originated by direct condensation from the solar nebula.
Derived from text
Trace Elements; Abundance; Chondrule; Solar Nebula; Olivine; Meteoritic Composition

20030111045 Colorado School of Mines, Golden, CO, USA
Challenges for Sample Return from the Lunar South Pole-Aitken Basin
Duke, Michael B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The South Pole Aitken (SPA) Basin is the oldest, deepest impact basin on the Moon. It was excavated during the early bombardment history of the Moon, prior to 3.9 billion years ago, possibly as part of the 'terminal cataclysm,' during which the near side mare basins were excavated. According to current models, such basins would have been immediately surfaced by breccia and melt rock created by the impact and perhaps by lower crust or even mantle blocks uplifted during the event. Subsequently, several multi-ring basins within and outside of SPA added debris to what must be a thick regolith (see [1]). Subsequently, mare basalts were locally added to the mix, although the basin was not filled with basalt as were the near side mare. The age and complexity of this mixture of materials provides a significant challenge for sample return missions.
Derived from text
Sample Return Missions; Structural Basins; Breccia; Basalt; Crusts

20030111046 Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse, Orsay, France
The CONCORDIA-Collection: Pristine Contemporary Micrometeorites from Central Antarctica Surface Snow
Duprat, J.; Engrand, C.; Maurette, M.; Gounelle, M.; Hammer, C.; Kurat, G.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In January 2000 and January 2002, we recovered micrometeorites (MMs) trapped in surface snow close to the French-Italian station CONCORDIA at Dome C (S 75 degrees, E 123 degrees). The central regions of Antarctica present substantial advantages for cosmic dust collections. Dome C is located at 1100 km from the margin of the continent and the surface snow is separated from the bedrock by more than 3km of ice. Because the dominant winds are blowing from the centre of the continent to the coast this snow is well preserved for terrestrial dust contamination within the MMs size range (25-500 microns). Moreover, the temperature stays below -20 C throughout the year. The MMs are expected to be much better preserved in a cold and clean snow from both mechanical stress and aqueous weathering compared to previous Antarctic collections. In order to take advantage on this, we developed and optimized a new technique of collection based on a stainless steel double-tank snow smelter of 3001, working with a 35kW-propane gas boiler. This device enabled us to melt and filter in clean conditions (down to 25 microns) surface snow from different snow layers up to a depth of 5m. A total of 25 cubic meters of smow was processed. During the melting procedure, the MMs were in contact with liquid water for only a few hours and our melting-sieving procedure does not involve andy mechanical pumping. The results presented here are still preliminary because only 40 extraterrestrial particles have been characterized so far. Two other collections of MMs have been performed in central Antarctica so far: the collection extracted from the Water Well of the South Pole Station (SPWW) and from the Water Well of Dome Fuji Station (DF).
Derived from text
Antarctic Regions; Micrometeorites; Snow; Earth Surface

20030111047 NASA Ames Research Center, Moffett Field, CA, USA
Gap-Opening, Disk Clearing, and the Survival of the Regular Satellites of Jupiter and Saturn
Estrada, P. R.; Mosqueira, I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is only recently that the theory of disk-companion interactions yields migration rates due to the gas tidal torque that are in agreement with numerical simulations and up to an order of magnitude slower than previous estimates. Also, for a weakly turbulent disk, the gap size is controlled primarily by the damping length of acoustic waves launched by the secondary at Lindblad resonances, which in turn depends on whether the waves are 2D or 3D. At least for small azimuthal wavenumbers

this damping length is of the order of the radial location of the Lindblad resonance. This may have important consequences for disk dispersal in satellite systems. In the case of Jupiter, it means that the inner Galilean satellites may have jointly opened a gap. On the other hand, in Saturn's system the satellites inside of Titan are probably too small to have opened gaps in the gas disk at the time of their formation; but the possibility exists that, by effectively clearing the gas disk inside its own orbit, Titan may have allowed smaller satellites to survive, depending on whether Titan can clear the disk in a timescale comparable to the migration rates due to gas drag and gas tidal torque for these objects.
Derived from text
Saturn Satellites; Jupiter Satellites; Sound Waves; Gaps

20030111048 Arizona State Univ., Tempe, AZ, USA
The Emerging Resurfacing History of Europa from Pole-to-Pole Geologic Mapping
Figueredo, P. H.; Greeley, R.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Geologic mapping of planetary surfaces provides information on the nature, sequence, and distribution of material units, from which one can assemble a geologic history. With this goal in mind, the Galileo SSI camera acquired an important dataset of images of Europa at a resolution suitable for geologic reconnaissance and mapping. We performed mapping and analysis of pole-to-pole transects at 230 m/pixel (covering about 10% of the satellite) across the leading and trailing hemispheres of the satellite. Here we report the results on the spatial and temporal distribution of surface units, and their implications for the resurfacing history of Europa. We show that a) the style of tectonic and cryovolcanic resurfacing changed with time, and b) these changes could reflect the thickening of Europa's lithosphere during its recent geologic history.
Derived from text
Geological Surveys; Planetary Mapping; Thematic Mapping; Planetary Surfaces

20030111049 Lunar and Planetary Inst., Houston, TX, USA
Hematite Coatings Match TES Spectra of Sinus Meridiani, Mars
Kirkland, L. E.; Herr, K. C.; Adams, P. M.; Salisbury, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lane et al. [1] and Christensen et al. [2] conclude that the 1996 Global Surveyor Thermal Emission Spectrometer (TES, ~1700-200 cm-1) spectra of regions in Sinus Meridiani match only coarsely particulate hematite. Here we show spectra of hematite coatings that match the TES signatures. The coating option is important because (1) hematite coatings can require little water to form, which may significantly change current interpretations and explain the apparent absence of other alteration minerals; and (2) one 2003 rover is planned for this site, so researchers need to prepare for possible measurement of hematite coatings by the rover instruments. This includes adding coating signatures to interpretation libraries and addressing measurement issues related to a hematite coating.
Author
Hematite; Absorption Spectra; Emissivity; Mars Surface

20030111051 Ball Aerospace and Technologies Corp., Boulder, CO, USA
Future Moon Missions: Flight Systems for the Cold, Dark, or Unseen 2003-2013
Dissly, R.; Miller, K. L.; Murrow, D.; VanCleve, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Solar System Exploration Survey (Decadal Survey), chartered by the Space Studies Board of the National Research Council, found that a South Pole-Aitken Basin Sample Return (SPA-SR) would be of fundamental importance to all of planetary science, and selected SPA-SR as one of 5 medium missions for the coming decade. SPA-SR examines the processes involved in Solar System formation in the approx. 3.7-4.5 Gya epoch, and the impact history of the inner planets. Engineering and operational interest in the Moon, while not captured in the Decadal Survey mission priorities, includes gravity surveys to improve orbit maintenance, topography and soil surveys for landing and construction, and resource location and extraction experiments. We present our capabilities for lunar and related Solar System missions, then examine science, engineering, and operational questions which can be addressed by systems emerging from various combinations of these capabilities. As examples, we examine: 1) Remote sensing of dark and cold regions; 2) In-situ experiments; 3) Sample handling and packaging

for return; 4) Cryogenic sample return. We emphasize improvements in the state of the art for remote sensing since Clementine and Lunar Prospector in the mid-1990's, and improvements in in-situ and sample return operations since the mid-1970's.
Author
Lunar Exploration; Technology Assessment; Remote Sensing; Sample Return Missions

20030111052 Kharkov Univ., Kharkov, Ukraine
On Phase Dependencies of Cometary Light Curves
Filonenko, V. S.; Churyumov, K. I.; Lunar and Planetary Science XXXIV; March 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

Generally, cometary visible integer brightness is sum of brightness of gas and dust components of cometary atmosphere and of hard nucleus. On the parts of orbits where the comets are visually observed a contribution of cometary nucleus to integer brightness is unessential. The gas component of integer brightness depends of full number of carbon molecules in cometary atmosphere and it is function of heliocentric distance. But dust component of integer cometary brightness depends furthermore from phase angle. Therefore, in principle, cometary phase dependencies may be determined from visually light curves of comets, which rich the dust. The light curves of 12 comets had been constructed and investigated. The statistical significant influence of phase dependencies on the light curves of 7 comets had been found. The values of phase coefficient of these comets had been determined. The obtained results are given below in the Table. For 2 comets the values of phase coefficient are subzero. For other 5 comets the mean value of phase coefficients is 0.047 m/grad that practically coincides with mean value of phase coefficients of C-type asteroids (0.041 m/grad). Apparently the phase dependencies of these comets determines by dark carbon particles in their atmospheres.
Author
Cometary Atmospheres; Brightness; Phase Shift; Comets; Comet Nuclei

20030111053 Academy of Sciences (USSR), USSR
Is Xe-HL a Real Component?
Fisenko, A. V.; Semjonova, L. F.; Verchovsky, A. B.; Wright, I. P.; Pillinger, C. T.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is known that Xe-HL represents a mixture of (i) r- and p-process isotopes generated in a supernova with (ii) isotopically normal Xe identified by the presence of s-process Xe-130. The question of whether the ultimate mixture of these components has occurred before implantation into presolar diamonds, or whether the components have been implanted separately remains unanswered. Based on the experimental implantation of noble gases into synthetic nanodiamonds it has been concluded that the actual mixture has occurred in the diamonds and that the isotopically normal component is Xe-P3. This also means that the isotopically anomalous component may not contain Xe-130 at all. On the other hand, analyses of grain size fractions of diamonds separated from the Efremovka CV3 meteorite indicate that Xe-P3 and Xe-HL are effectively separated from each other in the different size fractions because they were implanted at different energies. Since no further separation of Xe-HL into subcomponents is observed in the finest grain size fractions of diamonds, it is clear that the Xe-HL was mixed with a component containing s-isotopes (which is not Xe-P3), and then both were implanted simultaneously with similar energies. This would explain why the Xe136/Xe-132 ratio in levels off at a value of about 0.71 with decreasing of size of diamond grains. In the present study we have analysed this problem using a set of diamond grain-size fractions separated from the Boriskino CM2 meteorite which contain significantly more low temperature Xe-P3 than the Efremovka diamonds.
Derived from text
Xenon Isotopes; Meteorites; Rare Gases; Implantation

20030111054 Tokyo Inst. of Tech., Tokyo, Japan
Petrology and Oxygen Isotope Compositions of Refractory Inclusions from Acfer 094
Fagan, T. J.; Krot, A. N.; Yurimoto, H.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The ungrouped carbonaceous chondrite Acfer 094 is among the most primitive chondrites identified on the basis of pristine mineralogy, C and N abundances and isotopic compositions, the preservation of amorphous material in the meteorite matrix, and high abundance of presolar grains. Because of its pristine nature, Acfer 094 is well-suited for studies of pre-parent body petrogenesis. In this study we report petrographic observations and in situ oxygen isotopic analyses of Ca,Al-rich

inclusions (CAIs), amoeboid olivine aggregates (AOAs), and plagioclase- rich chondrules (PRCs) from Acfer 094 in an effort to understand the origin and processing of refractory materials in the nebular setting. Particularly, we address the following questions: (1) Did all CAIs originate in a 16O-rich gaseous reservoir? (2) How and when did CAIs experience oxygen isotope exchange? (iii) Is there a continuum in oxygen isotope compositions between refractory inclusions and Al-rich chondrules?
Derived from text
Petrology; Oxygen Isotopes; Refractories; Carbonaceous Chondrites

20030111055 Brown Univ., Providence, RI, USA
Characteristics of the Mars North Polar Basal Unit and Its Role in the Geologic History of the Region
Fishbaugh, Kathryn E.; Head, James W., III; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Beneath much of the northern polar layered deposits lies a dark, platy unit noted by a few authors and described in detail by Byrne and Murray. We have continued the investigation of this unit by examining MOC images and MOLA data (looking forward to the release of spring/summer THEMIS data) of the polar cap and of the features interpreted by Fishbaugh and Head as polar material remnants and glacial retreat features. While Kolb and Tanaka describe this unit as consisting of early north polar deposits, Byrne and Murray suggest that such a significant change in deposition style has taken place that the unit must represent a period in time when there was no polar cap. They believe that the basal unit (as it will hereafter be named in this abstract) consists of ice-rich paleoerg deposits that migrated to the low elevation plains underlying the current polar deposits. In addition to these possibilities, we suggest that the unit may have initially been deposited by outflow channels and/or a paleo-ocean. Fishbaugh and Head have shown that the north polar deposits may once have been larger, extending to about 75 N. Still unknown are the timing and cause of this retreat as well as how many times advance and retreat have occurred. The basal unit has yet to be placed conclusively in this history. However, the stratigraphic position of the basal unit below the polar cap places it in the transitional period between the Late Hesperian Vastitas Borealis Formation (VBF) and the polar cap (whose surface has a Late Amazonian crater age). The distribution of the unit (being associated exclusively with the cap and the Olympia Lobe) suggests that it may now comprise a basal ice portion of the ice cap (such as the distinctive lower deposits common in terrestrial ice sheets).
Derived from text
Paleontology; Polar Caps; Mars Surface; Stratigraphy; Craters

20030111056 Hawaii Univ., Honolulu, HI, USA
Simulations of Lahar Emplacement on Earth and Mars
Fagents, S. A.; Baloga, S. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Volcanic debris flows, or lahars, are common phenomena at terrestrial volcanoes where loose, unconsolidated volcanic material (e.g., ash and tephra) combines with abundant water on the flanks of the volcano to produce a fast moving, turbulent slurry. Such flows are commonly produced by the breaching and sudden draining of a crater lake, interaction with water or ice of a pyroclastic flow, or remobilization of an ash deposit by precipitation. On Earth, lahars may flow for tens of kilometers at rapid velocities and represent a significant hazard for anything in their path. On Mars, the existence, currently or in the past, of significant regolith ice stores polar ice caps, potential lake environments, glaciers or ice sheets, provides ample water with which volcanic heat and friable deposits may have interacted to produce debris flows. We have developed a mathematical treatment of the time-dependent advance of lahars and dilute debris flows that can be applied to topographic data in order to predict the depths, velocities, and transit times of such flows on both Earth and Mars. We base this model on an existing continuum model used to describe terrestrial lahar emplacement. However, with the advent of digital elevation data, e.g., MOLA data, we are faced with an important new issue. Specifically, how to adapt such a continuum model to topography in a discrete format. This is not a trivial proposition because it requires new boundary conditions to be established repeatedly for the flow across the discretized topography, and they must be maintained for all times throughout the entire transit of the lahar. However, we have developed the method for doing this by treating the changes between each elevation as an inclined plane and demanding that the new boundary conditions for all downstream intervals satisfy both local and overall flow volume and continuity requirements. Here we describe this model and discuss the implications for lahar deposits on Mars.
Author
Mars Volcanoes; Volcanic Eruptions; Mars Surface; Earth Surface; Topography; Planetary Geology; Mathematical Models

20030111057 New Mexico Univ., Albuquerque, NM, USA
Trace Element Distribution Between Olivine and Kirschsteinite in Angra Dos Reis
Fittipaldo, M. M.; Jones, R. H.; Shearer, C. K.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
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The angrites are a small and enigmatic group of basaltic achondrites that possess unique mineralogical and chemical properties. The dominant mineralogy of the seven angrite members (Angra dos Reis, LEW 86010, LEW 87051, Asuka 881371, Sahara 99555, D Orbigny, and a new Moroccan member) is fassaite, olivine, and plagioclase. Angrites display a wide range of thermal histories, with Angra dos Reis (AdoR) exhibiting a cooling history different from that of the rapidly cooled members and from LEW86010, a more slowly cooled member. AdoR could represent either a cumulate or a porphyritic igneous rock that was later altered by metamorphism. We are re-examining the thermal history of AdoR in light of the more recently described angrite members. Our emphasis is a trace element study of low-Ca olivine, which we refer to as olivine, and high-Ca olivine, which we refer to as kirschsteinite, in AdoR.
Derived from text
Olivine; Trace Elements; Meteoritic Composition; Metamorphism (Geology); Achondrites; Basalt

20030111059 Universidad Autonoma de Madrid, Cantoblanco, Spain
Seas Under Ice: Stability of Liquid-Water Oceans Within Icy Worlds
Fairen, Alberto G.; Ruiz, Javier; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The possible existence of internal oceans in some icy bodies of the outer Solar System has been suggested through the last years in a joint of observations that cover a wide range of evidences: magnetic fields in Europa and Callisto, and possibly Ganymede, induced by Jupiter s plasma environment in an electricity-conducting layer near the surface of these satellites, likely salty water; hydrated minerals on the surface of Europa and Ganymede, which suggest the presence of water on the surface in any moment in the past, with probably an internal source; geological evidences of a mobile layer a few kilometers beneath the surface of Europa; or recent resurfacing in Triton, suggested by its low craterization density.
Derived from text
Water; Gas Giant Planets; Ice; Geology; Seas

20030111060 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Tharsis-triggered Flood Inundations of the Lowlands of Mars
Fairen, Alberto G.; Dohm, James M.; Baker, Victor R.; dePablo, Miguel A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Throughout the recorded history of Mars, liquid water has distinctly shaped its landscape, including the prominent circum-Chryse and the northwestern slope valleys outflow channel systems [1], and the extremely flat northern plains topography at the distal reaches of these outflow channel systems.Basing on the ideas of episodic greenhouse atmosphere and water stability on the lowlands of Mars [3], a conceptual scheme for water evolution and associated geomorphologic features on the northern plains can be proposed. This model highlights Tharsis-triggered flood inundations and their direct impact on shaping the northern plains, as well as making possible the existence of fossil and/or extant life.Possible biologic evolution throughout the resulting different climatic and hydrologic conditions would account for very distinct metabolic pathways for hypothesized organisms capable of surviving and perhaps evolving in each aqueous environment, those that existed in the dry and cold periods between the flood inundations, and those organisms that could survive both extremes. Terrestrial microbiota, chemolithotrophic and heterotrophic bacteria, provide exciting analogues for such potential extremophile existence in Mars, especially where long-lived, magmatic-driven hydrothermal activity is indicated [14].
Derived from text
Mars Surface; Topography; Floods

20030111061 Imperial Coll. of Science and Technology, London, UK
Primary Variations in Micrometeorites with Entry Velocity
Genge, M. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Micrometeorites are that fraction of the extraterrestrial dust flux that survives atmospheric entry to be recovered from the Earth's surface. The majority of large micrometeorites (>50 m), recovered from Antarctic ice, experience significant heating during atmospheric entry with the result that volatile-bearing phases, such as clay minerals, have thermally decomposed. A significant proportion of particles also have been partially or completely melted. The degree of heating depends on peak temperature and duration of the thermal pulse caused by the hypervelocity collision of air molecules during deceleration and is a function of entry velocity, entry angle and particle size. The dependence on entry angle ensures that even a single velocity population of micrometeoroids will experience a range of heating effects. The overall degree of entry heating, however, will nevertheless increase with velocity. Since dust particles from the same source will have a restricted range of geocentric velocities, changes in the preatmospheric mineralogical and chemical properties of micrometeorites with degree of entry heating may allow identification of discrete populations of particles within the micrometeorite flux. Analyses of petrological variations with degree of heating are complicated by changes in the mineralogy and composition of particles accompanying heating. Identifying the primary features of heated micrometeorites, particularly in particles which have experienced melting, is problematic, however, large (>5 m) anhydrous silicates are found as relict phases within melted particles and allow comparison with unmelted particles. The current study presents data on variations in the abundance and nature of primary anhydrous silicates to enable entry heating affects to be correlated between different particle types.
Author
Micrometeorites; Atmospheric Entry; Temperature Effects; Aerodynamic Heating; Silicates; Meteoritic Composition; Meteoritic Microstructures

20030111062 Imperial Coll. of Science and Technology, London, UK
An Alluvial Fan at Apollinaris Patera, Mars
Ghail, R. C.; Hutchison, J. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Apollinaris Patera, Mars (7 deg.S, 173 deg.E), is an intermediate sized volcano (approx. 6 km high, 150 km diameter) with a large (200-km long) fan-like deposit on its southern flank. This fan is deeply incised and originates from a single breach in the rim of the summit caldera. New topographic and multispectral image data reveal that this fan is alluvial, implying a long-lived source of (volcaniclastic) sediment and water (probably from a caldera lake).
Author
Mars Volcanoes; Topography; Deposits; Alluvium

20030111063 Academy of Sciences (USSR), Moscow, USSR
Synthesis of Complex Organic Molecules During an Impact
Gerasimov, M. V.; Safonova, E. N.; Paskonova, E. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): RFBR-02-05-64419; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Organic molecules can be produced by various natural processes and can be found in interstellar clouds, meteorites, comets, planets, etc. There is a large number of works showing the possibility of synthesis of complex organic molecules at reduced conditions under the action of various energy sources. The transfer of organic molecules from one space object to another is not so easy since the counteraction of space bodies usually occur at high velocities with release of large energies, which result in destructive for organics high temperatures. An impact of a meteorite into the Earth is generally considered as destructive process for organics because of the action of two factors: 1) high temperatures of vaporization at impact velocities over 10 km/s, and 2) oxidizing conditions of the environment, which are unfavorable for production of organic molecules. Earlier we reported about rather efficient synthesis of volatile organic molecules during simulated impact-induced vaporization of silicates in atmosphere of He and H2. The formation of nonvolatile organic components in such processes was indicated by the abundance of carbon in C-C and C-H bonding during investigation of the forming condensates by methods of X-ray-photoelectron-spectroscopy (XPS). The aim of the present work was to investigate experimentally the possibility of synthesis of complex organic molecules from initially inorganic carbon and hydrogen at oxidizing conditions during simulated impact-induced vaporization of silicates.
Author
Synthesis (Chemistry); Organic Compounds; Meteorite Collisions

20030111064 NASA Johnson Space Center, Houston, TX, USA

Zeolite Formation and Weathering Processes Within the Martian Regolith: An Antarctic Analog

Gibson, E. K.; McKay, D. S.; Wentworth, S. J.; Socki, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As more information is obtained about the nature of the surface compositions and processes operating on Mars, it is clear that significant erosional and depositional features are present on the surface. Apparent aqueous or other fluid activity on Mars has produced many of the erosional and outflow features observed. Evidence of aqueous activity on Mars has been reported by earlier studies. Gooding and colleagues championed the cause of pre-terrestrial aqueous alteration processes recorded in Martian meteorites. Oxygen isotope studies on Martian meteorites by Karlsson et al. and Romenek et al. gave evidence for two separate water reservoirs on Mars. The oxygen isotopic compositions of the host silicate minerals was different from the oxygen isotopic composition of the secondary alteration products within the SNC meteorites. This implied that the oxygen associated with fluids which produced the secondary alteration was from volatiles which were possibly added to the planetary inventory after formation of the primary silicates from which the SNC s were formed. The source of the oxygen may have been from a cometary or volatile-rich veneer added to the planet in its first 600 million years.

Derived from text

Zeolites; Formation; Weathering; Mars Surface; Regolith

20030111065 Tennessee Univ., Knoxville, TN, USA

The Effect of Early Accretion and Redistribution of Al-26 on the Thermal Evolution of Mars

Ghosh, A.; Nimmo, F.; McSween, H. Y., Jr.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Thermal models of Mars provide insights into wide spectrum of questions related to the evolutionary history of Mars like the processes of core, crust and mantle separation, duration of the Martian dynamo and formation of the hemispherical dichotomy and the Tharsis region. We evaluate for the first time the effect of Al-26, and its redistribution during differentiation, on the early thermal evolution of Mars.

Derived from text

Temperature Distribution; Mars Surface; Crusts; Aluminum Isotopes

20030111066 Washington Univ., Saint Louis, MO, USA

A New Model of the Hydrologic Properties of the Martian Crust and Implications for the Formation of Valley Networks and Outflow Channels

Hanna, J. C.; Phillips, R. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is abundant geomorphic evidence for the importance of groundwater in the Martian hydrologic cycle. It appears likely that the valley networks formed as a result of groundwater sapping [1], and it is clear that the outflow channels are the manifestation of large-scale eruptions of groundwater to the surface [2]. Thus, our understanding of the formation of these features is only as good as our understanding of the hydrologic properties of the Martian crust. Clifford [3] modeled the Martian crust based upon interpretations of the lunar seismic data and general comparisons to terrestrial aquifers. MacKinnon and Tanaka [4] modeled the Martian curst as a layer of regolith overlying a fractured basement. The present model builds upon this groundwork to construct a more general and widely applicable model of the hydrologic properties of the Martian crust, based on the decomposition of the aquifer into its component parts and the detailed modeling of each component. Given the varying proportions of competent rock and breccia or sediments, as well as the fracture frequency, the porosity, hydraulic conductivity, and compressibility of an aquifer can then be calculated as functions of the depth and pore pressure. The individual aspects of this model are easily adjustable to match the inferred geologic environment of different areas and times in the planet s history, as well as any combination of depth and pore pressure.

Author

Hydrology Models; Mars (Planet)

20030111067 Space Science Inst., Boulder, CO, USA

Discrimination of Hydrovolcanic Tephras from Volcanic and Non-Volcanic Backgrounds in Hyperspectral Data of Pavant Butte and Tabernacle Hill, Utah: Relevance for Mars

Farrand, W. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NAG5-10577; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Water-magma, or ice-magma, interactions have long been theorized as an important process in the Martian geologic record [1-3]. The ability to unambiguously recognize tephra deposits and volcanic edifices produced by H2O-magma interactions is important for understanding the geologic history of Mars and for understanding the genesis of the major components of the Martian surface layer. Recognizing volcanic edifices produced by H2Omagma interactions on the basis of morphology alone is difficult.can be definitively identified as such. One means of providing supporting evidence for the identification of hydrovolcanic landforms and tephra deposits is through spectroscopy. Tephras produced by hydrovolcanic activity range from fresh basaltic glass (sideromelane) to glasses that have been completely altered to palagonite. A study of the visible through short-wave infrared (Vis-IR) reflectance of tephras composing tuff rings and tuff cones showed that the different stages of this alteration sequence have recognizable reflectance signatures [6,7]. However, the ability to recognize these different types of tephras against volcanic and nonvolcanic background materials has yet to be fully demonstrated. In this research, hyperspectral Vis-IR data over volcanic and hydrovolcanic terrains in the Black Rock Desert of Utah were analyzed in order to determine the separability of the component materials from volcanic and non-volcanic backgrounds.
Derived from text

Mars Surface; Volcanoes

20030111068 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Water Ice Albedo Variations on the Martian Northern Polar Cap

Hale, A. S.; Bass, D. S.; Tamppari, L. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Viking Orbiters determined that the surface of Mars northern residual cap is water ice. Many researchers have related observed atmospheric water vapor abundances to seasonal exchange between reservoirs such as the polar caps, but the extent to which the exchange between the surface and the atmosphere remains uncertain. Early studies of the ice coverage and albedo of the northern residual Martian polar cap using Mariner 9 and Viking images reported that there were substantial internannual differences in ice deposition on the polar cap, a result which suggested a highly variable Martian climate. However, some of the data used in these studies were obtained at differing values of heliocentric solar longitude (L(sub s)). Reevaluation of this dataset indicated that the residual cap undergoes seasonal brightening throughout the summer, and indicated that this process repeats from year to year. In this study we continue to compare Mariner 9 and Viking Orbiter imaging observations and thermal data of the north residual polar cap to data acquired with Mars Global Surveyor s Mars Orbiter Camera (MOC) instrument. In the current study, our goal is to examine all released data from MGS MOC in the northern summer season, along with applicable TES data in order to better understand the albedo variations in the northern summer and their implications on water transport. To date, work has focused primarily on the MOC dataset. In 1999, data acquisition of the northern polar regions began at L(sub s) = 107, although there was little north polar data acquired from L(sub s)= 107 to L(sub s) = 109. We examined a total of 409 images from L(sub s) = 107 to L(sub s)=148. We have also examined data from 2000 from L(sub s)= 93 to L(sub s)= 110; additional progress is ongoing. Here we present a progress report of our observations, and continue to determine their implications for the Martian water cycle.
Derived from text

Albedo; Mars Environment; Polar Caps; Mars Surface; Water; Variations; Ice

20030111069 Lancaster Univ., UK

Emplacement of the Prometheus Compound Pahoehoe Lava Flow Field on Io

Hake, M. D.; Wilson, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The voluminous Ionian compound lava flows, such as the approximately 10 meter thick, approximately 200 kilometer long Prometheus flow field, are composed of thermally-efficient, complex and continuous tube-fed plumbing systems. They contain individual lava flow units that are a typically a few hundred meters long and have their lateral extents limited by

cooling. The Ionian flows illustrate complex sequences of interfingering and overlapping flow units, displaying slow, laminar, radial flow front advance by budding and breakout of individual lobes and toes, and probably also involve inflation. We use effusion rate estimates to infer that individual flow units are approximately 0.3 meters thick. These flows are the Ionian equivalent of pahoehoe style compound flow fields on Earth and are similar, apart from the increased spatial scale caused by the smaller acceleration due to gravity on Io, to those which commonly form on the flanks of Kilauea volcano, Hawaii.
Author
Fluid Flow; Io; Lava; Prometheus; Volcanoes; Planetary Geology; Geomorphology

20030111070 NASA Ames Research Center, Moffett Field, CA, USA
Automated Rock Identification for Future Mars Exploration Missions
Gulick, V. C.; Morris, R. L.; Gazis, P.; Bishop, J. L.; Alena, R.; Hart, S. D.; Horton, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A key task for human or robotic explorers on the surface of Mars is choosing which particular rock or mineral samples should be selected for more intensive study. The usual challenges of such a task are compounded by the lack of sensory input available to a suited astronaut or the limited downlink bandwidth available to a rover. Additional challenges facing a human mission include limited surface time and the similarities in appearance of important minerals (e.g. carbonates, silicates, salts). Yet the choice of which sample to collect is critical. To address this challenge we are developing science analysis algorithms to interface with a Geologist's Field Assistant (GFA) device that will allow robotic or human remote explorers to better sense and explore their surroundings during limited surface excursions. We aim for our algorithms to interpret spectral and imaging data obtained by various sensors. The algorithms, for example, will identify key minerals, rocks, and sediments from mid-IR, Raman, and visible/near-IR spectra as well as from high resolution and microscopic images to help interpret data and to provide high-level advice to the remote explorer. A top-level system will consider multiple inputs from raw sensor data output by imagers and spectrometers (visible/near-IR, mid-IR, and Raman) as well as human opinion to identify rock and mineral samples.
Derived from text
Mars Exploration; Planetary Geology; Algorithms; Automation; Rock Mechanics; Imaging Techniques; Mars Surface Samples

20030111071 Chicago Univ., Chicago, IL, USA
Magnesium and Silicon Isotopic Compositions Recorded During Simultaneous Crystallization and Evaporation of CMAS Droplets into Ambient Solar Gas
Fedkin, A. V.; Grossman, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Activity-composition models were used to calculate vapor pressures over CaO-MgOAl2O3-SiO2 (CMAS) liquids and, from these, the change in chemical and isotopic compositions of droplets having compositions of reasonable condensate precursors of Types A and B refractory inclusions during simultaneous cooling, crystallization and evaporation into pure H2. In that work, melilite and spinel trapped within melilite crystals were assumed to be chemically and isotopically isolated from the liquid after melilite formation, but spinel surrounded by liquid was assumed to be in complete chemical and isotopic equilibrium with it. Evaporation rates of liquids were assumed to be so much greater than those of solids that the latter were ignored. Techniques were developed for calculating both the vapor pressures over CMAS liquids in a gas of any composition, and the effects of ambient gas composition on the evaporation rate of a CMAS liquid. They were used to model the chemical and isotopic evolution of a completely molten droplet having the composition of a high-temperature condensate during cooling and evaporation in an 11-element, closed system of solar composition. As evaporation proceeded with falling temperature, ambient pressures of evaporating species were allowed to rise, causing retardation of evaporation rates, and delta Mg-25 and delta Si-29 of the ambient gas allowed to fall while those of the droplet rose. The present work combines the features of both studies, permitting calculation of the chemical and isotopic evolution of a CMAS droplet during simultaneous cooling, crystallization and evaporation into a 'modified' solar gas, i.e. solar composition except for the amounts of elements and isotopes in the droplet.
Derived from text
Crystallization; Drops (Liquids); Evaporation; Magnesium Isotopes; Calcium Oxides; Aluminum Oxides; Silicon Isotopes; Solar Activity

20030111072 New Mexico Univ., Albuquerque, NM, USA

The Behavior of Thorium in Lunar Picritic Magmas: Implications for the Bulk Thorium Content of the Lunar Mantle and Lunar Heat Flow

Hagerty, J. J.; Shearer, C. K.; Vaniman, D. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous studies of heat flow from the lunar mantle have suggested that the amount of heat flow is strongly dependent on the abundance of radioactive isotopes in the mantle and is at least loosely correlated with Th content. Measurements of heat flow from the Apollo missions had been used to imply that those measurements could be extended outside of KREEP terrains; however, the asymmetrical distribution of Th on the lunar surface and presumably in the deep lunar mantle challenges that notion. Fortunately, lunar pyroclastic glasses, which are thought to represent quenched products of near-primary melts from the deep lunar mantle, can provide information about the concentration of radiogenic elements in the lunar interior. High pressure experiments on lunar picritic glasses indicate that the basalts they represent were in equilibrium with olivine + orthopyroxene residua. Such a mineral assemblage is incapable of fractionating Sm from Th during melting, which means that the Sm/Th of the glass approximates the Sm/Th of the mantle sources for these magmas. This paper reports the Th and Sm results from in-situ analyses of pyroclastic glasses from the Apollo 11, 14, 15, and 17 landing sites as a means to evaluate Th and Sm systematics in the lunar mantle.

Derived from text

Heat Transmission; Lunar Mantle; Magma; Thorium; Volcanology; Igneous Rocks

20030111073 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mars Pathfinder Near-Field Rock Distribution Re-Evaluation

Haldemann, A. F. C.; Golombek, M. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have completed analysis of a new near-field rock count at the Mars Pathfinder landing site and determined that the previously published rock count suggesting 16% cumulative fractional area (CFA) covered by rocks is incorrect. The earlier value is not so much wrong (our new CFA is 20%), as right for the wrong reason: both the old and the new CFA's are consistent with remote sensing data, however the earlier determination incorrectly calculated rock coverage using apparent width rather than average diameter. Here we present details of the new rock database and the new statistics, as well as the importance of using rock average diameter for rock population statistics. The changes to the near-field data do not affect the far-field rock statistics.

Derived from text

Mars Pathfinder; Remote Sensing; Planetary Mapping; Igneous Rocks

20030111074 Centre National de la Recherche Scientifique, Orsay, France

Phobos's Mineralogy Reinvestigated. Application of the Wavelet Transform to the Analysis of ISM/Phobos2 Infrared Spectra

Gendrin, A.; Erard, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the study presented here, a technique based on the wavelet transform and described in the accompanying abstract is applied to the near-infrared spectra of Phobos obtained by ISM in 1989 from the Phobos-2 spacecraft. Small mineralogical variations are observed across the red, optically altered, unit of Phobos. The mineralogical composition appears to comprise olivine in the whole observed area, while orthopyroxene is detected only in some localized regions.

Author

Phobos; Phobos Spacecraft; Mineralogy; Wavelet Analysis; Infrared Spectra

20030111075 Brown Univ., Providence, RI, USA

South Circumpolar Ice Sheet on Mars: Regional Drainage of Meltwater Beneath the Hesperian-aged Dorsa Argentea Formation

Ghatan, Gil J.; Head, James W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Dorsa Argentea Formation (DAF) has been the focus of considerable attention in the past few years. The combined efforts of several authors strongly suggest that the units of the DAF, distributed predominantly within two lobes (centered about 0W and 70W), represent the deposits of an expansive, Hesperian-aged circumpolar ice sheet. Extensive networks of esker-like ridges mapped by Head and Pratt provide evidence for basal drainage of meltwater within the DAF on both the E and W flanks of the 70W-lobe. Ghatan and Head interpreted a series of massifs located within the 0W-lobe as subglacial volcanoes that erupted into the Hesperian ice sheet, possibly resulting in local meltback. Four channels described by emerge from within the 0Wlobe and extend NW beyond the margins of the DAF, terminating in the Argyre basin. These channels are interpreted as evidence for lateral drainage of significant volumes of meltwater. A study by Milkovich et al. provides evidence for extensive lateral migration of meltwater just east of the 0W-lobe. Cavi Angusti, a series of irregularly shaped, steep sided basins, carved into the 70W-lobe, are interpreted by Ghatan et al. as most likely originating from melting of the ice-rich DAF via a combination of intrusive and extrusive magmatic heat. Extrusive magma/ice interaction is evidenced by the presence of centrally located edifices within many basins, which are similar in morphology and morphometry to Icelandic subglacial volcanoes. Work by Dickson and Head suggests a significant similarity between a series of pits and grooves located at the northern margin of Cavi Angusti on the 70W-lobe, and terrestrial kettle holes and sapping channels, often found at the margins of retreating ice sheets. Together, these individual investigations argue strongly for the ice sheet hypothesis. Tanaka and Kolb have also recently mapped the south polar region, although they suggest alternative, nonglacial origins for many of the features observed in the area.
Derived from text
Ice; Mars (Planet); Drainage; Melting; Water

20030111077 Virginia Univ., Charlottesville, VA, USA
Observations on Spatial Relationships of Impact Crater Floor Morphologies in the Sinus Sabaeus Region of Mars
Forsberg-Taylor, N. K.; Howard, A. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact cratering is arguably the most important surficial geologic process occurring on the terrestrial planets (with the exception of Earth). Since impact craters can be considered closed systems, they are excellent tools for measuring the degree and type of erosion occurring on a planet's surface. Until recently, studying the geomorphic features of impact craters on Mars has been difficult due to poor data resolution. However, within the last decade, the Mars Orbiter Laser Altimeter (MOLA) has returned high resolution topographic data of the Martian surface. Using these data and images of Mars returned from the Viking missions, we have created a comprehensive database of degradational characteristics of the craters in the Sinus Sabaeus region of Mars. The purpose of this study is to gain a better understanding of the past and present surface processes that modify the surface topography of Mars.
Derived from text
Geomorphology; Mars Craters; Mars Surface; Spatial Distribution; Topography; Meteorite Craters

20030111078 Carnegie Institution of Washington, Washington, DC, USA
Density Measurements of Iron-Sulfur Compounds at High Pressures and Temperatures: Implications for the Cores of Terrestrial Planets
Frank, Mark R.; Fei, Ying-Wei; Watson, Heather C.; Prakapenka, Vitali; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has long been hypothesized that iron and sulfur are important contributors to the cores of terrestrial planets such as Earth and Mars. Compositional models, based on elemental trends observed in SNC meteorites, suggest that the core of Mars may contain a significant component of sulfur (> 10 wt.%;). Further, the dearth of high-pressure data in the Fe-S system required that Fe and FeS be considered end-member compositions. Recent high-pressure experiments conducted using a multi-anvil apparatus were able to determine the presence of high-pressure iron-sulfur compounds at 14 and 21 GPa, respectively. The melting relations and bulk mineralogy in the Fe-FeS system at 21 GPa were outlined for temperatures ranging from 950-1400 C. These high-pressure experiments revealed that at least three new iron-sulfur compounds, Fe3S2, Fe2S, and Fe3S, were formed at high pressures. The possible presence of light elements in the cores of terrestrial planets requires that the properties of high-pressure Fe-S compounds be well understood. Specifically, Fe3S is important because it is the sulfur-bearing component that will be in equilibrium with metallic Fe for cores with sulfur concentrations <16.1 wt.%. To date, only the structure and pressure-density relation of Fe3S have been determined at 300 K. A recent study noted that Fe3S is the only quenchable phase in the system, whereas Fe3S2 and Fe2S were unstable at ambient conditions. The absence of structure and

pressure-density data for the Fe3S2 and Fe2S phases, plus the lack of any data for the three phases at elevated temperatures and pressures limits the ability to model accurately the density profile of a sulfur-bearing iron core. Therefore, it is essential to determine the properties of these phases at elevated temperatures and pressures to place constraints on models of terrestrial core formation.
Derived from text
Iron Compounds; Sulfur Compounds; Terrestrial Planets; Planetary Cores; Density Measurement; X Ray Diffraction

20030111079 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Large-Diameter Visible and Buried Impact Basins on Mars: Implications for Age of the Highlands and (Buried) Lowlands and Turn-Off of the Global Magnetic Field
Frey, H. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The global populations of visible and buried impact basins greater than 200 km diameter revealed by high resolution gridded MOLA indicate: (a) a small (approximately 10) number of very large basins (D=1300-3000km), most of which have remained visible over martian history; (b) a much larger population of smaller basins (D=200-800 km) with many more buried than visible (on images); (c) a depletion of visible basins at intermediate diameters which may be a signature of some global-scale event (formation of the lowlands? origin of Tharsis?); and (d) a crater retention age for the buried lowlands greater than that of the visible highlands but less than that of the total (visible + buried) highlands. Crustal magnetic anomalies are generally not present in the interiors of the largest basins with two exceptions: these two (which appear to be the oldest) may predate the demise of the global magnetic field.
Derived from text
Highlands; Mars Surface; Structural Basins; Geochronology; Magnetic Fields

20030111080 Field Museum of Natural History, Chicago, IL, USA
Tungsten Isotopic Composition of the SNC Meteorite Los Angeles: Further Implications for Early Differentiation History of Mars
Foley, C. N.; Wadhwa, M.; Janney, P. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The hafnium-tungsten (Hf-182-W-182) short lived radionuclide system (half life approx.9 Myr) has been used to date early solar system differentiation events for the Earth, Moon, Mars (SNC parent body), and Vesta (eucrite parent body)[1-10]. During planetary differentiation, the lithophile Hf segregates into the silicate fraction (crust and/or mantle) while the siderophile W segregates into the metallic core. If this differentiation occurs within the life-time of 182Hf, approx.45 Myr, then its timing can be determined by measuring the excess of the daughter product, 182W.
Derived from text
Hafnium Isotopes; Tungsten Isotopes; Radioactive Isotopes; Meteoritic Composition; Vesta Asteroid

20030111081 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evidence for Buried 'Pre-Noachian' Crust Pre-Dating the Oldest Observed Surface Units on Mars
Frey, H. V.; Frey, E. L.; Hartmann, W. K.; Tanaka, K. L. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Even though the Early Noachian (EN) used in geologic mapping is undefined at the early end, it is often assumed in absolute chronologies to extend back to 4.6 BYA. We explored this assumption by searching for evidence of buried impact basins, in the largest occurrences of Early Noachian terrain. The hypothesis is that if such basins exist, they indicate crust which must predate the surface units mapped as the oldest on Mars, and those units must then be less than 4.6 BY old. Alternatively, if no such buried features are seen, then the surface units may represent crust of the same age below, which could in principle be as old as Mars. Here we show the former alternative is true. There must be crust older than the oldest mapped surface units. We also show that a number of Noachian terrains on Mars appear to have a common total (visible + buried) crater retention age. This might be either the age of the original (planet-wide?) crust of Mars, or may indicate crater saturation.
Derived from text
Mars Surface; Planetary Geology; Structural Basins; Geochronology; Planetary Mapping

20030111082 Lunar and Planetary Inst., Houston, TX, USA

Pulse of the Solar System

Grubert, John Peter; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper introduces a slightly modified version of Newton's gravitational law which enables a commonality to be made between the forces of electrostatics and gravitation. These equations plus Hubble's constant and Heisenberg's uncertainty principle then allows the gravitational frequency or pulse of the Universe and Solar System to be calculated. Gravitational waves are ripples in space-time which unlike electromagnetic waves oscillate in two directions (polarizations) simultaneously, up/down and left/right for the plus (+) polarization and at 45-degree diagonals for the cross (x) polarization. They also travel at the speed of light just like electromagnetic waves, decay as they propagate, but can travel unimpeded through material that absorbs all forms of electromagnetic radiation. However, unlike electromagnetic waves that can be detected and measured, gravitational waves have to date never been directly detected. This paper sets out to prove that there is a galactic gravitational pulse in space that varies within the Solar System between 1.5 Hz and 1.8 Hz, being largest near large masses such as the Sun, Jupiter and Saturn, but affects the gravitational mass of every object in space.

Derived from text

Gravitational Waves; Solar System; Frequencies

20030111083 Max-Planck-Inst. fuer Chemie, Mainz, Germany

Tagish Lake: Bulk Chemistry and Terrestrial Alteration

Friedrich, J. M.; Wolf, S. F.; Voss, H.-P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Tagish Lake carbonaceous chondrite has been the focus of much attention since its isotopic, trace element, and mineralogic properties demonstrate a unique history. We have analyzed both pristine and disturbed Tagish Lake samples for 12 major and minor elements by ICPMS and ICPOES. When combined with data collected earlier, this brings the total number of elements quantified in identical aliquots of these samples to 61. Herein, we discuss relationships among major, minor, and trace elements within Tagish Lake and among other carbonaceous chondrites. Additionally, we discuss the significant effects of terrestrial alteration exhibited by Tagish Lake samples gathered from ice and snow.

Derived from text

Carbonaceous Chondrites; Lakes; Mineralogy; Extraterrestrial Environments; Cosmochemistry

20030111084 Museum fuer Naturkunde, Berlin, Germany

Launch Conditions for Martian Meteorites: Plagioclase as a Shock Pressure Barometer

Fritz, J.; Greshake, A.; Stoeffler, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is generally accepted that the 23 unpaired SNCO meteorites were ejected by hypervelocity impacts from the Martian surface. The ejection ages of the Martian meteorites which range from 0.73 and 20 Ma, imply that at least five impact events are required to transfer this group of meteorites to Earth. From the time-calibrated cratering statistics it must be concluded that the large number of ejection events in this short time interval require rather small craters (less than 3 km) for the ejection of the Martian meteorites. New computer simulations of hypervelocity impacts on Mars also indicate that the ejection of Martian meteorites from small craters is possible. To understand the process of mass transfer from Mars to Earth it is essential to know the final equilibration shock pressure of all Martian meteorites which defines the p/T-launch window. In this work we present data for the final equilibration shock pressure of 16 Martian meteorites.

Derived from text

Barometers; Feldspars; SNC Meteorites; Mars (Planet); Launch Windows; Mechanical Shock

20030111085 NASA Ames Research Center, Moffett Field, CA, USA

Mars Data Visualization and E/PO with Marsoweb

Gulick, V. C.; Deardorff, D. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Marsoweb is a collaborative web environment that has been developed for the Mars research community to better visualize and analyze Mars orbiter data. Its goal is to enable online data discovery by providing an intuitive, interactive

interface to data from the Mars Global Surveyor and other orbiters. Recently Marsoweb has served a prominent role as a resource center for the site selection process for the Mars Explorer Rover 2003 missions. In addition to hosting a repository of landing site memoranda and workshop talks, it includes a Java-based interface to a variety of datamaps and images. This interface enables the display and numerical querying of data, and allows data profiles to be rendered from user-drawn cross-sections. High-resolution Mars Orbiter Camera (MOC) images (currently, over 100,000) can be graphically perused; browser-based image processing tools can be used on MOC images of potential landing sites. An automated VRML atlas allows users to construct 'flyovers' of their own regions-of-interest in 3D. These capabilities enable Marsoweb to be used for general global data studies, in addition to those specific to landing site selection. As of September 2002, over 70,000 distinct users from NASA, USGS, academia, and the general public have accessed Marsoweb.
Author
Internet Resources; Scientific Visualization; Mars (Planet); Mars Global Surveyor

20030111087 NASA Johnson Space Center, Houston, TX, USA
Ar-39 - Ar-40 Dating of Two Angrites and Two Brachnites
Garrison, Daniel; Bogard, Donald; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Angrites are a rare group (approx.7 known) of igneous meteorites with basalt-like composition, which probably derive from a relatively small parent body that differs from those of other igneous meteorites. Angrites show evidence for extinct Mn-53, Sm-146, and Pu-244, and precise U-Pb, and Pb-Pb ages of 4.558 Gyr for two angrites define the time of early parent body differentiation. The S-147 - Nd-143 ages of two angrites range between 4.53+/-0.04 and 4.56+/-0.04 Gyr, but no Ar-39 - Ar-40 or Rb-Sr ages have been reported. Most angrites show no evidence for either shock brecciation or metamorphism.
Derived from text
Argon Isotopes; Time Measurement; Samarium Isotopes; Neodymium Isotopes; Metamorphism (Geology); Manganese Isotopes; Chronology

20030111088 Arizona State Univ., Tempe, AZ, USA
Sulfur-rich Carbonaceous Nanoglobules in the Tagish Lake Meteorite
Garvie, L. A. J.; Buseck, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Understanding the distribution, chemistry, and structure of C in carbonaceous chondrites (CC) is fundamental to revealing information on early solar chemical evolution. The Tagish Lake CC has generated much interest partly because of its pristine nature and high C content. Unique to the Tagish Lake CC are hollow carbonaceous nanoglobules. These particles are morphologically similar to materials produced by UV pyrolysis of interstellar ice analogues, and thus these hollow organic globules have been interpreted as extremely primitive organic materials that formed before or during the formation of the solar system. Using electron energy-loss spectroscopy (EELS) we determined the composition of carbonaceous nanoglobules in Tagish Lake. This spectroscopic method together with transmission electron microscopy (TEM) provides unique chemical and crystal-chemical information at high spatial resolution, free of spectral interferences from surrounding materials.
Derived from text
Carbonaceous Chondrites; Sulfur; Globules; Organic Materials; Chemical Composition

20030111089 NASA Johnson Space Center, Houston, TX, USA
Combined Carbon, Nitrogen, and Oxygen XANES Spectroscopy on Hydrated and Anhydrous Interplanetary Dust Particles
Feser, M.; Wirick, S.; Flynn, G. J.; Keller, L. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Interplanetary dust particles (IDPs) collected from the Earth s stratosphere generally contain percent-level concentrations of organic matter. This organic matter in IDPs is important for several reasons: 1) some IDPs contain interstellar organic matter, identified by high D/H or N-15, providing the opportunity to characterize this interstellar material, 2) comparison of the organic matter in anhydrous IDPs to that in hydrated IDPs can help establish the effects of parent body aqueous alteration, and, 3) IDPs are believed to have delivered to the surface of the early Earth pre-biotic organic matter important for the origin

of life. X-Ray Absorption Near-Edge Structure (XANES) spectroscopy provides information on the functional groups present in a sample, and XANES can be performed on the nano-scale, comparable to the size of some of the sub-units of the IDPs. The energies of the XANES transitions are diagnostic of the type of bonding of the C, N, and O, allowing identification of the functional groups present in the sample. As part of our ongoing effort to characterize the organic matter in the IDPs, we have performed carbon- and oxygen- and the first nitrogen-XANES spectroscopy on two IDPs and acid-insoluble residue from the CM2 meteorite Murchison.
Derived from text
Interplanetary Dust; Organic Materials; X Ray Absorption; Absorption Spectroscopy; X Ray Spectroscopy; Spectroscopy

20030111090 Centre d'Etude Spatiale des Rayonnements, Toulouse, France
Martian Gamma Albedo
Gasnault, O.; Maurice, S.; d'Uston, C.; Boynotn, W. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chemical measurements of Martian surface are currently made using -ray and neutron spectrometers onboard Odyssey [1-6]. The highquality -ray detector reveals spectral lines representative of bulk elements at the surface of the planet [7]. However, interpreting these spectra is challenging because of the low signal-to-background ratio. Here, to better handle the overall emission from Mars, we analyze the total number of counts measured by the -ray spectrometer. From these measurements, we derive a -albedo parameter, which reveals information on Martian atmosphere through spatial and time variations.
Author
Mars Surface; Albedo

20030111091 Tokyo Univ., Komaba, Japan
A Search for Active Volcanoes and Compositional Variation in Crust on Venus Using Nightside Near-Infrared Thermal Radiation
Hashimoto, G. L.; Sugita, S.; Imamura, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The thick atmosphere and clouds of Venus restrict methods to observe the surface. However, new spectral windows were discovered at the near-infrared wavelengths, in which thermal radiation emitted from the planetary surface penetrate through the thick Venus atmosphere and clouds. Although, thermal radiation emitted by the venusian surface is disturbed by reflected sunlight on the dayside, it can be observed on the nightside from above the clouds. The calculation of atmospheric radiative transfer model demonstrates that virtually all (greater than 95%) of the radiation observed within the 1.0 mm window is emitted by the surface. This near infrared window will allow us to measure the venusian surface based on spacecraft observation and ground-based telescopic observation. In this paper, we discuss the feasibility of detecting both active volcanic activity and crustal compositional heterogeneity on Venus using near-infrared observation through this window.
Derived from text
Planetary Crusts; Venus Surface; Venus Atmosphere; Volcanoes; Thermal Radiation; Near Infrared Radiation; Variations; Planetary Composition

20030111092 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Mechanism for Recent Production of Liquid Water on Mars
Hecht, M. H.; Bridges, N. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Though Mars is a cold, dry planet, with respect to the thermal stability of liquid water at low altitudes it is not terribly different from comparably cold places on Earth. In dry air such water would evaporate faster on Mars, at a rate comparable to a 60 C hot spring on Earth, but the heat loss associated with that evaporation would be mitigated by the poor thermal convection in the thin Martian air. Even at higher altitudes where the atmospheric pressure does not reach the triple point of water, liquid water might theoretically exist in a low-vapor pressure form such as wet soil, in a briny solution, or simply under a layer of dust or snow. The theoretical stability of liquid water does not suggest its occurrence, either on Mars or in Antarctica. In fact, global models have suggested that locations capable of providing sufficient heat for melting are, precisely for that

reason, too dry for water to be present. However, the temperature of irregular local structures such as trenches or craters can be markedly warmer than those of the uniform surfaces of global models. The work described here suggests a plausible scenario in which seasonal liquid water might be produced locally, in sheltered locations, through a process of condensation, cold-trapping, buffering, and melting. While the amounts produced in the present climate would be small, copious amounts of meltwater may have been produced at other phases of the orbital cycle, as recently as 20,000 years ago.
Derived from text
Water; Thermal Stability; Mars Surface; Melting; Vapor Pressure; Evaporation

20030111093 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Cosmic-Ray Exposure Age of a 480 Myr Old Fossil Meteorite by Noble Gas Analyses of Relict Chromite Grains
Hech, R.; Baur, H.; Schmitz, B.; Wieler, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We detected cosmogenic He-3 and Ne-21 in 6 individual chromite grains from a fossil meteorite recovered from a quarry in Lower Ordovician (480 Ma) marine limestone in southern Sweden. Helium and neon exposure ages agree with each other at approx. 300 000 years, suggesting negligible loss of cosmogenic He and Ne. This exposure age is at the very low end of the range of values observed for present-day meteorites.
Derived from text
Helium Isotopes; Neon; Gas Analysis; Cosmology; Cosmic Rays

20030111094 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Solar System Survey of Forced Librations in Longitude
Comstock, R. L.; Bills, B. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Physical librations in longitude are forced periodic variations of a body's rotation rate. If the torque producing the librations can be calculated, then observations of the phase and amplitude of librations can provide information on mass distribution, and effective strength of the body. In the near future prospects for observing physical librations look quite promising. Radio interferometric observations of Venus and Mercury may yield sufficiently accurate rotational observations that librations there may be visible. Range measurements from Earth to networks of landed instrument packages on Mars are likely to yield librational data there as well. We compute expected libration amplitudes from physical and orbital parameters of a set of planets and satellites partially motivated by a desire to identify candidates for future observations. Solar system bodies occupy one of three general rotation states: non-resonant states, resonant states, and the synchronous resonant state. Analytical treatments of forced librations were initially motivated by the Moon. Lunar librations were predicted by Newton, first detected telescopically by Bessel, and definitively resolved through lunar laser ranging which has led to quite thorough analysis of of librations for the synchronous case. The synchronous resonant state is commonly observed among satellites. The only known body to exist in a non-synchronous resonance is Mercury which exists in a 3:2 resonance, completing three rotations for every two revolutions about the sun. The analysis of Goldreich and Peale has lead to improved understanding of the general case of half integer resonance states. The dynamics of forced librations in non-resonant rotators has received less attention. While there are few cases in which non-resonant forced librations have been observed, Earth is an important exception, and current observing techniques may have the capacity to detect them on Venus. A comprehensive observing program spanning a range of solar system bodies can address an array of geophysical issues involving interior mass distribution of planets, satellites, and asteroids. Calculations of expected librations can supply amplitude estimates helpful in identifying the likelihood of detecting librations observationally. We present a survey of expected libration amplitudes for a subset of solar system bodies, identifying those bodies with amplitudes likely to be detectable, and commenting on spin state, and radial structure implications.
Derived from text
Librational Motion; Longitude; Solar System; Natural Satellites; Rotational States

20030111095 Washington Univ., Saint Louis, MO, USA
Compositional Evidence for Launch Pairing of the YQ and Elephant Moraine Lunar Meteorites
Korotev, R. L.; Jollitt, B. L.; Zeigler, R. A.; Haskin, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-4172; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Arai and Warren provide convincing evidence that QUE (Queen Alexandra Range) 94281 derives from the same regolith as Y (Yamato) 793274 and, therefore, that the two meteorites were likely ejected from the Moon by the same impact. Recently discovered Y981031 is paired with Y793274. The 'YQ' meteorites (Y793274/Y981031 and QUE 94281 are unique among lunar meteorites in being regolith breccias composed of subequal amounts of mare volcanic material (a VLT [very-low-Ti] basalt or gabbro) and feldspathic highland material. EET (Elephant Moraine) 87521 and its pair EET 96008 are fragmental breccias composed mainly of VLT basalt or gabbro. Warren, Arai, and colleagues note that the volcanic components of the YQ and EET meteorites are texturally similar more similar to each other than either is to mare basalts of the Apollo collection. Warren and colleagues address the issue of possible launch pairing of YQ and EET, but note compositional differences between EET and the volcanic component of YQ, as inferred from extrapolations of regressions to high FeO concentration. We show here that: (1) EET 87/96 consists of fragments of a differentiated magma body, (2) subsamples of EET represent a mixing trend between Fe-rich and Mg-rich differentiates, and (3) the inferred volcanic component of YQ is consistent with a point on the EET mixing line. Thus, there is no compositional impediment to the hypothesis that YQ is launch paired with EET.
Derived from text
Meteorites; Moon; Basalt; Gabbro; Magma

20030111096 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A First Attempt to Simulate the Natural Formation of Meteoritic Organics
Gardner, Kathryn; Li, Jean; Dworkin, Jason; Cody, George D.; Johnson, Natasha; Nuth, Joseph A., III; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our working hypothesis in these experiments is that meteoritic organics are a mixture of materials made both in the interstellar medium and in the solar nebula that were further processed within meteorite parent bodies to produce what we see today. The material synthesized in the pre-solar environment is currently under study in several laboratories, though to our knowledge none are investigating the changes that might occur as the result of metamorphic processes on the parent body itself. Material made in the Solar Nebula results from a Fischer-Tropsch type (FTT) synthesis as CO and H2 react on grain surfaces to make methane, as well as more complex species. The products of these reactions using natural catalysts have been well-studied and a calculation of the potential efficiency of FTT reactions in the solar nebula demonstrates that they could contribute significantly to the composition of material near 3 AU.
Derived from text
Meteorites; Interstellar Matter; Metamorphism (Geology); Fischer-Tropsch Process

20030111097 Washington Univ., Saint Louis, MO, USA
Laser-Ablation ICP-MS Analyses of Meteoritic Metal Grains in Lunar Impact-Melt Breccias
Korotev, R. L.; Jolliff, B. L.; Campbell, A. J.; Humayun, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-4172; NAG5-9800; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar impact-melt breccias contain metal grains from the meteorites that formed the breccias. Because the breccias contain clastic material that may derive from older breccias, metal grains from earlier impacts may be present, too. The large subset of moderately mafic (8 - 12% FeO), KREEP-rich ('LKFM') melt breccias is particularly important because: (1) these are the melt breccias most likely to have been produced in basin-forming impacts, (2) it is from these breccias that many of the approx. 3.9 Gyr ages that are so common in lunar samples derive, (3) the breccias contain large proportions of FeNi metal, more than 1% in some types of Apollo 16 breccias, and (4) the metal potentially provides information about the impactors causing the apparent cataclysm at 3.9 Gyr.
Derived from text
Meteoritic Composition; Lunar Rocks; Laser Ablation

20030111098 Brown Univ., Providence, RI, USA
Molecular Isotopic Characterization of the ALH 85013.50 Meteorite: Defining the Extraterrestrial Organic Compounds
Fuller, M.; Huang, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-1066; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Antarctic Meteorite Program has returned over 16,000 meteorites from the ice sheets of the Antarctic. This more than doubles the number of preexisting meteorite collection and adds important and rare specimens to the assemblage. The CM carbonaceous chondrites are of particular interest because of their high organic component. The Antarctic carbonaceous chondrites provide a large, previously uninvestigated suite of meteorites. Of the 161 CM chondrites listed in the Catalogue of Meteorites 138 of them have been recovered from the Antarctic ice sheets,. However, these meteorites have typically been exposed to Earth s conditions for long periods of time. The extent of terrestrial organic contamination and weathering that has taken place on these carbonaceous chondrites is unknown. In the past, stable isotope analysis was used to identify bulk organics that were extraterrestrial in origin. Although useful, this method could not exclude the possibility of terrestrial contamination contributing to the isotopic measurement. Compound specific isotope analysis of organic meteorite material has provided the opportunity to discern the terrestrial contamination from extraterrestrial organic compounds on the molecular level.
Derived from text
Isotopes; Molecular Dynamics; Meteorites; Extraterrestrial Matter; Organic Compounds

20030111099 Harper Coll., Palatine, IL, USA
Kilabo and Bensour: A Comparative Study of Two Recent LL6 Falls from Africa
Cole, K. J.; Sipiera, P. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The fall of a relatively rare meteorite is always an exciting event and when the situation repeats itself within a five-month period, it becomes very interesting. A possible explanation for this can be coincidence or perhaps maybe the two falls are actually related in some manner. The Bensour meteorite, which totals over 45kg, is reported to have fallen on February 11, 2002 along the Algerian/Moroccan border. Five months later on July 21st, a similar fireball was observed over Nigeria and subsequent meteorites were collected along a SE to NW line from Hadejia to the South to Kilabo to the North. The largest recovered mass (2kg) came to rest in the small town of Kilabo, with several smaller fragments being reported from various locations along the path of the fireball. The proposed name Kilabo (a.k.a. Hadejia) is pending the approval of the Meteoritical Society's Nomenclature Committee. In the present study the authors have examined both meteorites and have found that they are extremely similar in both their petrography and primary silicate mineralogy. With this in mind, perhaps both meteorites are related to a meteoroid stream that the Earth passes through at two different points in its orbit, much like the passage of a comet. The present paper will examine the mineralogy and petrology of both meteorites and compare this to other LL6 falls.
Derived from text
Africa; Meteorites; Mineralogy; Chondrites; Petrology

20030111100 Arizona Univ., Tucson, AZ, USA
Educational Use and Effectiveness of an Auditory Display of Mars GRS Data
Keller, J. M.; Boynton, W. M.; Enos, H. L.; Hamara, D.; Janes, D.; Kerry, K.; Pompea, S. M.; Prather, E. E.; Quinn, M.; Slater, T. F.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A central issue in science education involves engaging students in the process of scientific discovery. Too often, science is presented as a factual inventory to be memorized rather than an active process of questioning, investigation, and discovery. In addition, scientific data and ideas are most often presented either as text, in tables, graphs, or other visual representations. These modalities are effective and engaging to many, but by no means all, students. In 1983, Howard Gardner proposed a Theory of Multiple Intelligences and argued the need to expand our concept of human intelligence to include logical-mathematical, spatial, linguistic, musical, bodily-kinesthetic, and personal intelligences along with educational materials designed to maximize these intelligences. The scientific community has historically relied more heavily on the first two of these intelligences. Very little work has been done in integrating 'musical intelligence' into science and science education materials. Background information on this recent field of research can be found at the website for the International Community for Auditory Displays (ICAD) at http://www.icad.org.
Derived from text
Mars (Planet); Data Acquisition; Students; Graphs (Charts)

20030111101 Arizona Univ., Tucson, AZ, USA

Preliminary Correlations of Mars GRS Elemental Abundances with Thermal Inertia, Albedo, and Rock Abundance

Keller, J. M.; Boynton, W. V.; Taylor, G. J.; Kerry, K.; Janes, D. M.; Hamara, D.; Chamberlain, M. A.; Squyres, S. W.; Karunatillake, S.; Gasnault, O., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One year into the mapping phase of the Mars Odyssey Mission, the Gamma Ray Spectrometer (GRS) has collected data with strong enough statistics to make preliminary determinations of elemental abundances on the surface Mars. While the instrument's 10-degree x 10-degree footprint and the slow rate of gathering gamma rays from the planet surface limit our analysis at this early stage, we have gathered enough data to conduct preliminary correlations between elemental abundances and the following parameters: thermal inertia, albedo, and rock abundance. With continued data collection over the lifetime of the instrument, enhanced signal-to-noise will allow for an even stronger future analysis.

Author

Abundance; Albedo; Correlation; Data Acquisition; Planetary Mapping

20030111102 NASA Goddard Space Flight Center, Greenbelt, MD, USA

3-Dimensional Topographic Models for the Classroom

Keller, J. W.; Roark, J. H.; Sakimoto, S. E. H.; Stockman, S.; Frey, H. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have recently undertaken a program to develop educational tools using 3-dimensional solid models of digital elevation data acquired by the Mars Orbital Laser Altimeter (MOLA) for Mars as well as a variety of sources for elevation data of the Earth. This work is made possible by the use of rapid prototyping technology to construct solid 3-Dimensional models of science data. We recently acquired rapid prototyping machine that builds 3-dimensional models in extruded plastic. While the machine was acquired to assist in the design and development of scientific instruments and hardware, it is also fully capable of producing models of spacecraft remote sensing data. We have demonstrated this by using Mars Orbiter Laser Altimeter (MOLA) topographic data and Earth based topographic data to produce extruded plastic topographic models which are visually appealing and instantly engage those who handle them.

Derived from text

Three Dimensional Models; Topography; Remote Sensing; Digital Data; Elevation; Mars Surface

20030111103 Museum fuer Naturkunde, Berlin, Germany

Deformation Features of the Cretaceous Units of the ICDP-Chicxulub Drill Core Yax-1

Kenkmann, T.; Wittmann, A.; Scherler, D.; Schmitt, R. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

Contract(s)/Grant(s): DFG-KE-732/8; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Yaxcopoil-1 (Yax-1) borehole, 60 km SSW of the center of the Chicxulub crater, penetrated through 600 m of sediments below the impactites (from about 894.9 m to the lowermost drilling depth of 1510.9 m). These rocks which are most likely of Cretaceous age are deformed to various degree and consist of distinct lithologies, predominantly carbonates and sulfates (dolomite, limestone and anhydrite). Based on the drill core s position between the inner peak ring and the crater rim and considering structural information of other large impact craters, the sequence of Cretaceous rocks most likely represents displaced mega-block units of the crater floor which have been slumped from the rim of the transient crater towards their present position. To test this hypothesis, in particular the autochthonous or allochthonous character of the sediments, information on: (a) the spatial extent of the rocks, (b) the inclination of bedding planes and (c) all types of deformation features are required.

Derived from text

Deformation; Boreholes; Craters; Depth; Dolomite (Mineral); Drilling

20030111104 Eidgenoessische Technische Hochschule, Zurich, Switzerland

Homogeneity of Tellurium Isotopes in Chondrites, Leachates of Allende and Canyon Diablo

Fehr, M. A.; Rehkaemper, M.; Porcelli, D.; Halliday, A. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the present study, we analyzed bulk samples of the ordinary chondrites Plainview (H5), Mez Madaras (L3.7) and ALH84081 (LL6), the enstatite chondrite Abee (EH4) and the iron meteorite Canyon Diablo (IA). In addition, we conducted measurements on leachates of Allende. A powdered sample of Allende was sequentially leached with reagents of increasing strength ([6] - [9]): 8.5 M acetic acid, 4 M HNO3, 6 M HCl, 3 M HCl 13.5 M HF, conc. aqua regia in a high pressure asher. All measurements were performed by MC-ICPMS.
Author
Chondrites; Iron Meteorites; Tellurium Isotopes

20030111105 Arkansas-Oklahoma Center for Space and Planetary Sciences, USA
The Hera Near-Earth Asteroid Sample Return Mission: An Overview
Franzen, M. A.; Sears, D. W. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The obvious success of the NEAR Shoemaker mission has energized the scientific community into thinking about what missions should be proposed in the immediate future. The amount of information received from the high resolution photographs and spectral data have allowed us to start making connections between meteorites and asteroids. However, returned samples from asteroids could provide the vital link enabling us to understand the geological contexts of these samples and provide the answers to many other long standing questions regarding laboratory and astronomical investigations of asteroids. The proposed Discovery class mission Hera will be the opportunity to return asteroid samples for the scientific community to study.
Derived from text
Asteroids; Near Earth Asteroid Rendezvous Mission; Sample Return Missions; Meteorites

20030111106 Arizona State Univ., Tempe, AZ, USA
A New Mapping Approach for Highland Materials in the South Polar Region of Mars
Kolb, E. J.; Tanaka, K. L.; Skinner, J. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previously, we have reported on preliminary geologic mapping results for south polar specific map units, including the Dorsa Argentea Formation and the south polar layered deposits and other associated units. Now, our attention is focused on completing a 1:5,000,000 - scale map covering latitudes 60 -90 S. including ancient highland rocks. Viking-based geologic mapping at 1:15,000,000 scale and other earlier work utilized mapping approaches that we now feel require revision.
Derived from text
Mapping; Polar Regions; Mars Surface

20030111107 NASA Johnson Space Center, Houston, TX, USA
Laboratory Hydrothermal Alteration of Basaltic Tephra by Acid Sulfate Solutions: An Analog Process for Martian Weathering
Golden, D. C.; Ming, D. W.; Morris, R. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objective of this study is to conduct simulated Mars-like weathering experiments in the laboratory to determine the weathering products that might form during oxidative, acidic weathering of Mars analog materials.
Author
Weathering; Basalt; Mars Surface Samples

20030111108 Notre Dame Univ., IN, USA
Petrogenesis of the Apollo 14 High-Al Basalts Revisited: Distinct Magmatic Events, Source Metasomatism, and AFC
Kramer, G.Y.; Neal, C. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Apollo 14 landing site is situated within the Th-rich hotspot as defined by Lunar Prospector gamma-ray data. Basalts were returned predominantly as clasts in impact breccias, although occasional pristine large samples are present in the Apollo

14 sample collection. Trace element data for Apollo 14 high-Al basalts suggest a complex origin. The range of basalt compositions cannot be explained by simple fractional crystallization or by short-range unmixing. Dickinson et al. and Shervais et al. distinguished 5 groups of basalts on the basis of REE abundances. Using the terminology of, Group 1 basalts contain the highest REE abundances and Group 5 the lowest. However, Neal et al. suggested that a continuum of compositions existed between LREE-depleted (Group 5) and LREE-enriched (Group 1) end-members.
Derived from text
Petrogenesis; Basalt; Depletion; Gamma Rays; Lunar Prospector; Trace Elements

20030111109 Wheaton Coll., Norton, MA, USA
Can Hydrothermal Plumes Melt Through Europa's Ice Shell?
Collins, G. C.; Goodman, J. C.; Pierrehumbert, R. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The formation mechanism for regions of chaotic terrain on Europa is the subject of much debate. Several models have been proposed to account for these disrupted areas of Europa's surface including melting through the ice shell by a concentrated heat source in the underlying ocean, coalescence of solid-state diapirs, extrusion of warm ice onto the surface, and melting within the ice shell. While the melt-through hypothesis is attractive from the standpoint of explaining why chaos areas look, at first glance, like disrupted sea ice, it is more difficult in this model to explain the origin of the concentrated heat source beneath the floating ice shell. O'Brien et al. developed a numerical model of the melt-through process in order to explore the range of energies and timescales necessary to melt through the ice shell. Assuming a 6 km thick conductive ice shell with heat sources of 50-500 GW spread out over a 20-200 km wide area at the base of the shell, O'Brien et al. find that melt-through is possible over timescales on the order of 10(exp 2) to 10(exp 4) years, depending on the chosen heat flux. We have investigated these results using a different numerical scheme, and find that total melt-through will not occur under these conditions.
Derived from text
Europa; Ice; Mathematical Models; Melting; Plumes; Terrain; Hydrothermal Systems

20030111111 Arizona Univ., Tucson, AZ, USA
Numerical Simulations of Silverpit Crater Collapse
Collins, G. S.; Turtle, E. P.; Melosh, H. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-11493; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Silverpit crater is a recently discovered, 60-65 Myr old complex crater, which lies buried beneath the North Sea, about 150 km east of Britain. High-resolution images of Silverpit's subsurface structure, provided by three-dimensional seismic reflection data, reveal an inner-crater morphology similar to that expected for a 5-8 km diameter terrestrial crater. The crater walls show evidence of terracestyle slumping and there is a distinct central uplift, which may have produced a central peak in the pristine crater morphology. However, Silverpit is not a typical 5-km diameter terrestrial crater, because it exhibits multiple, concentric rings outside the main cavity. External concentric rings are normally associated with much larger impact structures, for example Chicxulub on Earth, or Orientale on the Moon. Furthermore, external rings associated with large impacts on the terrestrial planets and moons are widely-spaced, predominantly inwardly-facing, asymmetric scarps. However, the seismic data show that the external rings at Silverpit represent closely-spaced, concentric fault-bound graben, with both inwardly and outwardly facing faults-carps. This type of multi-ring structure is directly analogous to the Valhalla-type multi-ring basins found on the icy satellites. Thus, the presence and style of the multiple rings at Silverpit is surprising given both the size of the crater and its planetary setting.
Derived from text
Planetary Craters; North Sea; Computerized Simulation; Meteorite Craters; Geomorphology

20030111112 Southwest Research Inst., San Antonio, TX, USA
Methodology for Computer-aided, Interactive Rapid Assessment of Local or Regional Stress Fields
Colton, S. L.; Ferrill, D. A.; Sims, D. W.; Wyrick, D. Y.; Franklin, N. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On Earth, crustal deformation such as faulting, fracturing, and folding strongly influences surface topography, distribution and exposure of rock units, flow and accumulation of surface water, flow and entrapment of subsurface fluids (such as groundwater, oil, and natural gas), ore mineralization, climate conditions, heat flow in the crust, and seismicity. For a wide range of purposes and processes, understanding deformation features at or near the Earth's surface has been instrumental in exploring for natural resources, and for understanding the evolution of the Earth's crust and its relationship with the hydrosphere, atmosphere and mantle. Based on the many similarities between Earth and Mars, Mars deformation processes and features and the variability of resolved stresses on deformation features have a profound influence on fluid movement, related surface and subsurface mineralization, and the potential for past and present existence of life on Mars. Deformation features on Mars, including normal faults and resulting grabens, contractional wrinkle ridges, extension fracture systems, and relatively rare strike-slip faults have been mapped in local areas of investigation and in some cases, deformation features have been analyzed in detail. These investigations have concentrated on mechanics or statistics of particular deformation features, or on details of deformation mechanisms compared with similar features on Earth. Only a few studies focus on the larger-scale structural evolution of the crust of Mars. In the present investigation, we focus on a range of scales, from regional patterns of deformation to the details of fault morphology, including corrugations, linkages, and interactions of faults. We have developed a methodology for detailed mapping of large-scale structural features on Mars, determination of stress orientations responsible for deformation, and analysis of resolved stresses along such structures. We present preliminary results for northern Utopia Planitia on Mars to demonstrate our approach.
Derived from text
Planetary Geology; Stress Analysis; Mars (Planet); Methodology; Structural Properties (Geology); Stress Distribution; Planetary Mapping

20030111113 Colorado Univ., Boulder, CO, USA
Experimental Studies of Low-Velocity Microgravity Impacts into Regolith
Colwell, J. E.; Sture, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The dusty regoliths of ring particles, proto-planetesimals, planetary satellites, and asteroids are subject to collisions at low velocities (v approximately equal to 0.1 - 100 meters per second) in addition to the hypervelocity (greater than or = 1 kilometer per second) impacts from the interplanetary micrometeoroid flux. In some regions of Saturn s rings, for example, the typical collision velocity inferred from observations by the Voyager spacecraft and dynamical modeling is a fraction of a centimeter per second. These interparticle collisions control the rate of energy dissipation in planetary rings and the rate of accretion in the early stages of planetesimal formation. Dust on the surface of planetary ring particles and small (1 centimeter - 10 meters) planetesimals helps dissipate energy in the collision, but may also be knocked off, forming dust rings in the case of ring particles and slowing or inhibiting accretion in the case of planetesimals. Secondary impacts on asteroids and small planetary satellites occur at speeds comparable to the escape velocity from the object, or meters/second for objects approximately 10 kilometers in radius or smaller. We report on impact experiments performed in the reduced-gravity environment of the NASA KC-135 aircraft at speeds between 13 and 220 centimeters per second into simulated regolith.
Derived from text
Asteroids; Low Speed; Microgravity; Regolith; Spaceborne Experiments; Hypervelocity Impact

20030111114 City Univ. of New York, Brooklyn, NY, USA
On the Nature and Origins of FeO-rich Chondrules in CR2 Chondrites: A Preliminary Report
Connolly, Harold C., Jr.; Weisberg, Michael K.; Huss, Gary R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In recent years considerable research has been devoted to understanding the components in CR2 chondrites. In particular, constraints have been placed on the nature and petrogenesis of FeO-poor (type I) chondrules, Fe-Ni metal associated with FeO-poor chondrules and matrix, and refractory inclusions. One group of objects, the FeO-rich chondrules, has yet to be investigated in detail. Herein we present our preliminary results on the petrography, geochemistry, and O-isotope composition of FeO-rich (type II) chondrules from CR2 chondrites. Our goal is to determine the origin of FeO-rich chondrules and their relationship to other objects within the CR2's and, in the long term, to similar chondrules in other chondrite groups.
Author
Meteoritic Composition; Iron Oxides; Chondrule; Chondrites; Petrogenesis

20030111115 Vatican Observatory, Vatican City State (Holy See)

The Composition and Evolution of a Geophysically Reasonable Moon Produced by a Giant Impact

Consolmagno, G. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The magma ocean model for the early Moon's evolution has been one of the most important and influential hypotheses to come out of the Apollo program. Recognizing that the earliest stages of a terrestrial planet's evolution involve widespread melting, and attempting to understand what such a planetary-scale melting episode implies for geophysical and geochemical evolution, has been fundamental in our understanding not only of the Moon but of the major terrestrial planets and the HED parent body. In the 1970s Cameron first suggested that the Moon formed as the result of a Mars-sized planetesimal impacting onto the Earth. Since the 1980s this model has gained significant favor. It is consistent with our understanding of how planetesimals form, and we now know that a large number of such giant impacts did occur elsewhere in the solar system. It can explain the depletion of iron metal in the Moon, and might explain the identical oxygen isotope abundances between Earth and Moon rocks. It can explain the Moon s nearly circular but mildly inclined orbit. And, frankly, no other viable theory for the origin of the Moon exists. However, as modeled by Cameron and by Canup et al., the nature of the impact event has profound implications for both the physical origin of any magma ocean, and for the Moon's bulk composition.

Author

Lunar Evolution; Earth-Moon System; Lunar Composition; Meteorite Collisions

20030111116 Academia Sinica, Nanking, China

Hf(182)-W(182) Chronometry for an Early Differentiation in the Parent Body of Ureilites

Lee, D.-C.; Halliday, A. N.; Singletary, S. J.; Grove, T. L.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

Ureilites are primitive achondrites that are composed mainly of olivine and pyroxenes with abundant interstitial and crosscutting carbon polymorphs, Fe-Ni metal, sulfides, and silicates. Studies of ureilites indicate that the parent body went through a series of igneous processes, while, at the same time, ureilites contain features that can only be explained by mixing of primitive nebular materials. Several models have been proposed to explain the origin of ureilites, and these include multi-stage igneous cumulate processes, residues of partial melting, collision of primitive planetesimals, and smelting of an olivine-rich parent body. Despite the fact that no single model can yet satisfy all the observed chemical and physical evidence, there is little doubt that ureilites represent the silicate portion of a differentiated body. In this study, we present preliminary Hf(182)-W(182) (t(sub (1/2) ~ 9 myrs) data for a suite of ureilites in order to further constrain the nature and the timing of this partial melting/smelting event. Four ureilites, including ALHA77257, Dhofar132, EET96042, and PCA82506, have been analyzed for their W isotope composition and Hf/W ratios at ETH-Zurich. About 1.5 grams of powder was prepared for each sample using an aluminum-oxide mortar and pestle under a laminar flow of HEPA-filtered air. The experimental procedure has been described in detail elsewhere. All four ureilites show significant W(182) deficits relative to that of the terrestrial W standard. The ew varies from -3.6 to -2.7, which is sub-chondritic consistent with sub-chondritic Hf/W ratios (Hf(180)/W(184) varies from 0.07 to 0.3). In fact, these ureilites have W isotopic compositions comparable to that of early metals extracted from ordinary and enstatite chondrites and iron meteorites, in contrast to other basaltic achondrites all of which have positive to chondritic sigma W. There exists a positive but poorly defined relationship between the measured W isotope and Hf/W ratios among these four ureilites, with an initial sigma W at ~ -3.6, suggesting a possible common origin among the four samples. The unradiogenic ew observed in all four ureilites provides evidence that the parent body differentiated early, consistent with recently reported Mn(53)-Cr(53) data and comparable to the timescales for differentiation of the HED parent body. The unradiogenic ew signature in ureilites predominantly reflects their sub-chondritic Hf/W ratios and this is thought to be the product of the partial melting / smelting event that was responsible for the formation of ureilites. This reconnaissance Hf(182)-W(182) study has examined only four samples, and these do not cover the entire chemical and petrographic types of the ureilite families either. Therefore, it is premature to conclude much based on these data alone. Nonetheless, it seems clear that the ureilite parent body differentiated early. Future work should combine chemical and petrographic evidence to study ureilites of different chemical and petrographic types, such that a more complete picture to the evolution history of the ureilite parent body can be obtained.

Author

Ureilites; Meteoritic Composition; Isotope Ratios; Tungsten Isotopes; Hafnium Isotopes; Meteorite Parent Bodies

20030111117 Academy of Sciences (USSR), Moscow, USSR

Novae on Venus: Geology, Classification and Scenarios of Evolution

Krassilnikov, A. S.; Head, J. W.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): RFBR-02-05-65068; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Novae are 'radially fractured centers' on the venusian surface 100-300 km in diameter. Dense radial fracturing and upraised topography are common for them, massive volcanism is connected with some novae. We studied the complete set of novae (64 structures) from the 'Catalog of volcanic structures of Venus'. Novae are interpreted to be the result of updoming and fracturing of the surface due to interaction of mantle diapiris with the lithosphere. There are a few geological, numerical and analog models of novae formation. Our goals were: 1) To study the topography and geology of all novae and their surroundings. 2) To classify novae by their topography. 3) To study the relationship of novae with rift zones. 4) To study the period of novae activity relative to regional plains with wrinkle ridges (Pwr), which can be used as stratigraphic marker. 5) To create scenarios of novae evolution on the basis of our observations, using models of novae formation and mechanisms of radial dike swarm emplacement, volcanic construction spreading and mantle diapirism. We used the 'Magellan' GTDR, C1 and F-MIDR data for analysis included detail geological mapping.
Derived from text

Novae; Venus (Planet); Geology; Classifications; Evolution (Development); Volcanoes; Thematic Mapping

20030111118 Academy of Sciences (USSR), Moscow, USSR

Arachnoids on Venus: Structural Analysis, Classification and Models of Formation

Krassilnikov, A. S.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): RFBR-02-05-65068; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction. Arachnoids are features 'characterized by concentric or circular pattern of fractures or ridges and radial fracture patterns or ridges extending outward for several radii'.'Catalog of Volcanic structures of Venus' includes 265 arachnoids. They are most common between 50 and 175 km diameter and are represented by depressions. They are interpreted to have formed by evolution of rather small mantle diapirs with rather deep position. Formation of radial extensional structures was described as due to traces of radial dike emplacement. Previously we suggested tectonophysical models of arachnoid formation. Goals of the study: 1) To study the topography and geology of sample of arachnoids and their local surroundings. We studied 53 arachnoids (20% of population, each 5th structure from the catalog). 2) To classify arachnoids by sets of tectonic patterns. 3) To assess models of arachnoid formation and evolution on the basis of our observations, models of arachnoids and related structures formation (coronae, novae and calderas), and use processes of radial dike swarm emplacement and mantle diapirism. Methods. We used Magellan C1 and F-MIDR and GTDR data for geological analysis, which included: 1) Study of topography. 2) Study of distribution and kinematics of their deformation structures. 3) Detail geological mapping of typical examples.
Derived from text

Fractures (Materials); Structural Analysis; Rock Intrusions; Venus (Planet)

20030111119 Chicago Univ., Chicago, IL, USA

Dynamics of Hydrothermal Plumes on Europa: Implications for Chaos Formation

Goodman, J. C.; Collins, G. C.; Marshall J.; Pierrehumbert, R. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The apparent existence of a substantial liquid water layer beneath Europa s icy crust affects the transfer of energy from the tidally-heated rocky interior to the surface ice layer. Better understanding of the characteristic length, time, and velocity scales of flow in the liquid water layer can improve our understanding of the processes that reshape Europa s surface. Of those processes, debate is especially intense regarding the formation mechanism for chaotic terrain. The 'melt-through' model proposes that chaos regions and/or lenticulae are formed when hydrothermal plumes rising from localized seafloor heat sources melt away the overlying ice layer. Thomson & Delaney [5] (T&D, hereafter) suggest that the ocean currents at the top of the plume might drive the apparent drift of large ice blocks in chaos regions. But do hydrothermal plumes have the right size, heat flux, and velocities to be compatible with the melt-through hypothesis?
Derived from text

Plumes; Hydrothermal Systems; Europa; Crusts; Ice

20030111120 Aberdeen Univ., UK

Potential Preservation of Life Within Fluid Inclusions in Martian Impact Craters

Wilkins, A. D.; Parnell, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fluid inclusion studies have the potential to record various important features of impact sites including the heating effects due to impact, hydrothermal fluid circulation history, the subsequent behavior of exposed rocks at the planetary surface and, of most interest to astrobiology, the preservation of organic matter. 'Water is of interest not only from the perspective of planetary evolution but also for biology. Liquid water is universally recognized as an essential for life'. Therefore an understanding of Mars s history of water should allow us to determine the probability of life on Mars, for without liquid water it is unlikely that life arose or persisted on Mars. The absence of liquid water also precludes the entrapment of aqueous fluid inclusions.

Derived from text

Extraterrestrial Life; Exobiology; Mars Craters; Organic Materials; Water

20030111121 Iwate Univ., Morioka, Japan

Possible Xenolith and Xenocrysts of Olivine in the Asuka-881371 Angrite Collected from Antarctica

Yanai, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Angrite had been known as one of the oldest rocks coming from the space. Four and more meteorites had been identified as angrite, such as Angra dos Ries(1.5kg, fall in Brazil 1869[1]), Lewis Cliff 86010 (6.9g, find in Antarctica 1986), Lewis Cliff 87051(0.6g, find in Antarctica 1987), Asuka-881371[3] and others. In the all meteorites, angrite meteorites are very unique specimen for their oldest age, mineral assemblages such as Ca-pyroxene(fassaite) and Ca-olivine(kirschsteinite), and showing their unique textures of differences in each angrite.

Derived from text

Antarctic Regions; Rocks; Meteoritic Composition

20030111122 Tokyo Univ., Japan

Variations of Oxygen Isotopic Compositions of Silicate Spherules Collected from Antarctic Blue Ice

Yada, T.; Nakamura, T.; Noguchi, T.; Ushikubo, T.; Matsumoto, N.; Kojima, H.; Takaoka, N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent works suggest that unmelted, phillosilicate-bearing micrometeorites and hydrous interplanetary dust particles (IDPs) collected at stratosphere are related to hydrated carbonaceous chondrites, which are supposed to be derived from C-, P-, D-, or T-type asteroids. Anhydrous IDPs are supposed to be cometary origin because of their high D/H ratios and characteristic mineralogy that are distinct from any meteorites. It is difficult to clarify precursor materials of melted cosmic spherule, because of loss of their original mineralogy due to severe heating during atmospheric entry. Oxygen isotopic signature is useful for identification of planetary materials. In order to clarify the precursor of cosmic spherules, we analyzed oxygen isotopes of individual 37 cosmic spherules with an ion probe. Part of this work was briefly reported in, here we report a series of results in detail.

Derived from text

Antarctic Regions; Atmospheric Entry; Carbonaceous Chondrites; Interplanetary Dust; Oxygen Isotopes

20030111123 Prairie View Agricultural and Mechanical Coll., TX, USA

Some Recommendations for a Comprehensive Lunar Meteor Campaign

Cudnik, B. M.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent reports of meteors hitting the moon have opened up new opportunities in observational and theoretical astronomy. Since the Leonid meteor storm of 1999, some fifteen lunar impact events have been confirmed, and another twelve are very likely real events, which have not yet been confirmed. Several groups of astronomers, both professional and amateur, have documented the flashes of impacts on the surface of the Moon. There have been a number of attempts by groups of both amateur and professional astronomers to observe meteoroid impacts due to the annual meteor showers, with the only

confirmed events derived from the 1999 and 2001 Leonids. Two possibilities why no confirmed events have been seen in the other annual showers may be lack of large objects in the streams and/or the lower number densities of meteoroids as compared with the unusually dense Leonid streams of 1999 and 2001. In this Paper, I outline some recommendations on a comprehensive program to systematically monitor the moon for meteoritic impact events and the benefits derived from such a program.
Derived from text
Meteorite Collisions; Moon; Meteoroid Showers; Lunar Surface

20030111124 University of Southern Queensland, Toowoomba, Australia
The Source of Lunar Basalts in the Northern Oceanus Procellarum Region
Jackson, Noel W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analysis of Clementine remote sensing data permits new observations and therefore results to be obtained about mineral distribution on the lunar surface, basalt flow stratigraphy and thus the geological evolution of the Moon. In particular the northern section of Oceanus Procellarum contains numerous impact craters that have penetrated the basalt to different depths, providing natural probes for estimating the number and thickness of flows. These estimates, when coupled with a relative height topographic map, can be used to infer the source direction of the basalts flows. Clementine derived images, that include the primary mosaic image (415, 750, and 950 nm bands), ratio image (750/415, 750/950, and 415/750), and the iron image all indicate that basalt flows in the northern Oceanus Procellarum region change in composition over time and that different layers can be correlated over large areas based on their composition. The western parts of the northern portion of the mare are bounded by anorthositic highlands covered by anorthositic regolith and contains widespread titanium-poor basalts. In contrast, in the eastern Oceanus Procellarum, the larger craters expose at least two basalt flows greater than one kilometre thick; each titanium-rich surface unit, underlain by titanium-poor unit that itself is underlain by anorthositic basement. A statistical sample of craters to 20 kilometers in diameter was used to derive the relative thickness of the basalt layer(s). Using the relationship that depth equals ten percent of the diameter for craters up to about 20 kilometres. In addition, hand drawn isopach diagram and computer generated graphics for the basalt layers provide area and volume estimates that are in reasonable agreement. The titanium-rich basalts are estimated, in the region to be as young as 1.1 billion years old, while the titanium-poor basalts (Apollo 12 basalt samples), are estimated in age between 3.08 and 3.37 billion years. In the northern Oceanus Procellarum (area 525,000 square kilometres), the volume of basalt exceeds 240,000 cubic kilometres. The titanium rich surface layer is estimated to be 48,000 cu km and the titanium poor second basalt layer is about 193,000 cu kilometers. The resulting isopach cross sections combined with topographic maps infer that the titanium poor basalts flowed from a northwesterly direction while the titanium rich basalts flowed from a northeasterly direction into Oceanus Procellarum. These results in turn- provide a new set of constraints that need to be explained by models of the geothermal history of the Moon.
Author
Basalt; Lunar Evolution; Lunar Surface; Planetary Geology; Lunar Maria; Remote Sensing; Lunar Topography

20030111125 Tokyo Univ., Japan
Measurements of Ejecta Velocity Distribution from Regolith Targets in Oblique Impacts
Yamamoto, S.; Kadono, T.; Sugita, S.; Matsui, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The velocity distribution of impact ejecta from regolith-like target has been investigated in laboratory for nearly three decades. For the case of vertical impact, the ejecta velocity distribution is determined experimentally and given by a power-law with an exponent of 1.22. There is an upper limit to the ejecta velocity (Hartmann cutoff velocity) that depends on impact velocity. On the contrary, for the case of oblique impacts, it was reported that there exists a separate group of high-velocity ejecta component above the Hartmann cutoff velocity. However, there are few studies concerning the velocity distribution of the high-velocity ejecta component for oblique impacts. More data and further investigation are obviously required to quantify the ejecta velocity distributions from regolith targets for various impact angles. Therefore we performed impact experiments on sand targets for various impact angles, in order to measure the ejecta velocity distribution of the high velocity component above the Hartmann cutoff velocity.
Derived from text
Velocity Measurement; Ejecta; Regolith; Targets; Impact Velocity

20030111126 Oslo Univ., Norway

Oblique Mjolnir Marine Impact: Structural and Geophysical Diagnostic Constraints

Tsikalas, F.; Faleide, J. I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 40-km-diameter Mjolnir crater is a well-established complex marine impact crater in the central Barents Sea. Both geophysical and geological data unequivocally substantiate a meteorite bolide impact at approx. 142 Ma into an epicontinental basin with 300-500 m paleo-water depth.

Derived from text

Meteorite Collisions; Craters; Geophysics; Hypervelocity

20030111127 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Using MGS TES Data to Understand Water Cycling in Mars' North Polar Region

Tamppari, L. K.; Hale, A. S.; Bass, D. S.; Smith, M. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Martian water cycle is one of the three annual cycles on Mars, dust and CO2 being the other two. Despite the fact that detailed spacecraft data, including global and annual coverage in a variety of wavelengths, have been taken of Mars spanning more than 25 years, there are many outstanding questions regarding the water cycle. There is very little exposed water on Mars today, in either the atmosphere or on the surface although there is geological evidence of catastrophic flooding and continuously running water in past epochs in Mars' history as well as recent (within about 10,000 years ago) evidence for running water in the form of gullies. While there is little water in the atmosphere, water- ice clouds do form and produce seasonal clouds caused by general circulation and by storms. These clouds may in turn be controlling the cycling of the water within the general circulation.

Derived from text

Water; Storms; Mars Surface; Hydrological Cycle; Carbon Dioxide

20030111128 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Study of the Opposition Phase Curve in Low Albedo Media

Nelson, R. M.; Hapke, B. W.; Smythe, W. D.; Hale, A. S.; Piatek, J. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Opposition Effect, the pronounced non-linear intensity increase in the reflectance phase curve with decreasing phase angle,theta , has long been observed in solar system bodies and in laboratory investigations of the angular scattering properties of particulate media. The size and shape of the phase curve, and the change in linear polarization with theta, have been related to the physical properties of planetary regolith scattering materials. Near zero degrees the increase in reflectance with decreasing phase angle has been attributed to two distinct processes. The first is the elimination of shadows cast between the regolith grains as the phase angle decreases. This is called the shadow hiding opposition effect (SHOE). The second is coherent constructive interference between rays of light traveling along identical but opposite paths in multiply scattering media. This is called the coherent backscattering opposition effect (CBOE).

Derived from text

Albedo; Nonlinearity; Phase Shift; Planetary Composition

20030111129 Vermont Univ., Burlington, VT, USA

Filling in the Gap: An Experimental Study on Early Differentiation Processes

Ford, R.; Rushmer, T.; Benedix, G. K.; McCoy, T. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An 'oxidation gap' exists in chondrites between E and H types yet some meteorite groups, typically the primitive achondrites, seem to fill that gap (e.g. pallasites, acapulcoites, lodranites, winonaites, and IAB, IIE families). Previous experimental studies indicate that reduction of mineral compositions may occur during differentiation. It is possible that differentiation of precursor chondrite material under a variety of conditions (e.g. different fO2) can change the geochemistry, both elemental and isotopic, such that the end products cannot be easily related to their parent material. Although, oxygen

isotopic composition of silicates in IAB and winonaite indicates that the parent chondrite of these meteorites has not been sampled, this type of process might help explain the formation of the winonaite-IAB meteorite group. Unraveling such a history is difficult because the known starting composition is needed in order to assess how much the differentiation conditions have affected the chemistry of the product. A good way to test the effect of variable oxidation state during differentiation is to look for changes in metal composition and Fe-end member compositions of low-Ca pyroxene. We are testing this approach by comparing the compositions of partial melting experiments on an ordinary chondrite (Kernouve) and an enstatite chondrite (Indarch) under controlled, and opposite, fO2 conditions.
Derived from text
Oxidation; Meteoritic Composition; Chondrites; Stony-Iron Meteorites; Pyroxenes

20030111130 Tokyo Univ., Japan
Parentless Radiogenic Noble Gases in Lunar Soils: Evidence for Planet Pollution of the Sun?
Ozima, M.; Miura, Y. N.; Podosek, F. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Noble gases in the solar wind (SW), especially in their isotopic compositions, are generally regarded to be good proxies of solar noble gases, i.e. the primordial noble gases in the solar system. Lunar soils and soil breccias have been extensively studied as a means to investigate SW compositions, since many soils have been exposed to the SW long enough to accumulate substantial concentrations of noble gases, enough for precise isotopic analysis. However, laboratory analyses have clearly shown that noble gases in lunar breccias include excess (parentless) radiogenic components such as 40-Ar, 129-Xe and fission Xe that are not thought to be attributable to the SW. Therefore, these parentless radiogenic components have been assigned a lunar origin: Radiogenic components produced in the lunar interior were degassed to the transient lunar atmosphere, and some of these degassed noble gasses were re-implanted to the lunar surface together with SW.
Derived from text
Breccia; Isotopic Labeling; Lunar Soil; Radiogenic Materials; Rare Gases; Solar Wind

20030111131 Paris VI Univ., France
Topographic Profiles Across Valles Marineris Walls: Identification and Extent of Lava Layers in the Volcanic Basement
Gatineau, D.; Mege, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analysis of slope breaks in the Ius and Candor chasmata walls using MOLA altimetry data reveals that some of them can be followed laterally along the walls. They are interpreted as stratigraphic contacts between layers of contrasting strength within the lava pile, such as pyroclastic deposits and fluid lava flows. Five to 10 such lithologic boundaries have been identified. Their extent parallel to graben strike is between 200 and 400 km at least and 50 to 100 km at least across graben strike, which suggests that the surface area covered by individual volcanic layers may be on the order of 104-105 km2 or more.
Author
Volcanoes; Mars Surface; Topography

20030111133 City Univ. of New York, Brooklyn, NY, USA
Tafassasset: A Metal-rich Primitive Achondrite with Affinities to Brachinites
Nehru, C. E.; Weisberg, M. K.; Boesenberg, S.; Kilgore, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tafassasset (Tafa) is a recent find (26 stones recovered between 2000-2001) from the Tenere desert (Niger). Tafa is an unusual metal-rich meteorite with an achondritic texture. Its classification is contentious and is the main focus of this work. Bourot-Denise et al. suggested it was a metamorphosed CR chondrite based on O-isotopes that plot near the CRs, high metal abundance (10%) like the CRs and textural regions that they interpreted to be relict metal-rich chondrules texturally similar to those in the CR chondrites. However, a different sample of Tafa was classified as a primitive achondrite with a recrystallized texture. Zipfel et al. reported that both samples of Tafa (one in Paris and the other in Freiberg) are paired and are bulk compositionally similar to the primitive achondrites (brachinites and lodranites). Our continuing interest in the primitive CR chondrites and primitive achondrites led us to study this intriguing sample. If Tafa is a recrystallized CR, it is important as the first highly equilibrated sample from the CR parent body(ies) and may provide important clues to thermal processes on

chondritic asteroids. If it is related to the brachinites, it is important in being the first metal-rich brachinite and may provide clues to deciphering the petrogenesis of this poorly understood primitive achondrite group. The thin section that we studied showed remarkable similarity to Brachina, albeit metal rich. The goal of this study is to determine the relationship of Tafa to the brachinites and understand its origin.
Derived from text
Achondrites; Chondrites; Chondrule; Meteoritic Composition

20030111134 Tennessee Univ., Knoxville, TN, USA
Basalt Versus Andesite in the Martian Crust: New Geochemical Perspectives
McSween, H. Y., Jr.; Grove, T. L.; Wyatt, M. B.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Data from the MGS Thermal Emission Spectrometer (TES) has shown that surface type 1 (ST1) materials, interpreted as basalt, dominate the ancient crust in the southern highlands of Mars. Large expanses of surface type 2 (ST2) materials in the northern lowlands have been variously interpreted as andesite, oxidized crystalline basalt, or partly weathered basalt. The ambiguity in interpreting the ST2 lithology arises because volcanic siliceous glass (a major component of andesite) is spectrally similar to some oxidation products and/or clay minerals in TES data. Distinguishing between these multiple working hypotheses is crucial to understanding the planet's crust composition and differentiation. This study offers new geochemical data that complement an earlier consideration of this problem.
Derived from text
Mars Surface; Planetary Crusts; Andesite; Basalt

20030111135 Minnesota Univ., Duluth, MN, USA
In Situ Partial Melt on Venus: Evidence for Ancient Water?
Hansen, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mechanism(s) responsible for Venus plains volcanism remain mostly elusive. Distribution of so-called shield plains terrain [1] appears to be globally widespread, and formation of shield terrain might represent a major means of Venus resurfacing, particularly important during an earlier era. Shield terrain comprises countless individual lava flows that emanate from individual closely-spaced eruptive centers; the lavas coalesced to form an ultra-thin, mechanically strong discontinuous shield-paint layer covering tens to hundreds (?) of millions of km2. Shield-paint lava represents local shallow point-source partial melt across huge expanses of Venus; this unique style of volcanism may provide evidence for ancient Venusian water.
Author
Venus (Planet); Volcanology; Water

20030111136 Rensselaer Polytechnic Inst., Troy, NY, USA
Detailed Petrological Characterization of Asteroid 1459 Magnya
Hardersen, P.S.; Gaffey, M. J.; Abell, P. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The recent discovery of a basaltic asteroid, 1459 Magnya, in the outer regions of the main asteroid belt suggest that significant heating in the earliest epoch of the solar system reached further heliocentric distances than previously anticipated. Although relatively few (less than approx. 50) main-belt asteroids have been mineralogically characterized to give relatively precise inferred thermal histories, research into the heating pattern in the main asteroid belt can be attempted and is continuing. 1459 Magnya represents a potentially very important data point to advance our understanding of the actual heating pattern that occurred. In addition to the thermal work, other issues concerning 1459 Magnya include its potential similarity with the HED meteorites and its possible genetic linkage to asteroid 4 Vesta and its associated fragments. The resolution of these issues depends on detailed observations of 1459 Magnya that extend the wavelength coverage of this asteroid beyond at least 2.4 microns so that the pyroxene chemistry of the asteroid can be constrained.
Derived from text
Asteroids; Petrology; Analogies; Asteroid Belts; Vesta Asteroid

20030111138 Eotvos Lorand Univ., Budapest, Hungary

Outreach Activity of the Planetology Group of Eotvos University, Hungary: Experimental Programs and Experiences

Hargitai, H.; Berczi, Sz.; Kereszturi, A.; Opitz, A.; Silk, A.; Weidinger, T.; Tepliczky, I.; Bradak, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The task of the Planetology Group of the Eotvos Lorand University, Budapest is to teach and research on planetology at the university. These activities are made mainly by the voluntary work of the members, because the University does not have department for this scientific area. We teach planetology in the frame of the activity of the Cosmic Material Research Group and as part of the Physical Geography Curriculum. Our formal teaching activity consists of two elective courses on Planetary Science: 1, Regional and thematic planetology (two semesters) and 2, Cosmic materials and Lunar Rock petrography.

Author

Education; Planetology

20030111139 Washington Univ., Saint Louis, MO, USA

Regolith in the South Pole-Aitken Basin is Mainly Indigenous Material

Haskin, L. A.; Gillis, J. J.; Jolliff, B. L.; Korotev, R. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): NAG5-10485; NAG5-8905; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This abstract is concerned with the probability that a mission to a site within the South Pole-Aitken basin (SPA) would yield a meaningful sample of typical SPA floor material. The probability seems favorable, barring a highly atypical landing site, because the chemical composition of the SPA interior, as determined remotely from orbit, is different from that of the surrounding lunar surface. How representative would the sample be? To what extent have lateral transport or later events compromised the original chemical and mineralogical composition of the floor material? Where or in what kind of deposit should the mission land to provide the best example? We address these questions from the point of view of modeling of impact ejecta deposits. SPA is the largest lunar impact basin. Shallow for its diameter, it has a subdued gravity signature, a lower albedo, and a more Th- and Ferich interior than the surrounding highlands (the Feldspathic Highlands Terrane, FHT). Its floor may represent noritic or perhaps (but less abundant) gabbroic lower crust of the FHT, the upper crust stripped away by the basin-forming impact, possibly an oblique one.

Derived from text

Regolith; Chemical Composition; Deposits; Crusts; Landing Sites; Lunar Surface

20030111140 Washington Univ., Saint Louis, MO, USA

The Mars Microbeam Raman Spectrometer: An Improved Advanced Brassboard

Haskin, L. A.; Wang, Alian; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An advanced brassboard (ADBB) of the Mars Miscrobeam Raman Spectrometer is being developed. The probe and spectrograph have been redesigned with improved optics and the electronics have been miniaturized. The modified optical design in the probe and spectrograph provides better spectral resolution than the previous model and enables the probe design to be more compatible with robotic arm deployment. The CCD detector is now cooled thermoelectrically in anticipation of eventual terrestrial field testing of the instrument.

Derived from text

Spectrographs; Microbeams; Design Analysis; Field Tests; Deployment

20030111141 Carnegie Institution of Washington, Washington, DC, USA

Potential Sources of Hesperian Contractional Tectonics on Mars

Hauck, Steven A., II; Solomon, Sean C.; Phillips, Roger J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The formation of wrinkle ridges on early Hesperian volcanic plains constituted the most significant episode of contractional deformation in the history of Mars. Current hypotheses for the source of this deformation, based largely on photogeological mapping and basic physiographic relations, run the gamut from local and regional to global mechanisms. Here

we review the potential contribution to contractional strain of a variety of mechanisms in order to exclude those processes unlikely to be important and to isolate those worthy of further study.
Derived from text
Mars Surface; Planetary Geology; Tectonics; Volcanoes

20030111142 Museum fuer Naturkunde, Berlin, Germany
Hydrothermal Alteration of the Impactites at the ICDP Drill Site Yax-1 (Chicxulub Crater)
Hecht, L.; Schmitt, R. T.; Wittmann, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): DFG-Ke-732/8; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

About 100 m of impactites (suevitetype breccias) have been drilled at the ICDP drill site Yax-1 within the Chicxulub impact structure. Post-impact hydrothermal alteration including alkali metasomatism and devitrification of impact melt glass has significantly modified the mineralogy and chemistry of the impact breccia lithologies. Hydrothermal alteration has also affected the breccia dikes in the cretaceous megablock and locally the host sediments.
Derived from text
Breccia; Impact Melts; Drilling; Metamorphism (Geology)

20030111143 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Berlin, Germany
Thermal Modeling of the Near Surface Layer at the Beagle 2 Landing Site in the Isidis Planitia Region
Helbert, J.; Benkhoff, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Beagle 2, the Lander of the ESA Mars Express mission, is scheduled to land in the Isidis Planitia basin in January 2004. The lander has a strong focus on exobiological studies. Therefore the prime question is, whether the landing site might provide an environment suitable for hosting exobiological activity. In order to address this question we have performed a number of studies modeling the near surface temperature distribution using the Mars Surface Layer Thermal Model (MaSLaTMo) recently developed in our group. This model includes a detailed treatment of the energy transfer into the surface, including energy transported by gas flux and energy used to sublimate and provided by recondensation of volatiles within the surface. It allows to study the thermal and physical properties of a near surface layer on Mars with a high spatial resolution.
Derived from text
Thermodynamic Properties; Temperature Distribution; Energy Transfer; Landing Sites; Surface Temperature

20030111144 Cornell Univ., Ithaca, NY, USA
A Blind Test of Hapke's Photometric Model
Helfenstein, P.; Shepard, M. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-7964; NAG5-3639; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hapke's bidirectional reflectance equation is a versatile analytical tool for predicting (i.e. forward modeling) the photometric behavior of a particulate surface from the observed optical and structural properties of its constituents. Remote sensing applications of Hapke s model, however, generally seek to predict the optical and structural properties of particulate soil constituents from the observed photometric behavior of a planetary surface (i.e. inverse-modeling). Our confidence in the latter approach can be established only if we ruthlessly test and optimize it. Here, we summarize preliminary results from a blind-test of the Hapke model using laboratory measurements obtained with the Bloomsburg University Goniometer (B.U.G.). The first author selected eleven well-characterized powder samples and measured the spectrophotometric behavior of each. A subset of twenty undisclosed examples of the photometric measurement sets were sent to the second author who fit the data using the Hapke model and attempted to interpret their optical and mechanical properties from photometry alone.
Derived from text
Bidirectional Reflectance; Photometry; Predictions; Planetary Surfaces; Optical Properties; Mechanical Properties

20030111145 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Space Weathering: An Ultraviolet Indicator
Hendrix, A. R.; Vilas, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present evidence suggesting that the spectral slope of airless bodies in the UV-visible wavelength range can be used

as an indicator of exposure to space weathering. While space weathering generally produces a reddening of spectra in the visible-NIR spectral regions, it tends to result in a bluing of the UV-visible portion of the spectrum, and may in some cases produce a spectral reversal. The bluing effect may be detectable with smaller amounts of weathering than are necessary to detect the longer-wavelength weathering effects.
Derived from text
Space Weathering; Ultraviolet Spectra; Exposure; Spectral Bands

20030111146 Geological Survey of Canada, Ottawa, Ontario, Canada
Comparative Textural and Mineralogical Studies of Two Primitive Ordinary Chondrites: Saratov (L4) and an Unnamed (L/LL3) from Antarctica
Herd, R. K.; Hunt, P. A.; Venance, K. E.; Killgore, M. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Primitive ordinary chondrites potentially contain valuable information about the early Solar System, and are used e.g. in studies of pre-solar grains, the age of chondrule formation, and the age of chondrite equilibration. But documentation of their detailed petrography may be lacking, even though sophisticated chemical and isotopic analyses have been obtained. While documenting and classifying an Antarctic chondrite with low metal and well-defined chondrules, we have examined a comparable meteorite, Saratov. Its classification is L4 whereas the other is an L/LL3, probably of grade 3.5 to 3.6. Saratov fell September 6, 1918, total known weight (TKW) 328 kilograms. To date we have been unsuccessful in discovering a detailed description of its mineralogy and texture although it has been analyzed in some important studies and is widely available in collections and from dealers. Our study adds important information on Saratov. The Antarctic meteorite was found about a decade ago, TKW 2.3 kilograms.
Derived from text
Chondrites; Meteoritic Composition; Chemical Analysis; Petrography; Mineralogy; Classifications

20030111147 Geological Survey of Canada, Ottawa, Ontario, Canada
3D Imaging and Modelling with a Space-qualified Laser Camera System: Development of Terrestrial Applications and Potential for Planetary Exploration
Herd, R.; Spray, J.; Samson, C.; Miller, S.; Christie, I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Neptec s Laser Camera System (LCS) is a 3D auto-synchronized scanner whose design originated at the National Research Council of Canada (NRC). Two high-precision galvanometer-mirror combinations steer a laser beam and illuminate a target point in space. The LCS is a versatile instrument that can operate both in imaging and centroid acquisition modes. In imaging mode, the LCS raster scans objects and computes high-resolution 3D maps of their surface features. For each point imaged, the LCS records spatial coordinates (X,Y,Z) and the intensity (I) of the diffusely reflected laser signal. In collimated laser configuration, the LCS has a range precision of 0.1 mm at 1 m, 2 mm at 5 m, and 5 mm at 10 m. In focused laser configuration, the LCS can be used for very detailed imaging tasks requiring sub-millimeter precision. In centroid acquisition mode, the LCS determines the location of discrete target points on an object. In 1999, Neptec licensed this technology from NRC for space applications. With support from the Canadian Space Agency (CSA), Neptec introduced significant changes to port the original laboratory scanner to the space environment. The LCS was tested in August 2001 during Mission STS-105 of Space Shuttle Discovery; it acquired 4 high-resolution 3D images of Canadarm2 and of space station elements, and more than 2 hours of centroid data.
Derived from text
Imaging Techniques; Space Exploration; Cameras; Aerospace Environments; Laser Beams

20030111148 Lunar and Planetary Inst., Houston, TX, USA
The Impact Angles of Different Crater Forms on Mars
Herrick, R. R.; Hessen, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous surveys have been conducted of the Venusian and lunar impact crater populations in an effort to empirically determine the onset angle of various oblique impact forms. Those surveys showed a general consistency with predictions from small-scale experiments . That previous work also showed that in the presence of a dense atmosphere the onset angle increases

for various phenomena, and ejecta is carried downrange in a turbulent cloud. A weakness of the previous surveys was the small numbers of craters sampled. Venus has a young surface and the dense atmosphere prevents small craters from forming. Space weathering and gardening on the moon make it difficult to discern the distal ejecta for all but the most recent impacts. On Mars there are hundreds of well-imaged craters located on flat surfaces, and ejecta blankets are easy to distinguish because they are emplaced as ramparts. We have surveyed Martian craters over a large size range to empirically determine the angles for which various phenomena occur.
Derived from text
Mars Craters; Space Weathering; Downrange; Ejecta

20030111149 American Museum of Natural History, New York, NY, USA
Tomographic Study of Shapes and Metal Abundances of Renazzo Chondrules
Ebel, D. S.; Hertz, J.; Weisberg, M. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The origin of metal in the metal-rich, highly primitive, CR2 chondrites is vigorously debated. In some Renazzo chondrules, metal has an approximately solar Ni:Co ratio which led to suggest that it is a product of solar nebula condensation. Additionally, in many chondrules, metal occurs in two locations: as one or two large metal grains in the chondrule interior and as numerous smaller metal grains along the chondrule rim. In other chondrules, metal is more evenly dispersed in smaller grains. Interior metal generally has higher concentrations of the more refractory siderophile elements than metal in the rim, which tends to be enriched in volatile metals. This difference may be due to (1) partial evaporation and rapid recondensation of metal; (2) condensation of core metal at higher temperatures, suggesting accretionary growth of the chondrules as temperature decreased; or (3) late Fe addition to the metal on the chondrule rims due to FeO reduction from the adjoining silicates. Analyzed PGE distribution in CR chondrite metal and argued that rim metal may have formed by a reaction with the surrounding silicates at the time of chondrule formation. Showed that Ni and Co concentrations in the metal grains of the least circular, finest-grained chondrules do not follow a condensation trend. This implies that the relative amounts of Ni and Co in the interior grains were gradually established during chondrule melting due to Fe oxidation or reduction.
Derived from text
Tomography; Shapes; Metals; Chondrule; Solar Nebula; Meteoritic Composition

20030111150 Washington Univ., Seattle, WA, USA
Impactor Contamination of Dark Ray Craters on Ganymede
Hibbitts, C. A.; Hansen, G. B.; McCord, T. B.; Stephan, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Dark ray craters on Ganymede are believed to result at least partially from impactor contamination because they occur on many terrain types of many ages. Of the many dark ray craters on Ganymede, Kittu, Antum, Tammuz, Mir, and Melkart impact craters were all observed by the Near Infrared Mapping Spectrometer (NIMS) at a spatial resolution better than 10 km/pixel. Of these five dark ray craters, Kittu crater possesses a visible color spectrum distinctly flatter than other dark ray craters, more similar to C-type asteroid material rather than redder D-type material. We investigate the near infrared characteristics of the dark ejecta from Kittu and the other four craters for spectral evidence of impactor contamination. Using water-ice albedo or bi-direction reflectance models, we first subtract the effect of water ice from the dark ejecta. We then can compare the residual spectrum to mixtures of Ganymede, Callisto, and other non-ice materials.
Derived from text
Ganymede; Contamination; Craters; Near Infrared Radiation; Visible Spectrum

20030111151 Brown Univ., Providence, RI, USA
Geology of the Isidis Basin, Mars
Hiesinger, H.; Head, J. W., III; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Building on Bridges et al. [2003], we are currently studying the general geologic history and evolution of the Isidis basin based on topographic and imaging data obtained by orbiting spacecraft such as Mars Global Surveyor (MGS) and Mars Odyssey. This study complements our recently completed analyses on Syrtis Major to the west [Hiesinger and Head, 2003] and the transition between Syrtis Major and Isidis [Ivanov and Head, 2002]. The new data allow one to get a close view of the Isidis basin, its structure, stratigraphy, geologic history and its evolution. We are interested in a number of scientific

questions, for example, what are the characteristics of the Isidis rim and what caused its present morphology? What is the role and fate of volatiles in the Isidis basin and what are the characteristics of the uppermost surface layer? Does the floor of the Isidis basin primarily consist of volcanic plains as indicated by wrinkle ridges and cone-like features, material deposited by a catastrophic collapse of the rim as proposed by Tanaka et al. [2000], or of sediments deposited in an ocean as suggested by Parker et al. [1989, 1993]? What is the stratigraphy of the deposits within the Isidis basin and what processes were responsible for its present appearance?
Author
Mars Surface; Structural Basins

20030111152 Brown Univ., Providence, RI, USA
Ages of Lunar Mare Basalts in Mare Frigoris and Other Nearside Maria
Hiesinger, H.; Head, J. W., III; Wolf, U.; Jaumann, R.; Neukum, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar mare basalts cover about 17% of the lunar surface, occur preferentially on the lunar nearside, and often fill the low-lying inner depressions of large impact basins and craters such as Imbrium or Orientale. Basalts in Mare Frigoris are special in that they occur in an area that is not clearly related to any unambiguously accepted impact structure. Mare Frigoris may be part of the large and very old Procellarum basin, but the existence of this basin is still disputed. Wilhelms found the basalts of eastern Mare Frigoris to be of Imbrian age and the basalts of central and western Frigoris (west of approx.10degE) to be younger and of Eratosthenian age. He suggested that the concentration of Eratosthenian and Imbrian eruptions in Mare Frigoris, Mare Imbrium and Oceanus Procellarum is due to a thin lithosphere beneath the putative Procellarum basin. The majority of mare basalts in Mare Frigoris is characterized by relatively homogeneous low titanium abundances, bright albedo, strong 1 m- and prominent 2 micron-absorption bands. Based on the morphology of pre-mare craters, the thickness of the basalts in Mare Frigoris has been estimated to be less than 500 m. Whitford-Stark proposed that the basalts in Mare Frigoris were emplaced by flood-style eruptions 3.2-3.6 b.y. ago. Based on Lunar Orbiter IV images we performed new crater size frequency distribution measurements in order to determine surface model ages of basalts exposed within Mare Frigoris. In addition, we are expanding our crater counts to several other lunar areas, which are covered with mare basalts, such as Mare Nectaris, Mare Smythii, Mare Marginis, Mare Vaporum, Sinus Medii, and Palus Putredinis. We also determined ages for basalts exposed in craters Schickard, Grimaldi, Cr ger, Hubble, Joliot, Goddard, and two lava ponds south of the crater Endymion.
Derived from text
Basalt; Lunar Maria; Structural Basins; Frequency Distribution; Absorption Spectra

20030111154 Arizona Univ., Tucson, AZ, USA
JaH 031: A New LL Chondrite Breccia from Oman
Hill, D. H.; Patzer, A.; Boynton, W. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hundreds of meteorites have been recovered in recent years in the hot desert regions of Africa. Among them are meteorites from the Sultanate of Oman region known as Jiddat al Harasis (JaH). We report mineralogical, major element, and trace element data on a new LL5 (S5)(W2) breccia from this region: JaH 031. The importance of the recoveries cannot be underestimated as they provide valuable, rare specimens. Likewise, they present an expanded record and improved compositional and collision statistics for ordinary chondrites that is comparable to that of the Antarctic finds.
Derived from text
Breccia; Meteorites; Antarctic Regions; Chondrites

20030111155 Brown Univ., Providence, RI, USA
The Tagish Lake Meteorite as a Possible Sample from a T or D Type Asteroid
Hiroi, T.; Kanno, A.; Nakamura, R.; Abe, M.; Ishiguro, M.; Hasegawa, S.; Miyasaka, S.; Sekiguchi, T.; Terada, H.; Igarashi, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-3871; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the Tagish Lake meteorite fell in January 2000, the one of the kind meteorite has become the hottest issue among meteoriticists as well as astrobiologists. Meanwhile, concerning the physical origin of the meteorite in our solar system, only

Hiroi et al. reported that it likely came from a D asteroid based on comparison of their visible-near-infrared (Vis-NIR) reflectance spectra. However, because asteroid classification is usually performed based on a limited range of wavelength, the asteroid classes and surface compositions may not necessarily have one-to-one correspondence. Also, Hiroi et al. precluded the T-type asteroids simply because their average albedo is much higher than the visible reflectance of Tagish Lake although their spectral matches with Tagish Lake were good, and the 3-mm band spectra compiled in were not enough to compare the degree of hydration or kinds of hydrous minerals between primitive asteroids and Tagish Lake. In this paper, we employ more spectral datasets up to the 3-mm range to address the possible connection between two particular asteroids, 773 Irmintraud and 308 Polyxo, and the Tagish Lake meteorite.
Derived from text
Asteroids; Classifications; Meteorites; Spectral Bands; Hydration

20030111156 Brown Univ., Providence, RI, USA
Effects of Microsecond Pulse Laser Irradiation on Vis-NIR Reflectance Spectrum of Carbonaceous Chondrite Simulant: Implications for Martian Moons and Primitive Asteroids
Hiroi, T.; Moroz, L. V.; Shingareva, T. V.; Basilevsky, A. T.; Pieters, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-3871; RFBR-02-05-65156; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Goal of this study is to make a progress in understanding the optical effects of space weathering on small bodies believed to be similar in composition to carbonaceous chondrites: C, G, B, F, T, D, and P asteroids and possibly Martian satellites Phobos and Deimos. The companion work focuses on petrological and mineralogical aspects of this process. One of the main factors of space weathering is meteorite and micrometeorite bombardment leading, in particular, to impact melting of components of the regolith. Studies of lunar regolith and laboratory experiments simulating impact melting show that the melting products differ from the unmelted material in mineralogy and distribution of chemical components among different phases that results in spectral changes. We simulate impact melting of CM chondrite by pulse laser irradiation of an artificial analog of such a meteorite. The analog is a mixture of 46 wt.% non-magnetic fraction of L5 ordinary chondrite Tsarev, 47 wt.% serpentine, 5 wt.% kerite, and 2 wt.% calcite. It simulates rather well bulk chemistry, including volatiles such as H2O and CO2, and only approximately the CM chondrite mineralogy. Thus, we do not expect the mixture to be spectrally similar to CM chondrites, but expect the laser melting products to be similar to those formed by impact melting of natural CM chondrites.
Derived from text
Carbonaceous Chondrites; Chemical Composition; Laser Outputs; Irradiation; Pulsed Lasers; Reflectance

20030111157 Tokyo Univ., Japan
First Discovery of an Ultra-Refractory Nodule in an Allende Fine-grained Inclusion
Hiyagon, H.; Hashimoto, A.; Kimura, M.; Ushikubo, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fine-grained inclusions (FGIs) are considered to be of condensation origin judging from their fine-grained texture and the Group II REE pattern typically found in FGIs. Group II REE pattern is characterized by depletion of HREE (except Tm) relative to LREE and depletion of the least refractory Eu and Yb, suggesting condensation from a fractionated (HREE-depleted) gas. However, its counter part, an ultra-refractory component is rarely found in refractory inclusions. We report here the first discovery of an ultra-refractory (UR) nodule as a part of a FGI in Allende (CV3) meteorite. This FGI, named AFG-1, therefore would have important information on the REE fractionation, or gas/dust separation, at very high temperatures.
Derived from text
Inclusions; Fractionation; Cosmic Dust; Allende Meteorite

20030111158 Academy of Sciences (USSR), Moscow, USSR
Limiting Accuracy of Mars, Mercury, Venus Instantaneous Spin Components Estimation by Ground-based Radar
Holin, I. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ground-based imaging techniques prevent us from the very detailed investigation of planetary spin dynamics on two

reasons: 1) the above limits in accuracy are too rough to sense variations in rotational velocity and pole orientation, 2) measuring interval is compared to or exceeds the rotational period what demands the exact apriori model of variations to interpret observations adequately. To obtain full information on spin dynamics including variations which may be partially apriori unknown or stochastic we need a technique allowing precise measurement of instantaneous spin components. In other words we have to improve accuracy by 3 to 4 orders of magnitude with respect to radar techniques now in use and simultaneously cut the measuring time by 5 to 6 orders of magnitude (from years to minutes).
Author
Spin Dynamics; Radar; Venus (Planet); Mars (Planet); Mercury (Planet)

20030111159 Washington Univ., Seattle, WA, USA
Could Fast Rotator Asteroids be Rubble Piles?
Holsapple, K. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The strength of asteroids is an important property for dynamical processes involving evolution, disruption, cratering and mitigation methods. Internal stresses are produced by the centrifugal and gravitational forces, which depend on the asteroid's shape and size, and are limited by the strength. Therefore, studies of spin states can be used to infer limits on strength. An oft-quoted result is that a rubble pile, strengthless asteroid cannot spin faster than 11 rev/day, or have a period less than about 2.1 hours. Faster spins produce centrifugal tensile forces at the equator greater than compressive gravity forces, so material would be flung off. That limit is too high and can be refined.
Author
Asteroids; Space Debris; Rotation; Rotating Bodies

20030111160 Washington Univ., Seattle, WA, USA
On Nuking Menacing Asteroids
Holsapple, K. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most scientists now accept that impacts on the earth of large asteroids and comets have occurred in the past, and will, without intervention, occur again; with devastating affects on the earth and all living creatures. About ten years ago, researchers and others studied a number of ways that an asteroid could be diverted from an impending collision with the earth by pushing it sufficiently to change its course, making it miss the earth. Among the methods suggested, it is generally accepted that with a short warning time, such as a few years, only the nuclear bomb approach would work. In I report some recent studies on these issues, including the effect of asteroid porosity which is now thought to be likely. One of the conclusions is that porosity can make the use of surface explosives or impacts of large masses, both methods that deflect by cratering, ineffective. Of the other cases, some of the more interesting conclusions deal with the mitigation methods using a standoff nuclear weapon, which I present here.
Author
Asteroids; Nuclear Weapons; Nuclear Explosions

20030111161 Lunar and Planetary Inst., Houston, TX, USA
The Secular Evolution of the Primordial Kuiper Belt
Hahn, J. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Kuiper Belt is a vast swarm of comets orbiting at the Solar System's outer edge. This Belt is comprised of debris that was left over from the epoch of planet formation, and this swarm's distribution of orbit elements preserves a record of events that had occurred when the Solar System was still quite young. Although the common goal of most dynamical studies of the Kuiper Belt is to decipher this record, its interpretation is not entirely clear. In this document, Kuiper Belt Objects' (KBOs) eccentricities (e) and inclinations (i) are plotted versus their semimajor axes (a). The KBOs' three major dynamical classes are the Plutinos which inhabit Neptune's 3:2 resonance at a = 39.5 AU, the Main Belt KBOs which are the nonresonant bodies orbiting between 40 approx. < a approx. < 48 AU, and the more distant Scattered KBOs that live in eccentric, nearly Neptune crossing orbits. The Figure also shows that the Plutinos and the Scattered KBOs have inclinations that span 0 approx. < i approx. < 30 , while the Main Belt KBOs appear to have a bimodal distribution of inclinations centered on i approx. 2 deg and i approx. 17 deg. Note that accretion models show that these large approx. 100+ km KBOs must have formed from

much smaller planetesimal seeds that were initially in nearly circular and coplanar orbits having e and sin i approx. < 0:001. However the swarm's gravitational self stirring can not account for the Kuiper Belt's current excited state, so one or more mechanisms must also have stirred up the Kuiper Belt since the time of formation.
Author
Kuiper Belt; Orbits; Orbital Mechanics; Astronomical Models

20030111162 Arizona Univ., Tucson, AZ, USA
The Evil Twin of Agenor: More Evidence for Tectonic Convergence on Europa
Greenberg, R.; Hurford, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Voyager images of Europa showed evidence of both strike-slip displacement and dilation along cracks [1]. Galileo images confirmed that dilation has been common and widely distributed. Large crustal plates have separated, with the space between them filled by new surface material creating dilational bands. Similarly, new surface has also been created along strike-slip faults, where curves in the faults have resulted in pull-apart zones [2,3], similar in appearance to the dilational bands. Terrestrial style convergence features have not been identified, raising the question: How and where has crust been removed to compensate for the new surface area that has been created?
Author
Europa; Tectonics; Geological Faults

20030111163 Hawaii Univ., Honolulu, HI, USA
Detailed Mineralogical Analyses of Martian Meteorite-like Terrains Using MGS TES and Odyssey THEMIS Data
Hamilton, Victoria E.; Christensen, Philip R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Global deconvolutions of MGS TES spectra using martian meteorite spectra as end members show that in several small regions, martian meteorite- like mineralogies are identified, including Chassigny, ALH A77005, and ALH 84001 [1, 2]. Orbital multispectral thermal infrared and visible wavelength imaging data from Odyssey THEMIS provide us the opportunity to map the distribution and geologic environment of these materials at unprecedented (100-m and 20-m) spatial scales and assess their viability as potential source regions for some martian meteorites. We present new analyses of the distributions of these intriguing materials by integrating MGS TES and Odyssey THEMIS imaging and spectral data.
Derived from text
SNC Meteorites; Emission Spectra; Thermal Mapping; Infrared Spectra

20030111164 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Water Ice Clouds in the Martian Atmosphere: A Comparison of Two Methods
Hale, A. S.; Tamppari, L. K.; Christensen, P. R.; Smith, M. D.; Bass, Deborah; Pearl, J. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To date, the only two data sets offer the potential to examine year-to-year changes in cloud features over an entire Martian year: the Viking Infrared Thermal Mapper (IRTM) data set and the Mars Global Surveyor (MGS) Thermal Emission Spectrometer (TES) data set. We have examined the TES data in the same way in which we examined the Viking IRTM data. This provides water-ice cloud information separated in time by 12 Martian years. Since the data are analyzed with the same method, we obtain a very accurate 'apples to apples' comparison, and can generate a historical record of the subtleties of this annual event. Consequently, it is desirable to compare their results to ours to see what differences exist.
Derived from text
Mars Atmosphere; Ice Clouds; Water; Thermal Mapping; Thermal Emission; Astronomical Spectroscopy

20030111165 New Mexico Univ., Albuquerque, NM, USA
Trace Element Characteristics of Minerals in the Apollo 14 High-Al Basalts: Implications for an Igneous Versus an Impact Origin
Hagerty, J. J.; Shearer, C. K.; Papike, J. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous trace element and isotopic analyses of the Apollo 14 high-Al basalts, suggest that these samples represent the earliest stages of basaltic volcanism on the Moon and that they are not random samples from the lunar regolith. One of the primary goals of this work is to determine if these small, fragmented samples are the result of igneous or impact processes. The chemical information locked within the individual minerals will be used to define the characteristics and determine the potential mechanisms of early lunar volcanism. This paper reports the results from in-situ mineral analyses of the Apollo 14 high-Al basalts.
Derived from text
Minerals; Trace Elements; Apollo 14 Flight; Basalt; Aluminum; Lunar Surface; Volcanology

20030111166 Copenhagen Univ., Denmark
Early Thermal Evolution and Sizes of the HED and Mesosiderite Parent Bodies: New Constraints from Lu-Hf Chronology
Haack, H.; Bizzarro, M.; Baker, J. A.; Rosing, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The HEDs make up the largest suite of crustal igneous rocks available from asteroids. Silicate clasts in the mesosiderite metal-silicate breccias are also dominated by crustal rocks that resemble the HEDs in many ways. Silicate petrology in both groups of meteorites range from strikingly similar fine-grained basalts to coarse grained orthopyroxenites. Mesosiderites furthermore contain rare fragments of coarse-grained dunite. The crustal rocks on the mesosiderite parent body were at some point brecciated and mixed with molten metal. Existing chronological data and new Lu-Hf age data suggest that not only were the crustal rocks from these two parent bodies strikingly similar in terms of bulk chemistry, petrology and oxygen isotopes, they also both had an early igneous evolution (prior to the MPB metalsilicate mixing event) that prevailed for approximately 150 My. This would suggest that the two parent bodies were both of considerable size. The HED parent body is believed to be Vesta, which due to its large size has survived largely intact up to the present. If the mesosiderite parent body had a similar size what happened to it?
Author
Meteorite Parent Bodies; Lutetium; Hafnium; Siderites; Radioactive Decay; Chronology

20030111167 Geological Survey, Reston, VA, USA
Cryptic Metamorphic Effects in Chondrules from Highly Unequilibrated Ordinary Chondrites: An Insidious Parent-Body Process
Grossman, Jeffrey N.; Brearley, Adrian J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Herein, we report the results of further studies of the distribution and composition of chondrule mesostasis in LL chondrites with petrologic type =3.4. We show that albite-bearing mesostasis forms during the early stages of metamorphism, altering the primary record of pre-accretionary processes in all ordinary chondrites, including type-3.0 Semarkona. The silicarich glass found in type II chondrules is extraordinarily sensitive to metamorphic alteration, and, for related reasons, is far more difficult to analyze using electronbeam methods than many researchers have realized.
Author
Chondrites; Meteoritic Composition

20030111170 Museum of Natural History, London, UK
Carbon Reservoirs on Mars: Constraints from Martian Meteorites
Grady, Monica M.; Wright, I. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have started the programme with analyses of meteorites from the most numerous sub-group of martian samples, the shergottites. The past five years have seen a tripling of the number of martian meteorites recognized on Earth; by far the most rapid increase in numbers has been in the basaltic sub-group of shergottites. As of 31st December 2002, there were 14 individual shergottites, 10 of which are classified as basaltic. The increasing number of shergottites has also increased the number of ejection events from Mars' surface; dating of the shergottites indicates that lava flows with a range of crystallization ages (approx. 165 - 475 Myr) are being sampled. As well as constraining the isotopic composition of carbon reservoirs on Mars, a goal of the current research is to look at the abundance and isotopic composition of magmatic volatiles in martian

rocks, in order to obtain a picture of whither Mars' volatile inventory had evolved over the past 500 million years or so.
Derived from text
Mars Surface; Meteorites; Planetary Geology; Reservoirs; Carbon Isotopes

20030111171 Hawaii Univ., Honolulu, HI, USA
Spinels and Oxygen Fugacity in Olivine-Phyric and Lherzolitic Shergottites
Goodrich, C. A.; Herd, C. D. K.; Taylor, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Amongst martian meteorites correlations between La/Yb values and initial Sr and Nd isotopic compositions indicate the presence of long-term incompatible element-enriched and -depleted reservoirs, and suggest that martian magmatism is characterized by mixing between these reservoirs [1-4]. Recent work [5] has suggested that oxygen fugacity (fO2) is also correlated with these parameters, implying that the reservoirs are oxidized and reduced, respectively. Oxygen fugacity estimates have been based on coexisting Fe-Ti oxides (ulv spinel-ilmenite) for 5 basaltic shergottites and the groundmasses of olivinephyric [6] shergottites EETA79001 lithology A (EET-A) and Dhofar 019 [7,8]. Oxygen fugacity was also estimated for olivine-phyric shergottite DaG 476 using coexisting olivinepyroxene- chromite assemblages [5], which may reflect magmatic conditions more accurately than late-crystallizing Fe-Ti oxides. We extend this approach to olivine-phyric shergottites SaU 005, EET-A, Dhofar 019 and NWA 1110 (possibly paired with NWA 1068 [9,10]), and to lherzolitic shergottite ALHA77005.
Author
Shergottites; SNC Meteorites; Spinel

20030111172 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Selection of the Final Four Landing Sites for the Mars Exploration Rovers
Golombek, M.; Grant, J.; Parker, T.; Kass, D.; Crisp, J.; Squyres, S.; Carr, M.; Adler, M.; Zurek, R.; Haldermann, A., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Engineering constraints developed for the Mars Exploration Rovers (MER), their translation into ~185 potential landing sites and their downselection to 6 high priority science sites have been described [1, 2]. These 6 sites (Meridiani-previously referred to as Hematite, Gusev, Isidis, Melas, Eos, and Athabasca) were evaluated in detail as to their science potential and safety, relative to specific engineering constraints, at the 3rd MER Landing Site Workshop held March 26-28, 2002 in Pasadena, CA. This abstract describes: (1) the evaluation of these 6 sites, (2) the removal and reprioritization of sites following this workshop, (3) the identification of a low-wind site in Elysium, (4) the final 4 sites being considered for landing the 2 MER and (5) their evaluation at the 4th MER Landing Site Workshop held January 8-10, 2003 in Pasadena, CA [3].
Author
Mars Exploration; Landing Sites

20030111173 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Mars Express/NASA Project at JPL
Thompson, T. W.; Horttor, R. L.; Acton, C. H., Jr.; Arroyo, B.; Butman, S.; Jepsen, P. L.; Johnson, W. T. K.; Plaut, J. J.; Holmes, D. P.; Vaisnys, A.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

ESA's Mars Express Mission is an international collaboration between the European Space Agency (ESA) and the European space agencies with the National Aeronautics and Space Administration (NASA) as a junior partner. The primary objective of the mission is to conduct a search for potential hydrologic resources from orbit and on the surface of Mars. Launch will be from Baikonur, Kazakhstan in late May 2003; arrival at Mars will be in late December 2003.
Derived from text
Launching; Mars Missions; Mars Surface

20030111175 Tennessee Univ., Knoxville, TN, USA
Crystal Size Distribution Analysis of New Nakhlites and Los Angeles: How Do They Compare with SNCs of Old?
Lentz, R. C. F.; McSween, H. Y., Jr.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Crystal size distribution (CSD) analysis is a useful technique for quantifying textural information and linking petrographic texture to original crystallization conditions. In previous studies we have conducted CSD analyses of multiple thin sections of nakhlite meteorites, and several basaltic and mixed shergottites. Based on results of these analyses, we derived crystallization scenarios for some of these meteorites. With the addition of Los Angeles to the basaltic shergottite group and identification of two new nakhlites, new CSD analyses seem in order to test the validity of previous interpretations and perhaps to lend new insight into the crystallization histories and relationships within these meteorite groups.
Derived from text
Size Distribution; Crystals; Nakhlites

20030111176 Rutgers Univ., New Brunswick, NJ, USA
Exposure Histories of Seven Ordinary Chondrites with Helium-3 Losses
Ma, P.; Herzog, G. F.; Faestermann, T.; Knie, K.; Korschinek, G.; Rugel, G.; Wallner, A.; Schultz, L.; Johnson, J.; Jull, A. J. T., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many stony meteorites have lost both cosmogenic and radiogenic He. Some of the losses may have begun when collisions on m-sized meteoroids (rather than on parent bodies) launched fragments into Earth-crossing orbits that passed close to the Sun. Complex exposure histories would follow naturally in this picture. Among meteorites with He losses, complex histories appear to be fairly common for low cosmogenic (21)Ne contents (10(exp -8) cu cm STP/g), (21)Ne(sub c) <1, but rare for larger ones. The cosmogenic nuclide data needed to test for complex exposures are relatively scarce. To investigate further the possible link between complex exposures and helium losses, we have measured cosmogenic nuclides in seven ordinary chondrites with 0.53 < (21)Ne(sub c) <1.17, one of them -- Staelldalen - a fall.
Author
Chondrites; Radioactive Decay; Helium Isotopes; Meteoritic Composition; Space Weathering

20030111177 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Rock Size-Frequency Distributions at the Mars Exploration Rover Landing Sites: Impact Hazard and Accessibility
Golombek, M. P.; Matijevic, J. R.; DiMaggio, E. N.; Schroeder, R. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Viking and Mars Pathfinder landing sites and a wide variety of rocky locations on the Earth show size-frequency distributions that follow an exponential when expressed in cumulative fractional area covered by rocks of a given diameter or larger versus diameter plots. Mars lander rock distributions have been fit by an equation of the form: Fk(D) = k exp [-q(k) D], where Fk(D) is the cumulative fractional area covered by rocks of diameter D or larger, k is the total area covered by all rocks, and an exponential q(k) = 1.79 + 0.152/k, which governs how abruptly the area covered by rocks decreases with increasing diameter. These distributions form a family of noncrossing curves that flatten out at small rock diameter at a total rock abundance of 5-40%. Model rock size-frequency distributions indicate a low probability of impacting hazardous rocks during MER landing. Rocks large enough to analyze and abrade by the rover should be plentiful within an easy Sol's drive.
Derived from text
Frequency Distribution; Landing Sites; Rocks; Viking Mars Program; Size Distribution; Mathematical Models; Mars Roving Vehicles; Mars Exploration

20030111178 Harvard Univ., Cambridge, MA, USA
Cautionary Notes on Cosmogenic W-182 and Other Nuclei in Lunar Samples
Yin, Qingzhu; Jacobsen, Stein B.; Wasserburg, G. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Leya et al. (2000) showed that neutron capture on Ta-181 results in a production rate of Ta-182 (decays with a half-life of 114 days to W-182) sufficiently high to cause significant shifts in W-182 abundances considering the neutron fluences due to the cosmic ray cascade that were known to occur near the lunar surface. Leya et al. concluded that this cosmogenic production of W-182 may explain the large positive epsilon(sub W-182) values that Lee et al. (1997) had reported in some lunar samples rather than being produced from decay of now extinct Hf-182 (bar tau = 13 x 10(exp 6) yr). If the large range in epsilon(sub W-182) of lunar samples (0 to +11 in whole rock samples) was due to decay of now extinct Hf-182, it would require a very early time of formation and differentiation of the lunar crust-mantle system (with high Hf/W ratios) during the

earliest stages of Earth s accretion. This result was both surprising and difficult to understand. The ability to explain these results by a more plausible mechanism is therefore very attractive. In a recent report Lee et al. (2002) showed that there were excesses of W-182 and that epsilon(sub W-182) was correlated with the Ta/W ratios in the mineral phases of individual lunar rock samples. This is in accord with W-182 variations in lunar samples being produced by cosmic-ray induced neutron capture on Ta-182.
Derived from text
Cosmic Rays; Tungsten Isotopes; Nuclei (Nuclear Physics); Lunar Soil; Lunar Rocks; Hafnium Isotopes

20030111179 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Mn-Cr Isotope Systematics in the LL Type Ordinary Chondrite St. Severin
Glavin, D. P.; Lugmair, G. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mn-Cr analyses of several chondrites including Forest Vale, Dimmitt, Ste Marguerite and Richardton, have all shown reasonable agreement between the obtained Mn-Cr ages and the known Pb-Pb ages determined on phosphates. These studies imply that the best fit lines in the (53)Mn-(53)Cr evolution plots for these meteorites are isochrons rather than mixing lines and that the slope of the lines correspond to the Mn-Cr closure times for these ordinary chondrites. Furthermore, the fact that a correlation exists between the degree of metamorphism and the Mn-Cr closing times for H chondrites (H chondrites with lower petrographic grade have older Mn-Cr ages) is only explainable if the Mn-Cr ages date metamorphic events on the H chondrite parent body. In order to extend this work to include LL type ordinary chondrites we investigated the Mn-Cr isotope systematics of St. Severin (SS). There are two essential conditions we have considered for selecting meteorites for Mn-Cr analysis: (i) a reliable and accurate U-Pb age must be available for the meteorite and (ii) the U-Pb age must be > 4550 Ma, because Mn-Cr is a relative chronometer and for closure times younger than 4550 Ma, the Mn-Cr age cannot be determined since the short lived (53)Mn (half-life approx. 3.7 Ma) would have completely decayed. Gopel and co-workers have determined accurate Pb-Pb ages for six different L type chondrites and three LL chondrites. However, only one of these chondrites (St. Severin, LL6) fulfills condition (ii).
Author
Chondrites; Radioactive Decay; Geochronology; Manganese Isotopes; Chromium Isotopes; Meteoritic Composition

20030111180 Washington Univ., Seattle, WA, USA
'Normal' Fe-Mg-Al-Cr Spinel Minerals in Chondritic Stratospheric IDPs
Joswiak, D. J.; Brownlee, D. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spinel minerals with normal structure are common in extraterrestrial materials and can form via a large range of processes including nebular condensation, crystallization from liquid melts and sub-solidus metamorphic reactions. Owing to their ability to accept a large range of cations in their crystal structures these minerals can be regarded as useful petrogenetic indicators which largely reflect their parental sources. In carbonaceous chondrites, for instance, multicomponent spinels present in Type 2 chondrules crystallized from silicate melts (droplets) rich in Fe, Cr, Mg and Al whereas nearly pure MgAl2O4 spinels present in Type B CAIs formed in a nebular environment consistent with high temperature condensation of refractory minerals.
Derived from text
Meteoritic Composition; Spinel; Carbonaceous Chondrites; Extraterrestrial Matter; Melts (Crystal Growth); Metamorphism (Geology)

20030111181 National Taras Shevchenko Univ. of Kiev, Kiev, Ukraine
Kyiv Database of Lunar Occultations and Some Preliminary Results
Kazantseva, L. V.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since 1963 Astronomical Observatory of Kyiv National Taras Shevchenko University was the regional centre of occultation coordination. The collected results of observations of lunar occultations of stars and planets during 38 years are compiled in computer database. The base included more than 24 thousand of observation results of 580 observers from 77 sites on the territory of Ukraine, Russia, Georgia, Belorus , Moldova, Lithuania, Uzbekistan.. The access to the information can be

realised on a site of the Astronomical Observatory KU http://www.observ.univ.kiev.ua/ or to the e-mail address likaz@observ.univ.kiev.ua The assembled material is analyzed and compared to the similar data of the world bank. The statistical analysis of the data of preliminary reduction has revealed a whole series of remarkable periodicity in - . Some authors have analyzed observations of lunar occultations for long intervals of time and have pointed on periodicity in change of determined value - for distances between center of star and the Moon. Periodogram analysis of the results shows clear peaks on the certain frequencies in a range from 0 up to 0.2 cycles for lunation. Some significant peaks were identified by L.Morrison with the periods of change of arguments of used lunar ephemeris, periodic terms arising from the stellar reference frame. It was applied a method of the spectral analysis of time series to results of processing of the lunar occultations obtained by different authors and it was received frequency periodogram of change of the residuals. Various methods of reductions and analysis with the various input data (lunar ephemeris, star catalogue, charts of the marginal zone of the Moon) point to existence peaks near to frequencies 0.08 and 0.16 cycles for lunation. The question concerning occurrence of these periodicity (i.e. about sources of mistakes in processing lunar occultations, which arise with such frequency) remains open.
Author
Astronomical Catalogs; Astronomical Observatories; Statistical Analysis; Spectrum Analysis; Lunar Occultation

20030111183 Arizona Univ., Tucson, AZ, USA
2001 Mars Odyssey Gamma-Ray Spectrometer Science Data Products
Crombie, M. K.; Harshman, K. P.; McArthur, G. K.; Shinohara, C.; Boynton, W. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Odyssey Gamma-Ray Spectrometer (GRS) is a suite of three instruments working together to collect data that will permit the mapping of elemental concentrations on the surface of Mars. The gamma sensor head (GS), the neutron spectrometer (NS) and the high-energy neutron detector (HEND), are a complementary set of instruments in that the neutron instruments have better counting statistics and sample to a greater depth than the GS, but the GS determines the abundance of many more elements. The GRS collects a new spectrum approximately every 20 seconds, 360 times per orbit. Approximately 4200 spectra are expected to be received every day. Science and engineering data are downloaded from the spacecraft by the Jet Propulsion Laboratory (JPL) into the Telemetry Data System (TDS). The TDS sends data to a process that translates data packets and examines instrument health. Data are passed via a spooler to the University of Arizona (UA) database ingest process. The ingest process inputs raw data and the associated timing and spatial information into the UA database. The data are then processed through a number of programs that result in a calibrated data set. Raw data including the timing and spatial information are retrieved from the UA database to produce the GRS EDR data sets. Data processed through calibrations are retrieved from the UA database and are used to build intermediate science data products such as corrected gamma spectra (CGS) and special products.
Author
2001 Mars Odyssey; Gamma Ray Spectrometers; Instrument Packages; Data Systems; Data Processing; Calibrating

20030111184 Geological Survey, Reston, VA, USA
Lunar Meteorite Dhofar 026: A Shocked Granulitic Breccia, Not an Impact Melt
James, Odette B.; Cohen, Barbara A.; Taylor, Lawrence A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar meteorite Dhofar 026 was previously interpreted as an impact melt. Detailed studies of the rock and comparison to Apollo lunar samples 15418 and 60017 indicate that the rock instead is a shocked, partly melted, granulitic breccia. These studies are summarized.
Derived from text
Breccia; Impact Melts; Lunar Geology; Meteorites; Petrography; Granular Materials

20030111185 Arizona Univ., Tucson, AZ, USA
Trace Elements in High-Ca Pyroxene and Plagioclase in the Bilanga Diogenite: Implications for the Magmatic Evolution of Diogenites
Domanik, K. J.; Shearer, C. K.; Hagerty, J.; Kolar, S. E.; Drake, M. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-9435; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

High-Ca pyroxene and plagioclase are typically present as minor phases in diogenites. However, although the trace element content of diogenite orthopyroxene has been measured in a number of studies; almost no trace element data is available for the high-Ca pyroxene and plagioclase with which it routinely coexists in these meteorites. These data could provide insights into the nature and evolution of the melts from which diogenites crystallized in the HED parent body. In this study we have obtained initial measurements of several REEs in high-Ca pyroxene, plagioclase, and orthopyroxene in the Bilanga. Measurement of additional incompatible trace element concentrations in these phases is currently in progress.
Author
Meteorites; Trace Elements; Pyroxenes; Feldspars; Meteoritic Composition; Calcium

20030111186 Louisiana Univ., Monroe, LA, USA
Excavation Time for the Vedra and Maumee Channels (Mars) by Application of Equilibrium Sediment Transport Theory
DeHon, R. A.; Washington, P. A.; Thibodeaux, C. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The question of survival times of water on the surface of Mars has implications for the composition, thickness, and surface temperature of the martian atmosphere. Whether water was present for extremely brief periods or for geologically significant time spans may be determined in part by examination of the times necessary for sustained flow to empty reservoirs or to excavate channels. Previous estimates of the duration of the Maja Valles outflow system were poorly constrained by lack of accurate channel geometry. The acquisition of the MOLA data has provided the needed data to constrain the channel geometries sufficiently to determine the channel slope and cross-sectional geometry for several transects across the Maumee and Vedra trunk channels.
Derived from text
Excavation; Mars Surface; Sediment Transport; Transport Theory; Channel Flow; Equilibrium Flow

20030111187 Field Museum of Natural History, Chicago, IL, USA
High Precision Magnesium Isotopic Measurements of CAI Evaporation Residues
Janney, P. E.; Davis, A. M.; Wadhwa, M.; Mendybaev, R. A.; Richter, F. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Type B Ca-Al-rich inclusions have textures that have been interpreted as indicative of reheating to temperatures of about 1400 C, sufficient to produce a high degree of partial melting, and subsequent cooling at rates of the order of degrees per hour. They are often found to be enriched in the heavy isotopes of the moderately volatile elements silicon and magnesium, which also suggests a high temperature episode resulting in the partial evaporation of the more volatile components. This enrichment is typically interpreted as following the Rayleigh fractionation equation R/R(sub o)= f(sup (alpha 1)), where R is the isotopic ratio, initially R(sub o), is the fraction of the evaporating species remaining in the residue, and alpha is the kinetic gas-melt isotopic fractionation factor. Quantitative constraints on the duration of the high temperature event can be obtained given data for the evaporation kinetics and proportion of an element that has to be evaporated in order to produce a given amount of isotopic fractionation. Here we report new high precision magnesium isotope measurements on laboratory-produced evaporation residues of molten Type B CAI-like compositions to reexamine the relationship between the amount of magnesium removed by evaporation and the isotopic composition of the residue.
Derived from text
Evaporation; Residues; Magnesium Isotopes; Isotope Ratios; Aluminum; Inclusions; Calcium Oxides

20030111189 Observatoire de Midi-Pyrenees, Toulouse, France
Experimental Determination of the Hapke Shadowing Function Parameter for Planetary Regolith Surface Analogs
Cord, A. M.; Pinet, P. C.; Daydou, Y.; Chevrel, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The physics of the process that controls the interaction of light with planetary regolith surfaces is complex and only partially understood. In the past years, a number of semi-empirical models have been developed for analyzing the bidirectional reflectance data of particulate surfaces based on the scattering and absorption properties of minerals and rocks. In particular, using the radiative transfer equation describing the scattering of light from soils, Hapke developed an approximate analytical

solution, which is widely used for studying reflectance data from planetary surfaces. This model is generally difficult to handle because it requires the knowledge of six physical parameters, linked with multiple scattering, phase function, opposition effect, and roughness. This work presents a method for a determination of the global set of parameters involved in Hapke's model for planetary surface analogs when considering a set of angular conditions representative of the usual range from spaceborne observation in planetary exploration. We focus on the physical meaning of the shadowing function parameter (theta).
Derived from text
Bidirectional Reflectance; Planetary Surfaces; Surface Roughness; Regolith

20030111190 Chicago Univ., Chicago, IL, USA
Iron and Selenium Isotope Homogeneity in the Protosolar Nebula?
Dauphas, N.; Rouxel, O.; Davis, A. M.; Lewis, R. S.; Wadhwa, M.; Marty, B.; Reisberg, L.; Janney, P. E.; Zimmermann, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At a microscopic scale, the isotopic compositions of most elements are heterogeneous. Indeed, meteorites host circumstellar grains that survived the planetary scale isotope homogenization associated with collapse of the protosolar nebula. The composition of these grains is that of the stellar environment where they formed and the isotopic variations often must be displayed with logarithmic scales. At the other extreme, at a planetary scale, a few elements still display some heterogeneity limited to at most a few permil. As the precision in isotope determinations increases, an increasing number of elements provide evidence for such heterogeneity. Identification of isotope anomalies may help identify new presolar phases, allow better understanding of nebular processes such as gas dust decoupling and granular sorting, and help to trace genetic relationships between solar system objects. Leaching experiments in primitive meteorites have proven to be very useful for revealing nucleosynthetic anomalies. The isotopic composition of molybdenum was measured recently in leachates of carbonaceous chondrites. A dichotomy was observed between s and pr nuclides. This dichotomy probably results from the presence of a presolar phase bearing an s-process signature because p and r anomalies are not decoupled. In the present contribution, we pursue this work and report the determination of selenium and iron isotope abundances in these leaching experiments.
Derived from text
Homogeneity; Iron Isotopes; Solar Nebula; Selenium Isotopes; Isotopic Labeling

20030111191 Arizona State Univ., Tempe, AZ, USA
Oxygen Isotopic Compostion of Ca-Fe-rich Silicates in and Around an Allende Ca-Al-rich Inclusion
Cosarinsky, M.; Leshin, L. A.; MacPherson, G. J.; Krot, A. N.; Guan, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most components of CV chondrites show variable degrees of late-stage alteration resulting in the modification of preexisting mineral assemblages and/or in the formation of new minerals. The conditions and environment under which these processes occurred are highly debated, with arguments in favor of solar nebular as well as asteroidal settings. In the particular case of calcium-aluminum-rich inclusions (CAIs) these processes are typically evidenced by an Fe-alkali-halogen metasomatism, resulting in the formation of anorthite, nepheline, sodalite, grossular, wollastonite, diopside-hedenbergite-series pyroxene, andradite, and kirschsteinite. Similar mineral assemblages are also found in the matrices of these chondrites and in and around Allende dark inclusions. Detailed analysis and comparison of these late stage alteration phases in two different petrographic settings might offer better constraints on the formation conditions and environment. Therefore, we studied and compared the texture, mineralogy and chemical and oxygen isotopic composition of Ca-Fe-rich assemblages both in CAIs and the matrix of Allende, a member of the oxidized CV group in which these assemblages are very abundant.
Derived from text
Inclusions; Calcium; Aluminum; Chondrites; Oxygen Isotopes; Silicates; Chemical Composition; Allende Meteorite; Iron

20030111192 Washington Univ., Saint Louis, MO, USA
Scientific Expectations from a Sample of Regolith and Rock Fragments from the Interior of the Lunar South Pole-Aitken Basin
Jolliff, B. L.; Haskin, L. A.; Korotev, R. L.; Papike, J. J.; Shearer, C. K.; Cohen, B. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this abstract we discuss approaches and measurements to be made on returned samples to address these objectives.

Over thirty years of experience exist for the analysis of lunar materials; in some cases, however, new equipment now permits analyses that were not possible during much of that time. Noteworthy are capabilities for microanalysis that have been and continue to be developed for the investigation of small planetary samples and cosmic dust [e.g., 4 and refs therein]. Much can be done with small rock samples that was not possible or routine until recently, such as in-situ micro-isotopic and geochemical analyses using new/improved methods such as SIMS, LA-ICPMS, MC-ICPMS, SXRF, PIXE, and others [see 4]. Furthermore, much of what can now be done has not been done extensively with existing small rock fragments from the lunar regolith because of the availability of the large Apollo rock samples. Well-established analytical approaches have nevertheless been used effectively for many years on small lunar rock fragments (e.g., SIMS, EMP, INAA, XRF, SEM, TEM), and those results are just as pertinent to samples from an SPA-SR.
Derived from text
Lunar Rocks; Regolith; Microanalysis

20030111193 Oberlin Coll., OH, USA
Cobalt and Nickel Partitioning into Planetary Olivine
Dwarzski, R. E.; Herd, C. D. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Secondary Ion Mass Spectrometry (SIMS) has enabled trace analysis of transition-series elements in olivine in martian, terrestrial and lunar basalts. Two of the elements of interest are Ni and Co, which partition differently into planetary olivine, despite being present as divalent cations and having similar effective ionic radii in octahedral coordination. The partitioning of a trace element into a mineral (expressed as its D value) varies with temperature, pressure, oxygen fugacity, and melt composition; all of these are variables which change depending on planetary setting. Herd et al. compared Co, Ni, and Mn concentrations in lunar, martian, and terrestrial basaltic olivine. They noted differences in the behavior of Co in olivine between the planetary suites, specifically, that in martian olivine, Co increases as Ni decreases (tracking crystallization), in spite of its compatibility in olivine. The apparent incompatibility of Co was attributed to differences in the rate of change of D(sub Co) during igneous evolution, similar to the explanation for the behavior of Co in Apollo 12 olivine. Herd et al. postulated that the rate of change of D(sub Co) depends on oxygen fugacity, which would explain the difference between Co partitioning in martian and lunar olivine. Accordingly, we have carried out experiments with the goal of examining the effects of oxygen fugacity, temperature and melt composition on the partitioning of Co and Ni in olivine, in order to better understand the behavior of these elements in planetary basalts.
Derived from text
Cobalt; Nickel; Olivine; Planetary Mass; Trace Elements

20030111194 Paris-Sud Univ., Orsay, France
Chasma Boreale: The Role of Supra-Glacial Erosion
Costard, F.; Dupeyrat, L.; Peulvast, J. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chasma Boreale is a large reentrant in the north polar cap 520 km in length, 200 km in width and an average depth of 1300 m. The permanent ice cap represents a thick sequence of thin alternating bright deposits made of water ice layers and a mixture of low albedo dust or sands with frozen volatiles (mainly water). Various mechanisms have been proposed for the origins of Chasma Boreale. Wallace and Sagan suggested a catastrophic outflow fed by an ice-covered lake disrupted by an impact. Clifford proposed a jokulhlaup triggered by basal melting in association with a thermal anomaly. Benito et al. suggested a catastrophic outflow of meltwater induced by a tectonothermal event. An another hypothesis suggested by Howard proposed an erosional process involving a sublimation of the icy deposits by katabatic winds. More recently, Fishbaugh and Head proposed a catastrophic discharge of a subglacial volume of meltwater at the base of a polar ice sheet, with later modification by katabatic winds and sublimation. From the outflow hypothesis, after a subglacial eruption, with a supra glacial erosion in the distal parts of Chasma Boreale. In Iceland, it is common to observed deep depressions created by collapse just above subglacial lakes. After a subglacial phase, basal water bursts out on the glacier surface as a flood wave and spreads over the outwash plain. Various measurements of the lake temperature in Iceland vary from 1 C to 4 C. Supraglacial streams in terrestrial polar regions are powerful rivers characterized by a melting enlargement of the flood. Meltwater accumulated in the subglacial lake is then drained in a catastrophic jokulhlaup. Thermal and mechanical erosion are relatively active and contribute to the enlargement of the supra glacial stream.
Author
Mars Surface; Glaciers; Erosion; Melting; Water; Land Ice

20030111195 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Sensor Web in Antarctica: Developing an Intelligent, Autonomous Platform for Locating Biological Flourishes in Cryogenic Environments

Delin, K. A.; Harvey, R. P.; Chabot, N. A.; Jackson, S. P.; Adams, Mike; Johnson, D. W.; Britton, J. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

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The most rigorous tests of the ability to detect extant life will occur where biotic activity is limited by severe environmental conditions. Cryogenic environments are among the most severe-the energy and nutrients needed for biological activity are in short supply while the climate itself is actively destructive to biological mechanisms. In such settings biological activity is often limited to brief flourishes, occurring only when and where conditions are at their most favorable. The closer that typical regional conditions approach conditions that are actively hostile , the more widely distributed biological blooms will be in both time and space. On a spatial dimension of a few meters or a time dimension of a few days, biological activity becomes much more difficult to detect. One way to overcome this difficulty is to establish a Sensor Web that can monitor microclimates over appropriate scales of time and distance, allowing a continuous virtual presence for instant recognition of favorable conditions. A more sophisticated Sensor Web, incorporating metabolic sensors, can effectively meet the challenge to be in 'the right place in the right time'. This is particularly of value in planetary surface missions, where limited mobility and mission timelines require extremely efficient sample and data acquisition. Sensor Webs can be an effective way to fill the gap between broad scale orbital data collection and fine-scale surface lander science. We are in the process of developing an intelligent, distributed and autonomous Sensor Web that will allow us to monitor microclimate under severe cryogenic conditions, approaching those extant on the surface of Mars. Ultimately this Sensor Web will include the ability to detect and/or establish limits on extant microbiological activity through incorporation of novel metabolic gas sensors. Here we report the results of our first deployment of a Sensor Web prototype in a previously unexplored high altitude East Antarctic Plateau 'micro-oasis' at the MacAlpine Hills, Law Glacier, Antarctica.

Derived from text

Antarctic Regions; Autonomy; Cryogenics; Sensors; Microclimatology; Valleys; Activity (Biology)

20030111196 Tokyo Univ., Japan

Crystallization Experiments of Dar Al Gani Martian Meteorites: A Preliminary Report

Koizumi, E.; Mikouchi, T.; Monkawa, A.; Miyamoto, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recently, a lot of basaltic shergot-tites have been found from the desert areas in northern Africa and Middle East Asia. Most of them contain large olivine grains that are not present in the previ-ously known basaltic shergottites (except for EETA79001). These olivine grains are mostly Mg-rich, but they show different mineralogical features in each meteorite. Dar al Gani 476 and its paired samples are mainly composed of olivine, pyroxene and plagioclase (now transformed into 'maskelynite'). Olivine is pre-sent as a megacryst, and its core is too Mg-poor to be in equilibrium with its bulk composition. Pyroxene in Dar al Ganis are more Mg-rich than those of the other basaltic shergottites, and rather similar to those in lher-zolitic shergottites. Therefore, Dar al Ganis are believed to offer significant information on the rela-tionship between lherzolitic shergottites and basaltic shergottites or other martian meteorites. Oxygen fuga-city under which Dar al Gani crystallized was estimated about QFM-2.3. In this abstract, we present the initial results of our ongoing crystallization ex-periments on the bulk composition of Dar al Gani shergottites to advance understanding of the formation of these meteorites.

Derived from text

Crystallization; Mars (Planet); SNC Meteorites; Grain Size

20030111197 National Air and Space Museum, Washington, DC, USA

Characteristics of Martian Valley Networks and the Implications for Past Climates

Craddock, Robert A.; Irwin, Rossman P., III; Howard, Alan D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Martian valley networks indicate that at least geologic conditions were different in the past, if not the climate. It is commonly believed that valley networks must be the result of groundwater sapping because their apparent drainage densities are lower than terrestrial runoff channels. It has also been suggested that valley networks are not uniformly distributed on

topography, which would also argue in favor of groundwater sapping. When coupled to the belief that early Mars was cold and dry such observations have led many investigators to suggest that valley networks were fed by geothermal heating of ground ice. Unfortunately, however, plotting the densities of valley networks strictly from imagery data is easily influenced by observational bias and interpretation. To test some of the hypotheses derived from Viking era data, we have used MOLA topographic data and MOC and THEMIS imagery data to reevaluate valley network drainage densities and their related characteristics.
Derived from text
Climate; Mars (Planet); Topography; Valleys; Mars Surface; Planetary Geology; Imaging Techniques

20030111198 Mount Holyoke Coll., South Hadley, MA, USA
Moessbauer Spectroscopy of Mineral Separates from SNC Meteorites
Dyar, M. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-10424; NAG5-12687; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Numerous workers have recently focused attention on the issue of the oxygen fugacity (f(sub O2)) of martian samples. Estimates of fO2 based on Fe-Ti oxides and D(sub Eu)/D(sub Gd) and D(sub Eu)/D(sub Sm) ratios suggest a range of fO2 values for SNC meteorites from IW+2.5 - IW+3.5 for Shergotty to IW- 2.0 - IW+0.2 for QUE94201. Fe(3+)/Fe(2+) is also a function of f(sub O2), and synchrotron micro-XANES values for olivine, pyroxene, and feldspar Fe(3+) have been reported. However, the relationship between the reported Fe(3+) values and the other methods for estimating f(sub O2) is not clear, and further measurements of Fe(3+)/Fe(2+) by a more conventional technique have been needed. Accordingly, in this project, new Mossbauer spectroscopy data on mineral separates handpicked from 10 SNC meteorites are reported.
Derived from text
Minerals; SNC Meteorites; Mossbauer Effect; Spectroscopy; Mars Surface Samples

20030111199 Arizona Univ., Tucson, AZ, USA
Geomorphology of Debris Aprons in the Eastern Hellas Region of Mars
Crown, David A.; McElfresh, Sarah B. Z.; Pierce, Timothy L.; Mest, Scott C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The highlands of Promethei Terra east of the Hellas Basin are distinguished by a concentration of lobate debris aprons found in association with highland massifs, impact craters, and canyon walls. Recent MGS analyses of their surface morphology and topographic characteristics suggest that the eastern Hellas aprons are ice-rich flow features with complicated emplacement histories and surface degradation by loss of contained ice. Current work combines analyses of MOC, THEMIS, and MOLA data to further characterize the morphology, morphometry, and distribution of debris aprons, in order to provide constraints for models of apron formation and to assess styles of highland degradation.
Author
Geomorphology; Mars Surface; Debris; Structural Basins; Topography

20030111201 Oulu Univ., Finland
The Arched Graben of Venusian Corona-Novae
Kostama, V.-P.; Aittola, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Coronae and novae are two types of Venusian volcano-tectonic structures. Half of the Venusian novae are located within coronae. In general, the novae have been interpreted to represent the initial stage of the corona evolution and therefore are hypothesized to predate the corona rim structure. However, the recent studies show that the majority of the novae, which are located in the inner part of the coronae, seem to postdate the corona formation. The corona structures with nova inside them have been called as corona-novae. As the nova formation usually postdates the coronae annulus, the most recent phases of activity of corona-nova joint structures are in these cases the nova related features, i.e. the radial structures and the lava flows produced by the nova. However, there are some examples where very young arcuate graben are seen adjoining the structures. These arch-like systems are located on the flanks of the structures and they seem to bend away from the nova center. This is in contrast to the fractures of the annulae. Therefore they probably are of different origin. The studies of the volcano flanks

of Earth have shown that horseshoe-shaped scarps are formed after the eruption, which indicate the occurrence of failure of the scoria cone. The concentric fractures and backward tilted blocks are typical of rotational slides and slumps. It is also possible to have a lateral spreading of the cone resulting in fracturing of coherent material due to plastic flow of subsequent material. We have found evidence of the arcuate graben in at least four of the corona-novae of which one is analyzed in this paper.
Derived from text
Coronas; Geological Faults; Novae; Venus (Planet); Volcanoes; Planetary Geology

20030111202 Georgia Inst. of Tech., Atlanta, GA, USA
The Petrography of Meteoritic Nano-Diamonds
Dai, Z. R.; Bradley, J. P.; Brownlee, D. E.; Joswiak, D. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
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At least some meteoritic nanodiamonds are likely of presolar origin because of their association with anomalous Xe-HL and Te isotopic components indicative of a supernova (SN) origin. But the abundance of Xe is such that only approx. 1 in 10(exp 6) nano-diamonds contains a Xe atom, and the bulk C-13/C-12 composition of nano-diamond acid residues is chondritic (solar). Therefore, it is possible that a significant fraction of meteoritic nano-diamonds formed within the solar nebula. Nano-diamonds have recently been detected for the first time within the accretion discs of young stars by the Infrared Space Observatory (ISO). No comparable evidence of nanodiamonds in the interstellar medium has yet been found. We have identified nano-diamonds in acid etched thin-sections of meteorites, polar micrometeorites, and interplanetary dust particles (IDPs) with the goal of determining their distribution as a function of heliocentric distance. (It is assumed the meteorites and the polar micrometeorites are from asteroids at 2-4 AU and at least some of the IDPs are from comets at >50AU). We found that nano-diamonds are heterogeneously distributed throughout carbon-rich meteoritic materials (we identified them in some IDPs and not in others), and that their abundance may actually decrease with heliocentric distance, consistent with the hypothesis that some of them formed within the inner solar system and not in a presolar (SN) environment. In order to gain further insight about the origins of meteoritic nano-diamonds we are currently investigating their distribution in unetched thin-sections. We have examined a chondritic cluster IDP (U220GCA), fragments of the Tagish Lake (CM1) meteorite, and a SN graphite spherule (KE3d8) isolated from the Murchison (CM) meteorite. We selected U220GCA because its nano-diamond abundance (in acid etched thin-sections) appears to be as much as approx. 10X higher than in Murchison matrix, Tagish Lake because it has a higher reported nano-diamond abundance than other carbonaceous chondrites (approx. 3650-4330 ppm), and KE3d8 because it is a carbon spherule with an isotopic composition suggesting that it is a bone fide presolar SN grain.
Author
Petrography; Meteoritic Diamonds; Meteoritic Composition; Meteoritic Microstructures; Chondrites; Murchison Meteorite

20030111204 Oulu Univ., Finland
Morphology of the Northern Plains in the Circumpolar Region, Mars
Kostama, V.-P.; Kreslavsky, M. A.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The complex of polar deposits (the polar cap, its icy outliers and dune fields) at the North pole of Mars is surrounded by vast generally flat geologically homogeneous plains. These plains at high latitudes (greater than approximately 55 degrees) are covered with a thin geologically young material with specific decameter-scale surface texture containing much water ice. We refer this material as the high-latitude layer (HLL). High resolution MGS MOC images showed many circular features interpreted to be mantled craters. Our objective is to access geological processes that occurred in the region during the Amazonian, and the relative and absolute time scales of these processes, including those related to the origin of the shallow subsurface ice. To approach this goal, we studied the size-frequency distributions of circular features of different morphology, as well as peculiarities of the surface texture. We are carrying out a systematic survey of the high-resolution MOC images in the region. This work is in progress; here we report some preliminary observations.
Derived from text
Mars Surface; Planetary Geology; Polar Regions; Plains; Geomorphology

20030111205 Tokyo Univ., Tokyo, Japan

N-Body Simulation of the Uranian Eccentric Rings

Daisaka, H.; Makino, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the most striking features of the Uranian ring system is that some of rings, at least 6, 5, 4, alpha, beta, epsilon-rings, are eccentric. The existence of the eccentric rings is truly surprising, because it requires the pericenter of ring particles with different orbital periods to behave in exactly the same way under dispersive effects such as quadrapole moment of Uranus, which precesses the longitude of the pericenter of a ring particle, omega, depending on its semimajor axis, a. We studied the evolution of a ring satellite system in which a narrow ring is confined by two shepherding satellites orbiting around an oblate central planet, by performing direct N-body simulations. This is a setting similar to Kozai's model, but we have not made any assumption on the eccentricity of shepherding satellites. In our model, the orbits of satellites evolve through interaction with the ring and the other satellite. In our simulations, gravitational interaction and physical (inelastic) collision between ring particles are taken into account. For calculation of the gravitational interactions, we used GRAPE-6, which allow us to do simulations for a long time with a large number of particles.

Derived from text

Uranus Rings; Many Body Problem; Gravitational Effects; Eccentricity; Uranus Satellites

20030111208 Proxemy Research, Inc., Laytonsville, MD, USA

Rheology Comparisons for Several Martian and Terrestrial Lava Flows

Glaze, L. S.; Baloga, S. M.; Stofan, E. R.; Mouginis-Mark, P. J.; Shockey, K. M.; McColley, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars Orbiter Laser Altimeter (MOLA) data provide a level of detail equivalent to that available for unobserved lava flows on Earth. For lava flows on Mars, we have used MOLA data to derive longitudinal thickness profiles and underlying slope information. Here we report on a study to compare lava flows in different volcanic provinces and settings on Mars. We present some examples of the types of analyses and comparisons that can be done for typical flows at Ascraeus, Alba, Pavonis, Elysium, and Mauna Loa. These flows span a range of lengths, underlying slopes and rheologies. Some flows show channels and others do not. Through this comparative study, we are looking for correlations e.g., between underlying slope and rheologic changes, and systematic differences among volcanic provinces. Identification of such correlations enable us to isolate and refine models of lava flow emplacement.

Author

Rheology; Mars Volcanoes; Lava; Volcanic Eruptions

20030111209 Chicago Univ., Chicago, IL, USA

Microanalysis of Niobium in Iron Meteorites

Humayun, M.; Campbell, A. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Niobium and tantalum are generally regarded to be lithophile incompatible elements occurring in chondritic relative proportions in planetary materials [1]. Precise Nb/Ta data have indicated that Nb may be depleted in the Earth s mantle [2, 3] which may be evidence for sequestering in an eclogite reservoir [2], or for its removal into the core [3, 4]. Metalsilicate partitioning experiments have indicated that Nb, but not Ta, may behave in a weakly siderophile manner, and predict abundances of 15-50 ppb in iron meteorites [4]. Bulk analysis of iron meteorites by spark source mass spectrometry reported Nb abundances of 7-40 ppb correlated with V and Cr abundances [5], apparently consistent with the predictions above. We report the results of a microanalytical investigation of V, Cr, Nb, Zr, Hf and Ta abundances in metal, troilite, schreibersite and cohenite from iron meteorites using laser ablation ICP-MS. The elements above (with the exception of Cr) were found to be below detection limits in metal, phosphide and carbide phases, but V, Cr and Nb were found to be present in troilite, particularly from IAB irons.

Author

Iron Meteorites; Niobium; Microanalysis

20030111210 State Univ. of New York, Stony Brook, NY, USA

Hydrothermal Alteration of the Martian Crust: An Experimental Approach

Hurowitz, J. A.; McLennan, S. M.; Lindsley, D. H.; Schoonen, M. A. A.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The results presented herein represent the first in a series of experiments aimed at assessing the role that hydrothermal systems might play as a source of secondary minerals at the Martian surface. Utilizing the flow through reactor described in Tosca et al. [22], two successful experiments have recently been completed. In addition, four batch-type experiments will be initiated shortly. These experiments simulate the low temperature (epithermal) alteration of a synthetic Martian basalt by an acidic sulfate-chloride type fluid; an analog to the near surface environment peripheral to a hydrothermal system.

Derived from text

Hydrothermal Systems; Mars Surface; Minerals

20030111211 NASA Ames Research Center, Moffett Field, CA, USA

Spectral Properties of Hydrated Salts at Low Temperature: Implications for Europa Mission Spectrometer Design

Dalton, J. Brad; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowledge of the surface composition of Europa is critical for modeling of surface and interior processes and especially for evaluation of astrobiological potential. While much information has been derived from the Galileo Near-Infrared Mapping Spectrometer (NIMS) investigation, some breakthroughs have created more questions than answers. Any future Europa mission will attempt to capitalize on lessons learned from NIMS and try to answer these questions. At present, the surface composition appears to be a mixture of water ice, hydrated salts, sulfur compounds, radiolysis products (such as hydrogen peroxide and possibly simple organics like formaldehyde) and some as yet unidentified component. The small spatial scale of heterogeneity in Europa's surface geology poses additional challenges for orbiting spectrometers due to spectral mixing effects.

Author

Mission Planning; Europa; Hydrates; Salts; Spectrometers; Spectral Signatures

20030111212 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Pulse of the Volcano: Discovery of Episodic Activity at Prometheus on Io

Davies, A. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

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The temporal behaviour of thermal output from a volcano yields valuable clues to the processes taking place at and beneath the surface. Galileo Near Infrared Mapping Spectrometer (NIMS) data show that the ionian volcanoes Prometheus and Amirani have significant thermal emission in excess of nonvolcanic background emission in every geometrically appropriate NIMS observation. The 5 micron brightness of these volcanoes shows considerable variation from orbit to orbit. Prometheus in particular exhibits an episodicity that yields valuable constraints to the mechanisms of magma supply and eruption. This work is part of an on-going study to chart and quantify the thermal emission of Io's volcanoes, determine mass eruption rates, and note eruption style.

Derived from text

Io; Prometheus; Volcanoes; Planetary Geology; Planetary Mapping

20030111213 Arizona State Univ., Tempe, AZ, USA

Oxygen Isotopes in Refractory Inclusions from the Adelaide Carbonaceous Chondrite

Huss, G. R.; Hutcheon, I. D.; Krot, A. N.; Tachibana, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Adelaide is an anomalous carbonaceous chondrite with a CV-like bulk O composition abundant small chondrules, and an anhydrous low-FeO matrix [1,2]. Its bulk composition, which is highly depleted in volatiles [3], and the H, N, and C isotopic compositions and abundances [4] suggest that its nearest relatives are Bench Crater and Kakangari [5]. Refractory inclusions

comprise several percent of Adelaide and include melilite-rich CAIs, often containing spinel and hibonite, hibonite-rich CAIs, sometimes containing corundum, grossite-rich CAIs, and anorthite-spinel inclusions, among other types. The mineralogy and Al-Mg isotopic data [2, unpublished] indicate that Adelaide CAIs were largely unaffected by the metasomatism that altered CAIs in CV and CO chondrites, the aqueous alteration that was pervasive in CM chondrites, or thermal metamorphism. Adelaide CAIs may thus be among the best preserved CAIs available for study. As part of a broader study of refractory objects in Adelaide, we have made O-isotope measurements on 12 objects.
Author
Chondrites; Meteoritic Composition

20030111214 NASA Johnson Space Center, Houston, TX, USA
Nanophase Iron Globules in Lunar Soil
James, C. L.; Letsinger, S. L.; Wentworth, S. J.; McKay, D. S.; Basu, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-9396; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Micrometeoritic impacts on lunar soils produce melt and vapor. A patina of condensed vapor is deposited on lunar grains, the melt forms agglutinitic glass. In lunar soils, agglutinitic glass and rinds of grains host submicron-sized globules of pure Fe0 (Fe-rich globules larger than 1 micron usually contain other elements such as Ni, P, and S). Observation and measurement of such small size requires either back scattered electron (BSE) imaging with a high-resolution SEM or transmitted electron imaging with a TEM. The two techniques impose different limitations on the size-range of measurements. Resolution of BSE imaging of polished thin sections or grain mounts of lunar soils is at best around 4-5nm (JEOL 6340F field-emission (FE)-SEM at JSC). Therefore, Fe0 globules below 10nm in cross-sectional diameter are not truly measured. The upper limit of a millimeter or so is not a hindrance. In fact, it is an advantage because whole grains can be observed and mapped at varying magnifications. Angstrom-scale resolution of TEM images is more than sufficient to observe and measure the smallest of Fe0 globules that are about 1nm in cross-section. Microtoming edges of lunar grains; however, puts an upper size limitation of 50nm, at best, on the wafer, which more or less limits measuring Fe0 globules up to 30nm or so. Clearly, SEM and TEM techniques complement each other in obtaining the complete range of size distribution of Fe0 globules in lunar soils. Below we describe, in brief, our method of determining the size distribution of Fe0 globules in agglutinitic glass using BSE-SEM imaging and size measurement. Although our work is incomplete, we also include a table of results obtained so far, which understandably would be refined as we collect more data.
Author
Iron; Globules; Lunar Soil; Size Distribution

20030111216 NASA Johnson Space Center, Houston, TX, USA
A Liquidus Geothermometer for SNC, Lunar, and Eucritic Magmas
Jones, J. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two very useful pieces of information about a basalt are its liquidus temperature and liquid line of descent. To determine these, experiments are performed at various temperatures on the composition of interest between the solidus and liquidus. There are numerous examples of such experiments in the literature.
Author
Liquidus; Geotemperature; SNC Meteorites; Solidus; Basalt; Temperature Measurement; Magma; Lunar Rocks

20030111217 Louisiana State Univ., Baton Rouge, LA, USA
Petrology and Geochemistry of 3.3 Ga Komatites Weltevreden Formation, Barberton Greenstone Belt
Kareem, K. M.; Byerly, G. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Komatites provide several ways of assessing the chemical and thermal evolution of the mantle. Komatitic liquids are produced from very high degrees of partial melting of the deep mantle, and erupted as extremely fluid lavas. Komatites are important in the study of the early Earth because they are a significant constituent of the Archean crust. It has been proposed that komatiitic liquids are also an important component of volcanism on Io. On Earth they are found almost entirely within

the first two billion years of the geologic record -- the Archean. In this study we present petrographic and geochemical data on an unusually fresh sequence of these rocks, as well as a predicted fractional crystallization model which accounts for several critical observed traits of these flows.
Derived from text
Petrology; Geochemistry; Chemical Evolution; Igneous Rocks

20030111218 Washington Univ., Saint Louis, MO, USA
New Data Reveal Mature, Integrated Drainage Systems on Mars Indicative of Past Precipitation
Hynek, B. M.; Phillips, R. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Valley network systems on Mars remain the most unequivocal evidence that water carved the surface of the planet in the distant past and the climate was different than today. Most of these systems date from the Noachian [1], the period of heavy bombardment which is >3.7 Ga [2], although local or regional formation seems to have continued to more recent times [3]. The discovery of valley networks sparked a long-lived debate over the amount and importance of water at or near the martian surface. Both surface runoff and groundwater processes have been attributed to formation of valley networks but the relative importance of each is still unclear. In this study we analyzed recent Mars Global Surveyor (MGS) data in and around the Arabia Terra region with new techniques and found far more valley networks and mature drainage systems than previously observed. Certainly, both groundwater and surface runoff sculpted the martian landscape, however, our findings argue for a substantial contribution of surface runoff, implying past precipitation.
Author
Mars Surface; Water Runoff

20030111219 National Inst. of Polar Research, Tokyo, Japan
Igneous Petrogenesis of Yamato Nakhlites
Imae, N.; Ikeda, Y.; Kojima, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: We have carried out detailed petrographical-mineralogical description of three Yamato nakhlites (Y000593, Y000749 and Y000802). These three are paired. We clarified chemical compositional differences between the Yamato nakhlites and other nakhlites, and subclassified the Yamato nakhlites as an intermediate type between NWA817 and others (Nakhla, Governador Valadares and Lafayette) based on the compositional variation of pyroxenes and olivines [1]. In the present study, we summarize analytical results of the Yamato nakhlites obtained by electron probe microanalyzer, and discuss the petrogenesis of nakhlites using the bulk chemical composition of magmatic inclusions in olivine phenocrysts and mesostasis. We have carried out detailed petrographical-mineralogical description of three Yamato nakhlites (Y000593, Y000749 and Y000802). These three are paired. We clarified chemical compositional differences between the Yamato nakhlites and other nakhlites, and subclassified the Yamato nakhlites as an intermediate type between NWA817 and others (Nakhla, Governador Valadares and Lafayette) based on the compositional variation of pyroxenes and olivines [1]. In the present study, we summarize analytical results of the Yamato nakhlites obtained by electron probe microanalyzer, and discuss the peterogenesis of nakhlites using the bulk chemical composition of magmatic inclusions in olivine phenocrysts and mesostasis.
Author
Nakhlites; Petrogenesis

20030111220 Rensselaer Polytechnic Inst., Troy, NY, USA
Gravity Transect Profile and PDF/PF Comparisons from the Bee Bluff Structure
Jurena, D. J.; French, B. M.; Gaffey, M. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Bee Bluff structure is a 2.5 kilometer circular feature in the Gulf coastal plain sediments in south Texas. Possibilities of an impact origin were raised by the presence of anomalous faults and folds and the presence of quartz grains displaying PDFs. An objection to this explanation is the presence of quartz grains displaying PDFs far removed from the structure s location in the same rock formations as those found at the Bee Bluff structure. Possible explanations for this discrepancy include a non-impact origin for the Bee Bluff structure, with the grains being imported in from another impact structure, or that the structure is larger and this may account for the wide distribution of shocked quartz. One way to test for the presence

of a larger eroded structure would be a gravity transect across the feature. In addition, we also reexamined the planar features that were measured from the structure and in the same formations outside of the structure.
Derived from text
Sediments; Quartz; Rocks

20030111222 Arkansas Univ., Fayetteville, AR, USA
The Importance of Solar Wind in the Production of 'Space Weathering' Features on the Moon and on Asteroids
Kareev, M. S.; Sears, D. W. G.; Benoit, P. H.; Atabaev, B. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

'Space weathering' has been invoked to explain apparent mismatch between spectra of meteorites and asteroids. Space weathering is the alteration of the surface of small bodies with time, and it results in changes of the depth of absorption bands in the optical spectra. This process potentially masks the composition of the asteroid that can be determined by reflectance spectroscopy. Various mechanisms have been suggested for space weathering, that appears as the reddening and darkening of the spectra, the most popular involving the formation of iron nanoparticles (npFe0) by the evaporation of minerals during micrometeorite impact and condensation of iron. Here, we discuss the role of radiation, especially the solar wind, on this proposed space weathering process.
Derived from text
Space Weathering; Meteorite Collisions; Radiation Effects; Solar Wind; Stellar Evolution

20030111223 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Electrospray Ionization/Ion Mobility Spectrometer/Cylindrical Ion Trap Mass Spectrometer System for In-Situ Detection of Organic Compounds
Kanik, I.; Johnson, P. V.; Beegle, L. W.; Cooks, R. G.; Laughlin, B. C.; Hill, H. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The potential of an Electrospray Ionization/Ion Mobility Spectrometer/Cylindrical Ion Trap Mass Spectrometer (ESI/IMS/CIT-MS) as an analytical instrument for analyzing material extracted from rock and soil samples as part of a suite of instruments on the proposed 2009 Mars Science Lander (MSL) will be demonstrated. This instrument will be able to identify volatile compounds as well as resident organic molecules on the parts-per-billion (ppb) level. Also, it will be able to obtain an inventory of chemical species on the surface of Mars which will result in a better understanding of ongoing surface chemistry. Finally, questions relevant to biological processes will be answered with the complete inventory of surface and near surface organic molecules that the ESI/IMS/CIT is capable of performing.
Derived from text
Organic Compounds; Ion Mobility Spectroscopy; Mass Spectrometers; Chemical Reactions; Cylindrical Bodies

20030111224 Malin Space Science Systems, San Diego, CA, USA
Polar- and Middle-Latitude Martian Gullies: A View from MGS MOC After 2 Mars Years in the Mapping Orbit
Edgett, K. S.; Malin, M. C.; Williams, R. M. E.; Davis, S. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 2000, Malin and Edgett published initial results regarding the discovery, geomorphology, and possible origin of polar- and middle-latitude gullies on Mars. Except for gullies in Nirgal Vallis, and a single example at 24 N near the mouth of Kasei Vallis, all of the gullies documented through December 2002 occur poleward of 30 latitude in both hemispheres. The Mars Global Surveyor (MGS) Mars Orbiter Camera (MOC) began its third Mars year of observations in the nearly-circular, nearly-polar mapping orbit on 12 December 2002. More than 128,000 MOC images have been acquired; of these, > 54,000 are narrow angle (NA) images of resolution 1.5 to 12 m/pixel. Of the NA images, approx. 1300 exhibit polar- and middle-latitude gullies. This sample, 8.7 times the number of images examined by Malin and Edgett, provides an opportunity to re-evaluate the geomorphic, statistical, and geographic relationships described in the original paper.
Author
Mars Surface; Latitude; Valleys; Planetary Mapping

20030111225 Lyon-1 Univ., Lyon, France

Online Mars DEM Derived from MOLA Profiles

Delacourt, C.; Baratoux, D.; Gros, N.; Allemand, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The topography of Mars is a key parameter for the understanding of the geological evolution of the planet. Topographic data for most applications are represented as Digital Elevation Models (DEMs). DEMs are characterized by their spatial resolution (distance between neighbor points on the topographic grid) and the accuracy of elevations. The resolution and accuracy required depend on the geological applications from the global evolution of the whole planets to the study of small structures such as impact craters or grabens. DEMs of Mars at the local scale were mainly derived by stereophotogrammetric method during the Viking era. High Topographic profiles have been recently acquired by Mars Orbiter Laser Altimeter (MOLA) launched in the frame of Mars Global Surveyor mission in 1997. In this paper we describe how to generate DEM's through an interactive Internet application.

Derived from text

Digital Elevation Models; Topography; On-Line Systems; Mars Surface; Laser Altimeters; Planetary Geology

20030111226 Southwest Research Inst., Boulder, CO, USA

The Formation of Asteroid Satellites in Catastrophic Impacts: Results from Numerical Simulations

Durda, D. D.; Bottke, W. F., Jr.; Enke, B. L.; Asphaug, E.; Richardson, D. C.; Leinhardt, Z. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have performed new simulations of the formation of asteroid satellites by collisions, using a combination of hydrodynamical and gravitational dynamical codes. This initial work shows that both small satellites and ejected, co-orbiting pairs are produced most favorably by moderate-energy collisions at more direct, rather than oblique, impact angles. Simulations so far seem to be able to produce systems qualitatively similar to known binaries. Asteroid satellites provide vital clues that can help us understand the physics of hypervelocity impacts, the dominant geologic process affecting large main belt asteroids. Moreover, models of satellite formation may provide constraints on the internal structures of asteroids beyond those possible from observations of satellite orbital properties alone. It is probable that most observed main-belt asteroid satellites are by-products of cratering and/or catastrophic disruption events. Several possible formation mechanisms related to collisions have been identified: (i) mutual capture following catastrophic disruption, (ii) rotational fission due to glancing impact and spin-up, and (iii) re-accretion in orbit of ejecta from large, non-catastrophic impacts. Here we present results from a systematic investigation directed toward mapping out the parameter space of the first and third of these three collisional mechanisms.

Derived from text

Mathematical Models; Computerized Simulation; Asteroids; Hypervelocity Impact; Catastrophe Theory; Artificial Satellites

20030111227 Northwestern Univ., Chicago, IL, USA

New Mariner 6 and 7 Mosaics of Mars: Clues About Time Variable Surface Features

Edmonds, J. L.; Robinson, M. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Reprocessed far encounter data from Mariner 6 and 7 (1969) provide a valuable timestep with which to examine large scale surface processes on Mars. Although low resolution (20 km/pixel), the Mariner 6 and 7 far encounter images easily resolve large scale albedo features (>100 km). Planetary observers over the last century have tracked variations in size, shape, and location of albedo units. It is commonly assumed that these variations are due to eolian displacement of a layer of bright surface dust, possibly only microns thick, such that dark material beneath is revealed. Other mechanisms thought to be responsible for albedo region boundary movement are suspension of dust during saltation of coarser grains, and short distance displacement of these larger dark particles, usually in the context of wind streaks. Comparison of Mariner 6 and 7 data with subsequent spacecraft data and earlier telescopic data is useful in tracking albedo unit variations over time and thus identifying mechanisms responsible for these variations. For example, comparing the size and location of albedo features in each data set with recorded dust storm occurrence before the images were obtained allows for derivation of a cause-effect relationship between dust storms and albedo feature variations, as well as rates of atmospheric clearing.

Author

Mariner 6 Space Probe; Mariner 7 Space Probe; Mosaics; Planetary Mapping; Mars Surface

20030111228 Calgary Univ., Alberta, Canada

Locating Bolide Terminal Bursts Using Seismic Arrival Times: A Supracenter Location Program

Edwards, W. N.; Hildebrand, A. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

When sizable asteroidal or cometary fragments enter the Earth's atmosphere, atmospheric friction upon the falling object(s) produce fireball phenomena. As a projectile penetrates into denser layers increasing ram pressures usually cause the object to fracture in a cascading fashion leading to violent disintegration of some or all of the projectile. The resulting explosions produce acoustic waves that propagate to the ground where their arrival can be recorded by nearby seismic stations. If several adequately separated seismometers record the same event it is possible to locate the position of the explosion or supracenter in four dimensions (3 spatial, 1 temporal) using ray tracing in a process analogous to locating earthquake hypocenters in the solid earth. SUPRACENTER has been designed with this use in mind. Since these explosive events or terminal bursts often mark a position near the end of a bolide's supersonic travel, their position is of particular interest to any meteorite recovery effort. To test the effectiveness of the SUPRACENTER program in locating terminal bursts, locations for the explosions of fireballs were determined and compared to burst positions that had been, using independent methods, determined previously.

Derived from text

Bolides; Seismographs; Position (Location); Hypervelocity Projectiles; Earth Atmosphere; Models; Applications Programs (Computers)

20030111229 California Inst. of Tech., Pasadena, CA, USA

Hydrogen-Isotope Constraints on the Origin and Evolution of the Carbonaceous Chondrites

Eiler, J. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The carbonaceous chondrites are among the most primitive solid objects in the solar system and plausibly represent building blocks of the terrestrial planets, moons and asteroids. Although they are generally less differentiated and metamorphosed than other meteorite groups, the carbonaceous chondrites are compositionally and texturally diverse, in part reflecting processes acting on them after their accretion. One of the more important of these processes was aqueous alteration, either by water formed from melting co-accreted ice or by infiltration of externally-derived water produced elsewhere on their meteorite parent bodies. Several recent models of the protoliths, sources of water, and conditions and mechanisms of this water-rock reaction have been proposed based on evidence from oxygen isotope geochemistry. In this study, we re-examine this issue considering the added constraint of hydrogen isotope compositions of CV, CO, CM and CI carbonaceous chondrites. We particularly focus on the CM chondrites, which preserve the most diverse record of aqueous alteration.

Derived from text

Carbonaceous Chondrites; Hydrogen Isotopes; Solar System; Metamorphism (Geology); Geochemistry

20030111230 Max-Planck-Inst. fuer Chemie, Mainz, Germany

A Novel Cubic, Transparent and Super-Hard Polymorph of Carbon from the Ries and Popigai Craters: Implications to Understanding Dynamic-induced Natural High-Pressure Phase Transitions in the Carbon System

ElGoresy, A.; Dubrovinsky, L. S.; Gillet, P.; Mostefaoui, S.; Graup, G.; Drakopoulos, M.; Simionovici, A. S.; Swamy, V.; Masaitis, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cubic diamond (space group Fd3m) and lonsdaleite (space group P63/mmc) are the only known natural high-pressure polymorphs of carbon so far. Lonsdaleite was reported from shocked rocks in several terrestrial impact craters and in nanosize grains in unequilibrated chondrites. In terrestrial impact craters it occurs with shock-induced diamond, primary and secondary graphites in distinct petrographic setting. Demineralization residues of shocked rocks from the Lappaja rvi and Popigai craters contain, in addition to diamond and graphite, transparent but amorphous carbon. Recently, transparent very hard and dense carbon platelets that are thought to be Raman inactive were reported in coexistence with impact diamond in shocked gneisses from the Ries crater. In addition, transparent super-hard carbon with broad Raman Bands at approximately 1390 cm(exp -1) (sp3 bonding) and 1600 cm(exp -1) (sp2 bonding) of unknown nature was also found in shocked gneisses from Poppigai crater. Here, we report the results of micro beam x-ray diffraction studies of this carbon phase using Synchrotron radiation at the

ESRF Facility in Grenoble, France. The studies revealed the discovery of a new cubic, dense and super-hard polymorph of carbon.
Derived from text
Carbon; Craters; High Pressure; Petrography; Phase Transformations; Polymorphism

20030111231 Academy of Sciences (USSR), Moscow, USSR
Surface Chemistry of Chemically Treated Diamond Nanograins
Koscheev, A. P.; Serzhantov, A. E.; Merchel, S.; Ott, U.; Guillois, O.; Reynaud, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): RFBR-DFG-01-05-65416; RFBR-DFG-02-05-04001; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several attempts have been undertaken trying to find a correlation between IR features of the interstellar medium and meteoritic diamonds [6-9]. A main result of these studies is that many of surface IR-active chemical features are modified by the chemical procedure used to extract nanodiamonds from meteorites. This fact can explain differences in the published IR spectra of nanodiamonds extracted from the same meteorite using different extraction methods. However, in one report the same chemical procedure was applied to the two different meteorites and fine details of IR spectra of extracted nanodiamonds were not the identical in the two cases [8]. This fact stimulated us to study in details the effect of chemical extraction procedure on the chemical features of nanodiamond surfaces. Such a study may help to understand if there is a relation between the surface chemistry of nanodiamonds before and after chemical isolation (the memory effect) and, if so, to find a way how to extract the initial chemistry of meteoritic diamonds related to their chemistry in space.
Author
Meteoritic Diamonds; Infrared Spectra

20030111232 Chiba Inst. of Tech., Narashino, Japan
Mineralogy of the Dhofar 489 Lunar Meteorite, Crystalline Matrix Breccia with Magnesian Anorthositic Clasts
Takeda, Hiroshi; Saiki, Kazuto; Ishii, Teruaki; Otsuki, Mayumi; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar meteorites from Antarctica and hot deserts provide us with information not known in the Apollo and Luna samples. For example, Yamato (Y) 86032 possibly derived from the lunar far-side crust contained a 'gray anorthositic clast', and especially important is that bulk Sm-Nd data give a slightly negative value of Nd at 4.4 Ga ago. Nazarov et al. reported 5 non-paired lunar meteorites from the Dhofar region of Oman. Dhofar(D) 489 weighing 34.4 g was recovered from Oman and described by us as a crystalline matrix feldspathic breccia. The mg numbers of mafic silicates in this meteorite are higher than those of ferroan anorthosites (FAN) trend in the An vs. mg number diagram and extend into the top of the Mg-suite (MgS) rocks. This trend has been reported for the lunar granulitic rocks, but D489 does not show such granulitic texture. We report the mineralogy of D489 and discuss the origin of this possible magnesian anorthosite.
Derived from text
Lunar Rocks; Meteorites; Crystallinity; Mineralogy; Anorthosite

20030111233 New Mexico Univ., Albuquerque, NM, USA
Can Low Water/Rock Hydrothermal Alteration of Impact Materials Explain the Rock Component of the Martian Soil?
Nelson, M. J.; Newsom, H. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-8804; NAG5-10143; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The martian regolith is a globally homogenized product of chemical and aeolian weathering processes. The soil is thought to consist of a rock component, with lesser amounts of mobile elements (Ca, Na, and K) than a presumed protolith, and a salt or mobile element component enriched in sulfur and chlorine. In this study we consider the contributions of hydrothermal processes to the origin of the rock component of the martian soil.
Derived from text
Mars Surface; Planetary Geology; Regolith; Rocks; Hydrothermal Systems; Soils; Water

20030111234 Kobe Univ., Japan

Planetesimal Formation Through Gravitational Instability

Furuya, I.; Daisaka, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two prevailing processes of planetesimal formation are proposed. The first is the gravitational instability of a dust layer. The second is the growth through the mutual sticking of dust particles in a turbulent nebula. We consider the first one in this study. The solar nebula is considered to be turbulent more or less at early stages. After such turbulent motion has decayed, dust particles settle toward the central plane of the nebula.

Derived from text

Gravitational Instability; Dust; Protoplanets; Formation; Format

20030111235 Washington Univ., Saint Louis, MO, USA

Identification of Presolar Spinel Grains from a Murray Residue by Multi-Detection Raster Imaging

Nguyen, A.; Zinner, E.; Lewis, R. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): NAG5-11545; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Grain size separate CG from the Murray CM2 carbonaceous chondrite contains mostly spinel grains of average diameter 0.5 m. Zinner et al. found that approximately 1% of these spinel grains are of presolar origin as determined by their large O isotopic anomalies. These O isotopic measurements were made with the NanoSIMS on individual grains that were well separated from one another on a gold foil. The grains were selected for analysis from secondary electron and secondary O-16(-) images. The primary beam was then successively deflected onto these single grains for O isotopic analysis. While single grain analysis on dispersed samples is effective for finding relatively abundant anomalous grains, ion imaging in a raster mode on tightly packed grains might be more efficient for locating few anomalous grains among predominantly isotopically normal grains. In fact, this was the analysis mode used by Messenger et al. to discover presolar silicates in interplanetary dust particles. In an exploratory effort that is also geared toward establishing the optimum isotopic imaging technique in the search for presolar silicate grains in primitive meteorites, we measured O isotopic ratios in spinel grains from the Murray CG separate by raster imaging of areas with more or less tightly packed grains.

Derived from text

Imaging Techniques; Residues; Spinel; Raster Scanning; Grain Size; Murray Meteorite

20030111236 Wisconsin Univ., Madison, WI, USA

Iron Isotope Composition of the Lunar Mare Regolith: Implications for Isotopic Fractionation During Production of Single Domain Iron Metal

Wiesli, R. A.; Beard, B. L.; Taylor, L. A.; Welch, S. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The processes of space weathering are dominant in the development of the regolith and soils on all airless bodies in the Solar System. Indeed, it is this processing of the soil that complicates and masks the effective use of remote sensing by spectral reflectance. The lunar regolith provides us with invaluable samples study these effects of space weathering. In particular, variations in isotopic compositions can constrain some of the processes that act on the lunar soils. It has been observed that formation and maturation of the lunar regolith enrich the heavy isotopes of O, Si, S, K, Cd, Ca, and Mg, in comparison to lunar rocks, although the effect on Ca and particularly Mg are only minor. The mass-dependent isotopic variations of these elements are variably explained by: 1) ion sputtering; 2) volatilization by micrometeorite impacts; and 3) redeposition of some sputtered or volatilized matter after gravitational fractionation. The relative contributions of these processes to the isotopic fractionations are not well known. However, the abundance of nanophase Fe in lunar soils can provide signatures of some of these competitive processes.

Derived from text

Iron Isotopes; Composition (Property); Lunar Maria; Regolith; Isotopic Labeling

20030111237 Idaho Univ., Moscow, ID, USA

Secondary Fracturing of Europa's Crust in Response to Combined Slip and Dilation Along Strike-Slip Faults

Kattenhorn, S. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

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A commonly observed feature in faulted terrestrial rocks is the occurrence of secondary fractures alongside faults. Depending on exact morphology, such fractures have been termed tail cracks, wing cracks, kinks, or horsetail fractures, and typically form at the tip of a slipping fault or around small jogs or steps along a fault surface. The location and orientation of secondary fracturing with respect to the fault plane or the fault tip can be used to determine if fault motion is left-lateral or right-lateral.

Derived from text

Europa; Crusts; Terrestrial Planets; Fractures (Materials)

20030111238 British Columbia Univ., Vancouver, British Columbia, Canada

Transfer of Mercurian Impact Ejecta to Earth and Implications for Mercurian Meteorites

Gladman, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The existence of lunar and especially martian meteorites in our collections proves that escape from the gravitational well of Mercury (with escape speed of about 4.2 km/sec, less than that of Mars) should be possible, presumably via impact of asteroids or comets into the mercurian surface. Once impact ejecta is liberated from Mercury, it finds itself in orbit around the Sun. What fraction, if any, of this material would be able to subsequently find its way to Earth to perhaps give us mercurian meteorites? While several factors complicate the issue, new numerical simulations indicate that this number is order one tenth of one percent over ten million years, and possibly factors of several higher if the ejected particles are mechanical strength of the meteoroids is high, allowing them to survive for longer periods.

Author

Mercury (Planet); Ejecta; Meteoroids; Meteorites; Meteorite Parent Bodies

20030111239 Brown Univ., Providence, RI, USA

North-South Slope Asymmetries on Mars: Statistical Analysis of MOLA Data

Kreslavsky, M. A.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars Orbiter Laser Altimeter (MOLA) onboard Mars Global Surveyor (MGS) spacecraft produced a large homogeneous data set of precise elevation measurements along MGS tracks. We have used this data set to map and study statistical characteristics of kilometer- and subkilometer-scale topography. In the present work we use MOLA data set to map and study slope asymmetry on Mars. Slope asymmetry is an important parameter in processes related to insolation and water mobility.

Derived from text

Asymmetry; Laser Altimeters; Mars Surface; Statistical Analysis; Slopes; Data Processing

20030111240 Tokyo Univ., Japan

Crater-filling as a Probable Cause of Giant Tsunamis at the Cretaceous/Tertiary Boundary

Goto, K.; Tada, R.; Bralower, T. J.; Tajika, E.; Matsui, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A great number of Cretaceous/ Tertiary (K/T) boundary proximal deposits were reported from the shallow and deep-sea environments around the Gulf of Mexico. Because large tsunamis are one of the major consequences of the impact into the ocean, influence of the tsunamis is expected to have been recorded in these deposits. However, tsunami origin of these deposits is still criticized. Moreover, the ultimate cause of large tsunamis is controversial and their magnitude and extent are unknown. Two different generation mechanisms are proposed for the giant tsunamis caused by the K/T boundary impact. One is a landslide triggered by the impact seismic wave (landslide-generated tsunamis) and the other is a crater-filling of the ocean water (cratergenerated tsunamis). There are thick (greater than 250 m) landslide and gravity flow deposits of probable K/T

boundary age reported around the Yucatan peninsula, which might have caused large tsunamis. On the other hand, if the ocean water invaded into the crater immediately after the impact, the crater generated tsunamis would have been formed by the movement of water that fills and then flows out of the crater cavity. Although the latter mechanism has a potential to generate the largest tsunamis, no evidence of ocean invasion into the crater has been presented. So the examination of the sediments in the Chicxulub crater is critical to test the possibility of marine invasion and consequent generation of the large tsunamis. In this study, lithology, grain composition, chemical composition, grain size and nannofossil assemblage of the samples from YAX-1 core, drilled by the Chicxulub Scientific Drilling Program (CSDP), were analyzed to investigate the possibility of the marine invasion into the Chicxulub crater immediately after the impact.
Author
Craters; Cretaceous-Tertiary Boundary; Tsunami Waves; Drilling; Lithology

20030111241 Baylor Univ., Waco, TX, USA
Gravitational Interactions Between Protoplanets and Planetesimal Disks of Equal Mass
Lindsay, B. D.; Orr, K. W.; Hyde, T. W.; Barge, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Discoveries of extrasolar planets and their unusual properties have spurred renewed interest in protoplanetary dynamics and the formation of planets. Of particular importance is the study of the mutual interactions between circumstellar disks of gas and/or solid planetesimals and the protoplanets that are created by them, particularly if they form at an early stage in the protoplanetary system s evolution. With the discovery of so many extrasolar planets orbiting at small distances from their parent stars, a number of mechanisms have been proposed for orbital migration of protoplanets, since no one current model is able to explain how giant planets can be created at these positions within the protoplanetary system. Some of them involve protoplanets creating gaps in the protoplanetary disk, limiting the accretion that allows them to become gas giants while locking them into the migration of the surrounding protoplanetary disk. Others involve dynamical friction with gas, dust or planetesimals in the vicinity of the protoplanet which can affect the motion of protoplanets by dissipating their kinetic energy and causing inward migration. This is particularly true in systems with more than one planet, where mean motion resonances could also play a role. A number of simulations of both types have been conducted employing gaseous protoplanetary disks having a wide range of protoplanet-to-disk mass ratios, showing that interactions between the two can result in significant protoplanetary eccentricities. These eccentricities can also be seen in the planetesimals within the disk as a result of the protoplanets perturbations, particularly in the vicinities of mean motion resonances
Derived from text
Gravitational Effects; Protoplanetary Disks; Protoplanets; Extrasolar Planets; Mass Ratios; Planetary Evolution

20030111242 Paris XI Univ., Orsay, France
Early Solar System Irradiation and Beryllium-7 Synthesis
Gounelle, M.; Shang, S.; Glassgold, A. E.; Shu, F. H.; Rehm, K. E.; Lee, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Using 2 irradiation models (A and B), in the framework of the x-wind theory, we have calculated the yields of Be-7 formed by irradiation. In model A, the initial abundance ratio is within error of the one reported experimentally. In model B, which has the advantage over model A in successfully reproducing the initial abundance of Ca-41, we obtain a low yield for Be-7. It is however possible to reconcile our calculations with the experimental data if we take into account a gas phase production of Be-7. It is possible to explain in the framework of irradiation models the presence in the early solar system of Be-7 at a level comparable to that found by Chaussidon and coworkers.
Derived from text
Beryllium Isotopes; Irradiation; Solar System; Synthesis (Chemistry); Supernova Remnants

20030111243 NASA Johnson Space Center, Houston, TX, USA
Morphological Evidence for an Exclusively Inorganic Origin for Magnetite in Martian Meteorite ALH84001
Golden, D. C.; Ming, D. W.; Morris, R. V.; Brearley, A. J.; Lauer, H. V., Jr.; Treiman, A.; Zolensky, M. E.; Schwandt, C. S.; Lofgren, G. E.; McKay, G. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The origin of magnetite crystals in Martian Meteorite ALH84001 is the focus of a debate about the possibility of past (and present) life on Mars. McKay et al. originally suggested that some of the magnetite crystals associated with carbonate globules in Martian Meteorite ALH84001 are biogenic in ori-gin, because they are single magnetic domain, free of crystalline defects, chemically pure, and coexist with other metastable phases in apparent disequilibrium. Thomas-Keprta et al. reported that a subpopulation of magnetite crystals (approx. 25%) associated with carbonate globules in ALH84001 and magnetite crystals produced by magnetotactic bacterial strain MV-1 have similar morphologies with crystal elongation along the [111] crystallographic axis that they describe as 'truncated hexa-octahedral' ([111-THO]) magnetite. Along with several other properties, the [111]-THO morphology has been proposed to constitute a biomarker (i.e., formed only in biogenic processes), so that the presence of [111]-THO magnetite in ALH84001 may be evidence for past life on Mars.
Author
Morphology; Inorganic Materials; Magnetite; Mars (Planet); SNC Meteorites

20030111244 Arizona State Univ., Tempe, AZ, USA
JMARS: A Multimission Data Fusion Application
Gorelick, N. S.; Weiss-Malik, M.; Steinberg, B.; Anwar, S.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The combined data sets from the Viking, Mars Global Surveyor, and Mars Odyssey missions provide a tremendous wealth of information that can be difficult to use collectively. Arizona State University has developed a package, called JMARS, that provides seamless integration of these existing data sets in a client-server model useful for both mission planning and targeting purposes, as well as data analysis.
Author
Mars Probes; Mars Surface; Image Analysis

20030111245 NASA Johnson Space Center, Houston, TX, USA
Abiotic Earth - Establishing a Baseline for Earliest Life, Data from the Archean of Western Australia
Lindsay, J. F.; Brasier, M. D.; McLoughlin, N.; Green, O. R.; Fogel, M.; McNamara, K. M.; Steele, A.; Mertzman, S. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Stromatolitic structures preserved at two stratigraphic levels within the 3.47-3.43 Ga Warrawoona Group of Western Australia have been interpreted as some of 'the least controversial evidence of early life on earth' and 'the oldest firmly established biogenic deposits now known from the geologic record'. The structures were said to have formed in a shallow sub-tidal to intertidal setting as part of an evaporite succession. In an extensive field program we have re-evaluated exposures of the Strelley Pool Chert from which stromatolites have been described and carried out detailed mapping and sampling of the Strelley Pool West site 13.7 km west of the type locality. Data from our ongoing program cast considerable doubt on the biogenic origins of the stromatolitic structures and on the nature of their depositional setting.
Derived from text
Paleontology; Mineral Deposits; Sedimentary Rocks; Stratigraphy; Abiogenesis

20030111246 Alaska Univ., Fairbanks, AK, USA
Morphology of the Terny Astrobleme Based on the Field Observation and Sample Analysis
Krochuk, Roman V.; Sharpton, Virgil L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Terny impact structure is located at 48 deg 08 min N; 33 deg 31 min. E within the Ukrainian Precambrian Shield. At its present erosion level (approximately 700 m below the original pre-impact surface) no morphological evidence of the crater remains. However because it is located within an economically significant Fe-ore belt, mines and quarries provide considerable surface and subsurface access to the substructural characteristics of what was originally a central peak crater approximately 8 km in diameter. Last year we conducted field work at the Terny structure. Special attention was given to the area of intense deformation which appears to delineate the central uplift. Extending from the P-2 mine to the United mine (profile A-A'), samples were collected at depths of 365 and 920 m. Here we report the initial results of this study. Previous

research shows some differences in location of the central peak of this eroded astrobleme.
Derived from text
Geomorphology; Mines (Excavations); Precambrian Period; Mineralogy; Veins (Petrology); Lunar Craters

20030111247 NASA Johnson Space Center, Houston, TX, USA
Lunar Mare Basalts as Analogues for Martian Volcanic Compositions: Evidence from Visible, Near-IR, and Thermal Emission Spectroscopy
Graff, T. G.; Morris, R. V.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The lunar mare basalts potentially provide a unique sample suite for understanding the nature of basalts on the martian surface. Our current knowledge of the mineralogical and chemical composition of the basaltic material on Mars comes from studies of the basaltic martian meteorites and from orbital and surface remote sensing observations. Petrographic observations of basaltic martian meteorites (e.g., Shergotty, Zagami, and EETA79001) show that the dominant phases are pyroxene (primarily pigeonite and augite), maskelynite (a diaplectic glass formed from plagioclase by shock), and olivine [1,2]. Pigeonite, a low calcium pyroxene, is generally not found in abundance in terrestrial basalts, but does often occur on the Moon [3]. Lunar samples thus provide a means to examine a variety of pigeonite-rich basalts that also have bulk elemental compositions (particularly low-Ti Apollo 15 mare basalts) that are comparable to basaltic SNC meteorites [4,5]. Furthermore, lunar basalts may be mineralogically better suited as analogues of the martian surface basalts than the basaltic martian meteorites because the plagioclase feldspar in the basaltic Martian meteorites, but not in the lunar surface basalts, is largely present as maskelynite [1,2]. Analysis of lunar mare basalts my also lead to additional endmember spectra for spectral libraries. This is particularly important analysis of martian thermal emission spectra, because the spectral library apparently contains a single pigeonite spectrum derived from a synthetic sample [6].
Author
Basalt; Lunar Rocks; Mars Volcanoes; Meteoritic Composition

20030111248 Hawaii Univ., Kula, HI, USA
Low-Ca Pyroxene in Amoeboid Olivine Aggregates in Primitive Carbonaceous Chondrites
Krot, Alexander N.; Oetaev, Mikhail I.; Yurimoto, Hisayoshi; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Amoeboid olivine aggregates (AOAs) are aggregates of nebular gas-solid condensates which appear to have experienced high temperature annealing without substantial melting [1]. In primitive carbonaceous chondrites, AOAs consist of forsteritic olivines, FeNi-metal, and refractory materials composed of Aldiopside, anorthite, spinel, and very rare melilite. Primary minerals in AOAs are O-16-rich (DELTA (sup 17)O less than -20%o), suggesting formation in an O-16-rich gaseous reservoir. Although thermodynamic calculations at 10(exp -3) 10(exp -6) bar total pressure predict condensation of enstatite by reaction between SiO(gas) and forsterite at approximately 50- 80 K below the condensation temperature of forsterite, no low-Ca pyroxenes in AOAs have yet been identified. Here, we report a discovery of low-Ca pyroxene in AOAs from CV, CR, CM, and ungrouped carbonaceous chondrites Adelaide and Acfer 094.
Derived from text
Aggregates; Carbonaceous Chondrites; Olivine; Calcium; Pyroxenes

20030111249 NASA Johnson Space Center, Houston, TX, USA
Space Rocks Tell Their Secrets: Space Science Applications of Physics and Chemistry for High School and College Classes
Lindstrom, M. M.; Tobola, K. W.; Stocco, K.; Henry, M.; Allen, J. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As the scientific community studies Mars remotely for signs of life and uses Martian meteorites as its only available samples, teachers, students, and the general public continue to ask, 'How do we know these meteorites are from Mars?' This question sets the stage for a three-lesson instructional package Space Rocks Tell Their Secrets. Expanding on the short answer 'It's the chemistry of the rock', students are introduced to the research that reveals the true identities of the rocks. Since few high school or beginning college students have the opportunity to participate in this level of research, a slide presentation

introduces them to the labs, samples, and people involved with the research. As they work through the lessons and interpret real data, students realize that the research is an application of basic science concepts they should know, the electromagnetic spectrum and isotopes. They can understand the results without knowing how to do the research or operate the instruments. Derived from text

SNC Meteorites; Technology Utilization; Electromagnetic Spectra; Students; Instructors; Rocks

20030111250 Pomona Coll., Claremont, CA, USA

Magma Reservoirs Feeding Giant Radiating Dike Swarms: Insights from Venus

Grosfils, E. B.; Ernst, R. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): NAG5-10157; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Evidence of lateral dike propagation from shallow magma reservoirs is quite common on the terrestrial planets, and examination of the giant radiating dike swarm population on Venus continues to provide new insight into the way these complex magmatic systems form and evolve. For example, it is becoming clear that many swarms are an amalgamation of multiple discrete phases of dike intrusion. This is not surprising in and of itself, as on Earth there is clear evidence that formation of both magma reservoirs and individual giant radiating dikes often involves periodic magma injection. Similarly, giant radiating swarms on Earth can contain temporally discrete subswarms defined on the basis of geometry, crosscutting relationships, and geochemical or paleomagnetic signatures. The Venus data are important, however, because erosion, sedimentation, plate tectonic disruption, etc. on Earth have destroyed most giant radiating dike swarm's source regions, and thus we remain uncertain about the geometry and temporal evolution of the magma sources from which the dikes are fed. Are the reservoirs which feed the dikes large or small, and what are the implications for how the dikes themselves form? Does each subswarm originate from a single, periodically reactivated reservoir, or do subswarms emerge from multiple discrete geographic foci? If the latter, are these discrete foci located at the margins of a single large magma body, or do multiple smaller reservoirs define the character of the magmatic center as a whole? Similarly, does the locus of magmatic activity change with time, or are all the foci active simultaneously? Careful study of giant radiating dike swarms on Venus is yielding the data necessary to address these questions and constrain future modeling efforts. Here, using giant radiating dike swarms from the Nemesis Tessera (V14) and Carson (V43) quadrangles as examples, we illustrate some of the dike swarm focal region diversity observed on Venus and briefly explore some key implications for the questions framed above.

Author

Venus Surface; Planetary Geology; Magma; Rock Intrusions

20030111251 NASA Johnson Space Center, Houston, TX, USA

A New Approach to Evaluate Collision Probabilities Among Asteroids, Comets, and Kuiper Belt Objects

Liou, J.-C.; Kessler, Don J.; Matney, Mark; Stansbery, Gene; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A new method to evaluate the longterm collision probabilities between orbiting objects has been developed. It is designed to work with any orbital evolution model to estimate the collision probabilities of a system (asteroids, comets, Kuiper Belt objects, or planetesimals) as the system evolves in time. Contrary to Opik's classical method based on uniform sampling in space, this method is based on uniform sampling in time. Since orbital elements are updated frequently rather than based on some assumptions, this dynamical approach is more general than Opik's. When applied to an Opik system - a system of objects with fixed semimajor axes (a), eccentricities (e), and inclinations (i), and randomly distributed right ascensions of the ascending node (Omega), arguments of pericenter (omega), and mean longitudes (lambda), this method yields results that are consistent with those obtained using Opik's method.

Derived from text

Collisions; Asteroids; Comets; Kuiper Belt

20030111252 Hawaii Univ., Honolulu, HI, USA

Silica-rich Igneous Rims Around Magnesian Chondrules in CR Carbonaceous Chondrites: Evidence for Fractional Condensation During Chondrule Formation

Krot, A. N.; Libourel, G.; Goodrich, C. A.; Petaev, M. I.; Killgore, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The CR (Renazzo-type) carbonaceous chondrites are among the most pristine meteorites, and therefore, study of their high-temperature components (CAIs, AOAs, chondrules) can potentially provide important information on physico-chemical conditions in the early solar nebula. The CR chondrites are characterized by the presence of large concentrically zoned (layered) Type I chondrules which may have recorded evolution of solar nebula materials in the region of CR chondrule formation. It was recently shown that the outermost layers around Type I chondrules in CR chondrites commonly have a high abundance of a silica phase, suggesting significant Si/Mg fractionation in the CR chondrule-forming region. Here, we characterize the mineralogy and petrology of these silica-rich rims, and discuss their origins and implications for chondrule formation in general.
Derived from text
Carbonaceous Chondrites; Chondrule; Mineralogy; Petrology; Silicon Dioxide; Magnesium; Igneous Rocks

20030111253 Lamont-Doherty Geological Observatory, Palisades, NY, USA
Green Glasses: New Pressure Calibration, New Ascent Mechanism, New Calculations, Same Story
Longhi, John; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

New melting experiments that have located the trace of the Di-Wo eutectic from 0.5 to 2.5 GPa (1370 C - 1520 C) have also demonstrated pressure intensification in BaCO3 pressure assemblies in contrast to friction-induced pressure reduction at lower temperatures. Accordingly, BaCO3 assemblies require a correction that is both temperature and pressure dependent. Application of such a correction yields pressures for the CMAS spinel/garnet transition (SGT) and quartz-coesite transformation (QCT) in close agreement with salt-cell data. The pressure correction also requires modification of melting model algorithms and re-examination of the polybaric fraction fusion hypothesis for green glass magmas. Also, recent development of a model for run-away dike propagation raises the possibility of rapid magma transport directly from deep source regions thus making batch melting processes plausible.
Derived from text
Melting; Glass; Temperature Dependence; Eutectics; Magma

20030111254 Hawaii Univ., Honolulu, HI, USA
An Igneous Origin for Martian Magnetic Anomalies?
Hammer, J. E.; Brachfield, S.; Rutherford, M. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The presence of alternately magnetized sources on Mars indicates that at one time Mars had a magnetic field, presumably generated by an internal dynamo, and that its polarity reversed at least once before shutting off. Mars does not currently possess a magnetic field, so the anomalies are attributed to remanent magnetization (RM) of minerals in the crust. The initiation and cessation of the inducing field, its timing, and the implications for Mars thermal evolution, compositional differentiation, and volatile budget are critical components of understanding the planetary dynamics of Mars. Isobaric (1 bar) constant-rate cooling experiments were run using Fe-rich (i.e., Martian) basalt to ascertain whether conditions necessary for crystallization of minerals retaining intense RM are consistent with any of the models proposed for generation of the Martian magnetic anomaly.
Derived from text
Magnetic Anomalies; Magnetic Fields; Crystallization

20030111255 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Dawn Mission: A Journey in Space and Time
Russell, C. T.; Coradini, A.; DeSanctis, M. C.; Feldman, W. C.; Jaumann, R.; Konopliv, A. S.; McCord, T. B.; McFadden, L. A.; McSween, H. Y.; Mottola, S., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

By successively orbiting both 4 Vesta and 1 Ceres the Dawn mission directly addresses the longstanding goals of NASA and the planetary community to understand the origin and evolution of the solar system by obtaining geophysical and geochemical data on diverse main belt asteroids. Ceres and Vesta are two complementary terrestrial protoplanets (one apparently 'wet' and one 'dry'), whose accretion was terminated by the formation of Jupiter. Ceres is little changed since it formed in the early solar system, while Vesta has experienced significant heating and differentiation. Both have remained intact over the age of the solar system, thereby retaining a record of events and processes from the time of planet formation. Detailed

study of the geophysics and geochemistry of these two bodies provides critical benchmarks for the early solar system conditions and processes that shaped its subsequent evolution. Dawn provides the missing context for both primitive and evolved meteoritic data, thus playing a central role in understanding terrestrial planet formation and the evolution of the asteroid belt. Dawn is to be launched in May 2006 arriving at Vesta in 2010 and Ceres in 2014, stopping at each to make 11 months of orbital measurements. The spacecraft uses solar electric propulsion both in cruise and in orbit to make most efficient use of its xenon propellant. The spacecraft carries a framing camera, visible and infrared mapping spectrometer, gamma ray/neutron spectrometer, a laser altimeter, magnetometer, and radio science.
Derived from text
Geochemistry; Geophysics; Mapping; Planetary Evolution; Solar System; Asteroids

20030111256 Arizona State Univ., Tempe, AZ, USA
Airborne Radar Study of Mars Analogs in the Southwestern USA
Greeley, R.; Doggett, T. C.; Davies, A. G.; Baker, V.; Dohm, J.; Ferre, P. A.; Hinnell, A.; Rucker, D.; Roden, J.; Stough, T., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The search for surface and near-surface liquid water on Mars is a central part of current and planned future exploration, which include radar sounders on Mars Express and MRO and proposed synthetic aperture radar (SAR) imagers. In order to penetrate sand and dust cover, these systems are proposed for longer wavelengths (e.g, from [2]: 24 cm / L-band and 74 cm / P-band) than those considered optimal for the detection of soil moisture (6 cm / C-band). However, there has been some success in detecting soil moisture at longer wavelengths. Given the size and mass constraints for Mars missions, the optimization of radar instrument parameters for meeting science objectives, such as searching for liquid water, is essential. In this on-going study, we are using repeat coverage of Mars analog sites with multifrequency (C, L and P band) airborne radar and ground truth soil sample data to assess the detectability of soil moisture.
Derived from text
Airborne Radar; Mars Surface; United States; Analogs; Detection

20030111257 Museum of Natural History, London, UK
Rare Earth Element Systematics of Fine Grained Calcium-Aluminium-rich Inclusions and Amoeboid Olivine Aggregates from Efremovka (CV3)
Russell, S. S.; Krot, A. N.; Jeffries, T. W.; Ulyanov, A. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many components of chondrites have experienced melting prior to their incorporation into the chondrite parent body. Important exceptions include fine-grained spinel-rich calcium aluminium-rich inclusions (CAIs), and amoeboid olivine aggregates (AOAs). Both of these groups of objects have fluffy textures and are aggregates of small, irregularly-shaped grains, thus they may represent pristine condensates from the early solar system. Our aims were to study the trace element characteristics of condensed components and to compare and contrast two groups of objects (AOAs and CAIs) that have different bulk chemistries, in order to compare their origins. Previous studies of REEs in fine grained CAIs and AOAs have focused on inclusions from the oxidized CV3 chondrite Allende that experienced late-stage metasomatic alteration. In order to minimize effects of secondary alteration, we selected inclusions from the reduced CV3 chondrite Efremovka meteorite, that is less altered than Allende.
Derived from text
Rare Earth Elements; Chondrites; Calcium; Aluminum; Melting

20030111258 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Future Moon Mission: The Lunar Seismic Network
Neal, C. R.; Lawrence, D. J.; Banerdt, W. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The New Views of the Moon initiative has integrated remotely sensed and sample data in its approach to synthesizing lunar research over the last 30+ years. This integration has clearly demonstrated what we know and, maybe more importantly, what we don't know about the Moon. Most significantly, it has helped to formulate fundamental scientific questions about the

Moon that still need to be addressed. In addition, the lessons learned from the study of the Moon provide an invaluable road map for our exploration of the inner planets of the solar system. The results of the New Views initiative highlight in explicit detail just how little we know about the nature of the lunar interior. While studies of the Moon have produced the magma ocean hypothesis, this cannot be adequately tested until seismic data are obtained from around the Moon and the nature of the lunar interior is evaluated in detail. The existing Apollo seismic experiment data only provide us with clues about the interior of the Moon, primarily because the seismometers were set up in a relatively restricted area on the lunar nearside. Interpretations based on these limited data are ambiguous. For example, the presence of garnet in the lunar mantle has been proposed by several authors to accommodate higher velocities in the middle mantle (greater than 500 km). This has been supported by geochemical evidence from some mare samples. However, Nakamura et al. and Nakamura suggested that increasing the proportion of Mg-rich olivine in the lunar mantle could accommodate the higher velocities. What has become apparent is the presence of a seismic discontinuity around 500 km, albeit somewhat heterogeneous in nature and this has been interpreted as the maximum depth of LMO melting. While innovative modeling approaches have refined the original data, comprehensive and definitive interpretations of the lunar mantle remain elusive and fundamental questions regarding lunar origin, evolution, and structure still remain unanswered. Major questions that need to be answered during a Lunar seismic mission are presented.
Derived from text
Moon; Solar System; Space Missions; Lunar Exploration; Lunar Seismographs

20030111259 New Mexico Univ., Albuquerque, NM, USA
Oxidation State of Vanadium in Glass and Olivine from Terrestrial and Martian Basalts: Implications for Oxygen Fugacity Estimates
Karner, J. M.; Sutton, S. R.; Papike, J. J.; Shearer, C. K.; Newville, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several studies have demonstrated the usefulness of Synchrotron micro x-ray absorption near edge structure (XANES), or (SmX) spectroscopy, to determine the oxidation state of elements in planetary materials. Delaney et al. used SmX to investigate the oxidation states Fe, Cr, and V in extraterrestrial samples, and later determined the oxidation state of V in experimental glasses as a function of oxygen fugacity. More recently, Sutton et al. studied the oxidation state of V in meteoritic fassaite and also synthetic pyroxene. This paper reports our first results using SmX spectroscopy to determine the oxidation state of vanadium in olivine and glass from a terrestrial ocean floor (OF) basalt and a martian basaltic shergottite meteorite, Dar Al Gani 476. The goal of this study, and of future studies, is to use V (and Cr, Fe) valence states to determine the oxygen fugacity of basalts from different planetary bodies.
Author
Oxidation; Vanadium; Glass; Olivine; Basalt; Shergottites; Ocean Bottom

20030111260 George Washington Univ., Hampton, VA, USA
Global Measurements of the Mars Upper Atmosphere: In Situ Accelerometer Measurements from Mars Odyssey 2001 and Mars Global Surveyor
Keating, G. M.; Theriot, M.; Tolson, R.; Bougher, S.; Forget, F.; Forbes, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the recent Mars Odyssey 2001 Accelerometer Experiment measurements of the upper atmosphere, insitu measurements have finally been extended from pole to pole. The Mars Odyssey 2001 (M01) Spacecraft was placed into a near polar orbit about Mars in September 2001. Aerobraking was performed from then until January 2002 to circularize the M01 orbit. The spacecraft carried triaxial accelerometers, which were used to safely perform aerobraking and to continue exploration of the detailed properties of the upper atmosphere, which had begun with the Mars Global Surveyor accelerometer measurements. The accelerometers were used to measure atmospheric density, and from the vertical structures measured on both inbound and outbound trajectories the scale height, temperature and pressure were determined. Altogether 600 vertical structures were obtained ranging from 95 km to above 170 km. Measurements were obtained for the first time near the North Pole and also the first measurements were obtained on the night-side in the Northern Hemisphere. Temperatures near 110 km were discovered to unexpectedly increase with latitude maximizing near the North winter pole, apparently due to dynamical heating [1]. This result is contrary to the MarsGram and MTGCM models used for Odyssey aerobraking, where model temperatures are predicted to minimize near the winter pole. For example, maximum temperatures near the North winter pole at 100 km were observed to be near 200 K while MTGCM temperatures were predicted to be near 100 K. However, a winter polar warming is predicted by the European Mars GCM [2] at both the North and South Poles in local winter at high altitudes.

The altitudinal variations and high latitude diurnal variations of temperature near the North Pole also appear to be in fair accord with the Forget et al. model. Apparently the upper atmosphere North polar winter warmings may result from adiabatic heating from the subsiding branch of the cross-equatorial meridional circulation from the Southern Hemisphere summer. The only measurements of the Southern Hemisphere winter polar upper atmospheric temperatures were obtained from accelerometers aboard the Mars Global Surveyor. These measurements do not show winter polar warmings, but minimum temperatures near the winter South Pole more in accord with radiative equilibrium, and more in accord with the MTGCM model. Apparently the summer-to-winter cell supplying dynamical heating to the North winter pole near perihelion is much stronger than the summer-to-winter cell supplying dynamical heating to the South winter pole near aphelion. The stronger dynamical heating during the North polar winter may result from being near perihelion where the closer sun and stronger dust activity may strengthen the meridional cell.
Derived from text
Atmospheric Temperature; Atmospheric Density; Diurnal Variations; Mars Environment

20030111261 Eotvos Lorand Univ., Budapest, Hungary
Chaotic Terrains as Indicators of Crustal Thickness of Europa
Kereszturi, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the last years there were observations suggest there is a thick water ocean below the ice crust of Europa where the ice crust drifts on the top of the ocean. Important question is the thickness of this ice crust because it influences the future cryobotic missions and the tectonic structure of the crust. Because the most active crust cracking and rotation happens at the chatotic terrains we analysed these regions as indicators of the structure and thickness of the ice crust. Based on the Galileo spacecraft s images we estimated the relative height of the icebergs based on their shadows and Airy isostasy models. With this we can approach the relative thickness and thickness variations on Europa which could be an interesting infromation among the other thickness estimations.
Author
Europa; Icebergs; Image Analysis

20030111262 AVL-AST doo, Zagreb, Croatia
Surface Age Computations for Mars: A Step Toward the Formal Proof of Martian Ocean Recession, Timing and Probability
Salamuniccar, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many indicators for ocean on Mars were proposed: outflow channels and features related to the evolution of standing bodies of water (polygons, lobate impact craters), features consistent with the shoreline interpretation, MEGAOUTFLO hypothesis, MOLA data, glaciers, fluvial channels and gullies, MGS data, influence on planetary climate, etc. Recently, mathematical approach was proposed providing a way to compute how deep Martian ocean was during each period of the planet history, including the probability that ocean did exist once. The important step toward the formal proof of Martian ocean recession, timing and probability, are surface age computations based on crater statistics.
Derived from text
Mars (Planet); Probability Theory; Computation; Oceans

20030111264 NASA Johnson Space Center, Houston, TX, USA
Heavy Ion Flux Comparison of MARIE and ACE/CRIS Instruments
Lee, K. T.; Andersen, V.; Atwell, W.; Cleghorn, T.; Cucinotta, F.; Pinsky, L.; Saganti, P.; Turner, R.; Zeitlin, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

The charged particle spectrum for nuclei from protons to neon, (charge Z=10) has been observed during the cruise phase and in orbit around Mars by the MARIE charge particle spectrometer aboard the Odyssey spacecraft. The cruise data was taken between April 23, 2001 and August 11, 2001. The Mars orbit data was taken from March 5, 2002 through December 2002. Both the cruise data set and the orbital data set are compared with the simultaneous observations made by the CRIS instrument

aboard the ACE space-craft, located at L1. Any detectable differences between the two spacecraft data sets could lead to the understanding of the radial dependence of solar modulation.
Author
Charged Particles; Neon; Protons; Mars (Planet)

20030111265 Kobe Univ., Japan
Bidirectional Reflectance of Asteroid Surface Analogues: Quantification of Porosity and Surface Roughness
Sakai, T.; Tomita, N.; Nakamura, A. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Laboratory photometric phase curves of meteorite powders give constraints on the meteorites-asteroids connections, as well as the surface structure of asteroids. We performed laboratory measurements of bidirectional reflectance of meteorite powders with the sample surfaces smoothed by spatula. The results were as follows: the surfaces of meteorite powders showed shallower phase curves than those of most asteroids, and those made of carbonaceous chondrite-powders were about one-half or twice brighter than asteroid 253 Mathilde, although the wavelength of the measurements was not exactly the same as asteroid observations. The real surface of asteroids is naturally be rougher than those prepared in the laboratory. Here we report the results of our study on the bidirectional reflectance of powdery surfaces of artificial materials and an ordinary chondrite meteorite with various surface structures.
Derived from text
Bidirectional Reflectance; Asteroids; Porosity; Surface Roughness

20030111266 Massachusetts General Hospital, Boston, MA, USA
The Status of Cross Section Measurements for Neutron-induced Reactions Needed for Cosmic Ray Studies
Sisterson, J. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): W-7405-eng-36; NAG5-10538; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cosmic ray interactions with lunar rocks and meteorites produce small amounts of radionuclides and stable isotopes. Advances in Accelerator Mass Spectrometry (AMS) allow production rates to be measured routinely in well-documented lunar rocks and meteorites. These measurements are analyzed using theoretical models to learn about the object itself and the history of the cosmic rays that fell on it. Good cross section measurements are essential input to the theoretical calculations. Most primary cosmic ray particles are protons so reliable cross sections for proton-induced reactions are essential. A cross section is deemed accurate if measurements made by different experimenters using different techniques result in consistent values. Most cross sections for proton induced reactions are now well measured. However, good cross section measurements for neutron-induced reactions are still needed. These cross sections are required to fully account for all galactic cosmic ray interactions at depth in an extraterrestrial object. When primary galactic cosmic ray (GCR) particles interact with an object many secondary neutrons are produced, which also initiate spallation reactions. Thus, the total GCR contribution to the overall cosmogenic nuclide archive has to include the contribution from the secondary neutron interactions. Few relevant cross section measurements have been reported for neutron-induced reactions at neutron energies greater than approximately 20 MeV. The status of the cross section measurements using quasi-monoenergetic neutron energies at iThemba LABS, South Africa and white neutron beams at Los Alamos Neutron Science Center (LANSCE), Los Alamos are reported here.
Derived from text
Neutrons; Cross Sections; Galactic Cosmic Rays; Neutron Beams; Nuclear Reactions

20030111267 Massachusetts Inst. of Tech., Cambridge, MA, USA
Experimental Investigations of Ureilite Petrogenesis: Relationships Between mg# and Smelting Extent
Singletary, S. J.; Grove, T. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have conducted melting experiments on liquids predicted to be in equilibrium with ureilites to explore the phase relations of the smelting reaction and understand the relations between ureilites. Correlations of modal mineralogy, mineral chemistry and texture are consistent with smelting as a major process involved in ureilite petrogenesis. Although ureilites resemble igneous rocks their mode of origin remains controversial. The competing hypotheses include origin as products of fractional crystallization, residues of partial melting, or a nebular origin. Previous experiments provided support for the

hypothesis that ureilites are the residues of a partial melting/smelting event that began just as augite was exhausted from the residue. Ureilites are comprised of approximately 90% anhedral olivine and pyroxene and less than 10% dark interstitial material consisting of a mixture of silicates, carbon, metal, carbides and sulfides. The mg# (100*molar Mg/[Mg+Fe]) of olivine in ureilites varies from 75 to 95. Here we present new experimental data on the low mg# end of the ureilite suite. In addition to systematic variations in mg#, the ureilites can be divided into subgroups based on pyroxene occurrence. The majority of ureilites consist of the assemblage olivine + pigeonite + carbonaceous matrix; the remaining ureilites contain olivine plus or minus pigeonite plus or minus augite plus or minus opx.
Derived from text
Mineralogy; Petrogenesis; Smelting; Ureilites; Magnesium

20030111268 Tennessee Univ., Knoxville, TN, USA
An Evaluation of the Igneous Crystallization Programs: MELTS, MAGPOX, and COMAGMAT, Part 2, Importance of Magmatic fO2
Slater, V. P.; Thompson, C. K.; Nettles, J.; Milam, K.; Stockstill, K. R.; Cahill, J.; Anand, M.; Taylor, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This is Part II of a study to evaluate the appropriate application of magma crystallization computer models used in the geologic community. These crystallization models (MELTS, MAGPOX, and COMAGMAT) often are used without prior knowledge of the programs strengths and weaknesses, potentially introducing error during result interpretation. Part I by Thompson et al. [this volume] examines the results produced by these computer models for three rock compositions using estimated values for magmatic fO2 and 1 bar pressure. Part II of this study assesses the limitations of the programs for a range of magmatic fO2 conditions.
Derived from text
Crystallization; Igneous Rocks; Computer Programs; Mineralogy; Melts (Crystal Growth)

20030111269 Carleton Univ., Ottawa, Ontario, Canada
Magnetic Susceptibility of Stony Meteorites from the National Meteorite Collection of Canada
Smith, D. L.; Ernst, R. E.; Herd, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There has been recent interest in using magnetic susceptiblity to characterize and classify meteorites. Measurements of magnetic susceptibility represent a fast, non-destructive and systematic way to categorize the rapidly expanding inventory of stony meteorites being discovered on Earth. Previous studies have demonstrated that although magnetic susceptibility varies over 4 orders of magnitude, there is consistency between different fragments of the same meteorite and also between different meteorites in the same class. Application of the magnetic susceptibility technique has also been used to identify misclassified meteorites. The National Meteorite Collection of Canada is hosted at the Geological Survey of Canada (GSC), which is part of Natural Resources Canada. This collection contains 2700 meteorite specimens belonging to 1100 different meteorites. Among these are 730 different stony meteorites. The Canadian collection thus represents an opportunity to apply and expand the magnetic susceptibility approach initiated by Rochette and co-workers. In this paper we report initial results from the Canadian collection. We present magnetic susceptibility data for 194 specimens from 108 different stony meteorites. For 11 meteorites we analyzed multiple specimens (for a total of 97). In addition, our equipment and measurement protocol allowed us to investigate two additional parameters, which were not part of previous meteorite studies, frequency dependence and anisotropy. We evaluated the frequency dependence by measuring specimens at two frequencies, 19000 and 825 Hz. Our method for approximating anistoropy is discussed.
Derived from text
Canada; Magnetic Permeability; Stony Meteorites; Geological Surveys

20030111270 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Paterae on Io: Volcanic Activity Observed by Galileo's NIMS and SSI
Lopes, Rosaly; Kamp, Lucas; Smythe, W. D.; Carlson, R.; Radebaugh, Jani; Gregg, Tracy K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Paterae are the most ubiquitous volcanic construct on Io s surface. Paterae are irregular craters, or complex craters with

scalloped edges, interpreted as calderas or pit craters. Data from Galileo has shown that the activity of Ionian paterae is often confined to its interior and that generally lava flows are not seen spilling out over the edges. We use observations from Galileo s Near-Infrared Mapping Spectrometer (NIMS) to study the thermal emission from several Ionian paterae and compare them with images in visible wavelengths obtained by Galileo s Solid State Imaging System (SSI). Galileo s close fly-bys of Io from 1999 to 2001 have allowed NIMS to image the paterae at high spatial resolution (1-30 km pixel). At these scales, several of these features reveal greater thermal emission around the edges, which can be explained as the crust of a lava lake breaking up against the paterae walls. Comparisons with imaging data show that lower albedo areas (which are indicative of young lavas) coincide with higher thermal emission areas on NIMS data. Other paterae, however, show thermal emission and features in the visible that are more consistent with lava flows over a solid patera floor. Identifying eruption styles on Io is important for constraining eruption and interior models on Io.
Derived from text
Volcanoes; Fluid Flow; Thermal Emission; Imaging Techniques

20030111271 Arizona State Univ., Tempe, AZ, USA
Isotopic Composition of Silicon Carbide in the CO3 Chondrite Colony
Smith, J. B.; Huss, G. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-11543; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Presolar grains have been identified in primitive members of all chondrite classes. The isotopic compositions of presolar grains provide probes of galactic evolution and nucleosynthesis in stars, while the abundances and characteristics of presolar grains contain a record of thermal processing in the solar system. Most of the detailed isotopic work has been done on SiC from Murchison and Orgueil, supplemented by a few studies of ordinary and enstatite chondrites. This work investigates SiC in the Colony CO3.O meteorite. SiC is present in Colony at a matrix-normalized abundance of approximately 3.7 ppm, much less than in CI chondrites and the matrixes of CM and primitive ordinary and enstatite chondrites. The abundances of SiC and other presolar grains in Colony seem to correlate with the chemical processing that produced CO3 chondrites. This implies that the known presolar grains experienced the same processing as the bulk CO3 material and assumes that the parent material was the same as that for other chondrites, including CI. That parent material is most plausibly the average material in the sun s parent molecular cloud. One test of this idea is to look for primary differences between SiC in Colony (and other meteorites) and that in CI and CM chondrites. True differences not related to thermal processing would falsify the assumption that all chondrite classes originated from the same reservoir of presolar dust.
Derived from text
Abundance; Chondrites; Isotopic Labeling; Silicon Carbides; Granular Materials; Colonies

20030111272 Carnegie Institution of Washington, Washington, DC, USA
Re-Os Systematics and HSE Distribution in Metal from Ochansk (H4) Chondrite
Smoliar, M. I.; Horan, M. F.; Alexander, C. M. OD.; Walker, R. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-10425; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous studies of the Re-Os systematics of chondrites have documented considerable variation in the Re/Os ratios of whole rock samples. For some whole rock chondrites, Re-Os systematics display large deviations from the primitive isochron that are considerably larger than deviations in other isotope systems. Possible interpretation of these facts is that the Re-Os system in chondrites is particularly sensitive to post-formation alteration processes, thus providing a useful tool to examine such processes. Significant variations that have been detected in highly siderophile element (HSE) patterns for ordinary chondrites support this conclusion. We report Re-Os isotope data for metal separates from the Ochansk H4 chondrite coupled with abundance data for Ru, Pd, Ir, and Pt, determined in the same samples by isotope dilution. We chose this meteorite mainly because it is an observed fall with minimal signs of weathering, and its low metamorphic grade (H4) and shock stage (S3).
Derived from text
Siderophile Elements; Chondrites; Osmium; Rhenium; Metals; Metamorphism (Geology)

20030111273 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Martian Plains Volcanism in Syria Planum and Tempe Mareotis as Analogs to the Eastern Snake River Plains, Idaho: Similarities and Possible Petrologic Contributions to Topography

Sakimoto, S. E. H.; Gregg, T. K. P.; Hughes, S. S.; Chadwick, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-12287; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Prior to the Mars Global Surveyor (MGS) and Mars Odyssey (MO) missions, The Syria Planum region of Mars was noted for several clusters of small (5-100 km) shield volcanoes and collapse craters, long tube and fissure-fed lava flows, and possible volcanic vents that were thought to be nearly contemporaneous with the volcanism in the Tempe- Mareotis province, which has long been known for volcanic shields and vents analogous to those of the Eastern Snake River Plains (ESRP) in Idaho. Recent MGS-based work on regional and global populations of martian small shields has revealed significant global trends in edifice attributes that are well-explained by eruption models with latitudinal variations in subsurface water/ice abundance, consistent with recent MO evidence for significant amounts of subsurface water that varies in latitude abundance s, and topographic and morphologic evidence for more geologically recent lava-ice relationships. However, while the global trends in small volcano data can be at least partially explained by volatile interactions with volcanism, some global and regional characteristics appear to be perhaps better explained by possible compositional, crystallinity or eruption style variations. This study expands the sampling of shields done in martian initial global studies for the Syria Planum and Tempe-Mareotis regions, which display a newly visible breadth and number of features in image and topography data. We compare these features to a similar range of features visible in the ESRP where both compositional and eruption style variations can quantitatively be shown to contribute to morphologic and topographic differences.

Derived from text

Mars Surface; Volcanoes; Planetary Geology; Topography; Analogies

20030111274 Instituto de Educacion Secundaria, Madrid, Spain

From Madrid to the Sky: An Experience, Out of the Classroom, to Understand the Size of the Solar System

Lopez, Concha; AngeldePablo, Miguel; Castilla, Gabriel; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The textbooks represent the Solar System through pictures, but that offers us a distorted vision of the reality. The distances between the planets are of a great magnitude in comparison with their size. For this reason results very difficult to represent our planetary environment in a correct way. Consequently, if we want to make us an idea specifies of their magnitude we must accomplish different activities: paper models with the size of the planets to scale and representation to scale of the distance between the planets. Normally these activities should be accomplished separately due to the big difference between sizes and distances. In the activity that we present here we decided to join distances and sizes using as reference framework the most important streets and squares of the capital of Spain. We organize a tour on foot by the principal streets of Madrid in order to that the pupils transformed their city into a Solar System to scale.

Derived from text

Solar System; Planetary Environments; Distance; Planets

20030111275 Ecole Nationale Superieure de Chimie, Paris, France

On the Controversial Biogenicity of the Organic Matter in the Oldest Archean Cherts: Can Electron Paramagnetic Resonance Provide Clues?

Skrzypczak, A.; Binet, L.; Gourier, D.; Derenne, S.; Robert, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The occurrence of objects resembling microbial fossils in the oldest Archean cherts (ca. -3.5 Byr) has been claimed as a definitive evidence of the existence of Life at this time. However the biogenicity of the kerogen-like organic matter (OM) contained in these objects is still a matter of controversy. This OM is characterized by a highly refractory nature and only a limited number of analytical tools are available to determine the origin of such macromolecular materials. Moreover, the spectroscopic techniques classically used in organic geochemistry such as solid state C-13 nuclear magnetic resonance and Fourier transform infra-red only yield limited information on such highly aromatic macromolecules. In the present study, we used, for the first time on such materials, the electron paramagnetic resonance (EPR) to investigate the origin of this ancient OM through the nature of the organic free radicals it contains. An organic radical in macromolecular carbonaceous matter can

be viewed as a single electron in a dangling bond resulting from homolytic cleavage of C-X bonds (X=H, C, N, O,...). The resulting unpaired electron may be stabilized by delocalization over aromatic moieties. EPR is based on the absorption of an electromagnetic radiation in the microwave range by an electron spin submitted to an applied static magnetic field. The absorption spectrum reflects the interactions of the spin with its environment and therefore provides information on the chemical and electronic structure of the surrounding matter. EPR has been scarcely used to analyse OM in geological samples but a recent study on carbonaceous chondrites revealed its potentiality to provide new insights on extraterrestrial macromolecular OM. Due to its high sensitivity, EPR enables to study in situ the extremely small amount of OM contained in raw cherts, without the constraint of isolating and concentrating the OM. In the present study, three cherts ranging in age from 45 Myr (Clarno Formation, USA) to 2.1 Byr (Gunflint Formation, Canada) and 3.5 Byr (Warrawoona, Australia) were analysed by EPR. The biological origin of the OM is well documented for the first two cherts but controversial for the Warrawoona chert. This work aims at assessing the ability of the radicals to probe the origin and the ageing stage of the OM in cherts.
Derived from text
Organic Materials; Geochronology; Biogeny; Electron Paramagnetic Resonance; Precambrian Period

20030111276 Geological Survey, Flagstaff, AZ, USA
Meter-Scale 3-D Models of the Martian Surface from Combining MOC and MOLA Data
Soderblom, Laurence A.; Kirk, Randolph L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have extended our previous efforts to derive through controlled photoclinometry, accurate, calibrated, high-resolution topographic models of the martian surface. The process involves combining MGS MOLA topographic profiles and MGS MOC Narrow Angle images. The earlier work utilized, along with a particular MOC NA image, the MOLA topographic profile that was acquired simultaneously, in order to derive photometric and scattering properties of the surface and atmosphere so as to force the low spatial frequencies of a one-dimensional MOC photoclinometric model to match the MOLA profile. Both that work and the new results reported here depend heavily on successful efforts to: 1) refine the radiometric calibration of MOC NA; 2) register the MOC to MOLA coordinate systems and refine the pointing; and 3) provide the ability to project into a common coordinate system, simultaneously acquired MOC and MOLA with a single set of SPICE kernels utilizing the USGS ISIS cartographic image processing tools. The approach described in this paper extends the MOC-MOLA integration and cross-calibration procedures from one-dimensional profiles to full two-dimensional photoclinometry and image simulations. Included are methods to account for low-frequency albedo variations within the scene.
Derived from text
Mars Surface; Three Dimensional Models; Topography; Altimetry; Data Acquisition; Mars Global Surveyor

20030111277 Southwest Research Inst., San Antonio, TX, USA
Physical Models of Pit Chain Formation over Dilational Faults on Mars
Sims, D. W.; Morris, A. P.; Ferrill, D. A.; Wyrick, D. Y.; Colton, S. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pit craters are collapse features that are circular, elliptical or corrugated in plan view and frequently occur as alignments (pit chains) in the highlands of the western hemisphere of Mars. Pit chains are often associated with extensional faults, particularly bounding graben structures. Pit chains may consist of aligned individual pits or overlapping pits that produce troughs with irregular scalloped walls. Numerous mechanisms have been suggested for pit chain formation that implicitly require creation of void space at depth, including deep fissuring in response to crustal extension. Ferrill et al. show that steeply dipping to vertical dilational faulting in consolidated rock is likely to occur as a response to crustal extension on Mars, possibly to depths of 5 km, resulting in the creation of significant tabular void space. We test dilational faulting as a mechanism for pit chain formation using analog methods. Results show that all pit chain morphologies observed in Mars imagery may be produced by collapse of weak material over continuous or discontinuous vertical tabular voids at depth.
Derived from text
Geological Faults; Mars Surface; Pits (Excavations); Geomorphology; Stretching; Environment Models

20030111278 Observatoire de Midi-Pyrenees, Toulouse, France

Distribution of Hydrogen at the Surface of the Moon

Maurice, S.; Feldman, W. C.; Lawrence, D. J.; Gasnault, O.; Elphic, R. C.; Chevrel, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We now have information from the fully reduced Lunar Prospector Neutron Spectrometers. Interpretation of these data yields distributions of rare earth elements (REE) Sm and Gd, major oxides and hydrogen on the Moon. Once both contributions of REE and major oxides are accounted for, we can construct the first global map of hydrogen implanted within the first 2 meters of the lunar regolith. It is interpreted as a maturity clock, reset locally by recent impact events. We make the connection of this new data set to the already-discovered reservoirs of hydrogen at the Lunar poles.

Derived from text

Hydrogen; Lunar Surface; Lunar Prospector; Neutron Spectrometers

20030111279 Washington Univ., Saint Louis, MO, USA

Internal Structures of the Galilean Satellites: What Can We Really Tell?

McKinnon, W. B.; Desai, S. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The internal structures (e.g., core size and composition) of the Galilean satellites cannot be uniquely determined by density and moment-of-inertia values alone. Assumptions about composition, chemistry, and thermal structure must be made, and differences in these assumptions account for, in part, the sometimes different conclusions reached to date. Here we show how different oxidation states, completeness of metal-from-rock differentiation, Mg number, and non-hydrostatic gravity affect internal structure determinations. We argue that solar composition is compatible with the chemistry of all 4 satellites, and that strong Fe/Si enrichment or depletion with respect to solar values is not required.

Derived from text

Galilean Satellites; Moments of Inertia; Chemical Composition; Enrichment; Hydrostatics; Gravitation

20030111280 Tennessee Univ., Knoxville, TN, USA

Mineralogy of Martian Atmospheric Dust Inferred from Spectral Deconvolution of MGS TES and Mariner 9 IRIS Data

McSween, Harry Y.; Hamilton, Victoria; Hapke, Bruce W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Although numerous inferences have been made about the mineralogy of martian dust from visible and near-infrared spectral observations, direct determination has been hampered by spectral masking due to fine-grained ferric oxides. The failure to identify the minerals that constitute the dust and surficial soils, aside from some oxide pigments, hampers our understanding of martian weathering processes and conditions. Therefore, we are attempting to directly determine the silicate mineralogy of the global dust by deconvolving thermal infrared spectra of atmospheric dust acquired during seasonal dust storms by the Mars Global Surveyor Thermal Emission Spectrometer (MGS TES) and Mariner 9 Infrared Interferometer Spectrometer (IRIS). Thermal infrared spectra of atmospheric dust are dominated by absorptions in the 8-12 micron region. Such features are consistent with the presence of significant amounts of silicate materials. Although montmorillonite has been suggested to be a significant component of the dust, this composition is not consistent with visible to near-infrared and thermal infrared observations of dust on the surface. We hope to place new constraints on the composition of the atmospheric dust by performing new analyses of the TES and IRIS data.

Derived from text

Mineralogy; Mars Atmosphere; Dust Storms; Wind Effects

20030111281 Centre National de la Recherche Scientifique, Gif-sur-Yvette, France

Spinel Formation in an Impact Plume: A Thermodynamic Approach

Siret, D.; Robin, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nickel-rich spinel is recognized as a cosmic event marker. Spinel is found in K/T boundary sections all over the world, in lower-middle Jurassic hardground, in late Pliocene sediments and in upper Eocene sediments. Its composition is

characterized by a high nickel oxide concentration (NiO greater than 1 wt%) and a high iron oxidation state (Fe(3+)/Fe(sub tot) greater than 70 mole%) involving formation in an oxygen-rich environment. Robin et al. have shown that oxidation of meteoroids and impact generated products in the atmosphere leads to the formation of Ni-rich spinel. Direct condensation from a gas phase or crystallization from a high temperature melt generated by a meteorite impact have also been suggested as potential sources for Ni-rich spinel. However, there is to date no compelling evidence of spinel condensation/crystallization from an impact plume. Meteorite impacts produce high temperature and pressure plumes that rapidly expand. During this stage, temperature and pressure decrease allowing condensation reactions to occur. As these conditions are not reproducible experimentally, the only way to determine the condensation sequence is thermodynamic modeling. We report here the first numerical simulation performed on the physical and chemical reactions that occur in an impact plume, depending on temperature and pressure conditions. The purpose of this study is to determine whether the plume can provide the kind of environment (temperature, pressure, oxygen fugacity) needed for the formation of Ni-rich spinel.
Derived from text
Spinel; Thermodynamics; Hypervelocity Impact; Plumes; Meteoritic Composition

20030111282 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Martian Buried Basins and Implications for Characteristics of the Burial Layer and Underlying Surface
Sarid, A. R.; Frey, H. V.; Roark, J. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Deciphering the cratering record on Mars has been challenging because it may reflect the changes in both the population of impactors and in the resurfacing processes on Mars. However, it is possible to determine the breadth of impactors captured in the cratering record. Extensive areas of resurfacing are of particular interest because they likely contain material from various ages in Martian history. By deducing the impact populations in both surface and underlying layers of terrain, it is possible to determine the age of the layers and constrain theories on the development of the Martian surface. However, to do so requires a method of 'seeing' impact features which are no longer visible.
Derived from text
Mars Surface; Impactors; Cratering; Planetary Geology; Surface Layers

20030111283 University Coll., London, UK
Textures and Fragment Size Distributions in Diogenite (HED) Meteorites: Processes and Geological Settings
McLeish, E. R.; Treiman, A. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Brecciated diogenite meteorites occur in two textural patterns: fragmental and granular. Fragmental diogenites consist of angular clasts, lightly annealed or cemented together. Sizes of these fragments follow a power-law distribution (i.e., are scale-invariant). Granular diogenites are compact rocks, with shear boundaries between their fragments. Fragmental diogenites are impact ejecta; granular diogenites are likely to be basement rock, deformed during impacts. Diogenites, basaltic achondrites of the howardite-eucrite-diogenite (HED) clan, are orthopyroxenites with minor chromite, olivine, and other phases. They are inferred be from the asteroid 4-Vesta.
Derived from text
Meteoritic Composition; Achondrites; Deformation; Size Distribution

20030111284 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Global Characterization of Polygonally Fractured Terrain on Venus and Implications for a Climate Change Origin
Smrekar, S. E.; Moreels, P.; Franklin, B. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On Earth, polygonal fractures with spacings of 1-100 cm form in lava flows that cool slowly under isotropic stress conditions. On Venus, polygonal fractures are observed with typical fracture spacings of 1-2 km, covering regions 10s to 100s of km across. These features have been proposed to form via cooling of lava flows or above subsurface intrusions, or due to surface cooling caused by climate change. A watershed algorithm was modified to search the entire Magellan image database autonomously for terrains with polygonal fractures. Here we characterize the 204 polygon terrains found using this method

(including over 170 newly identified regions) with respect to size, morphology, stratigraphy, and geologic setting. These results are used to examine different models of origin.
Derived from text
Climate Change; Fractures (Materials); Polygons; Terrain; Venus (Planet); Geomorphology

20030111285 Lancaster Univ., UK
Links Between Depths of Magma Reservoirs and Volcanic Eruption Rates on Io
Leone, G. L.; Wilson, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We: 1. review the volume eruption rates deduced for various volcanic events on Io, 2. infer likely depth of magma reservoirs feeding the eruptions and 3. show that the observed eruption rates can be sustained from sufficient voluminous crustal reservoirs.
Author
Depth; Magma; Reservoirs; Volcanoes

20030111286 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Measurement of Mars Dust Particle Size and Electrostatic Charge Distributions Using the E-SPART Analyzer
Mazumder, M. K.; Biris, A. S.; Trigwell, S.; Calle, C. I.; Buhler, C. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are strong indications that dust is of great importance on Mars. Dust appears to have both long-term effects on the surface geologic evolution as well as on the aeolian processes in the present climate conditions. Early spacecraft missions confirmed hypotheses from telescopic work that changes observed in the planet s surface markings are caused by wind-driven redistribution of dust. Suspended dust is known to alter the atmospheric thermal structure and circulation as well as to obscure our ability for remote observation of the planet s surface, especially during the occasional development of larger, planet-encircling dust storms which occur on average once every three Martian years.
Derived from text
Mars Surface; Dust Storms; Electrostatic Charge; Temperature Distribution

20030111287 Arizona Univ., Tucson, AZ, USA
Discovery of a Large Rayed Crater on Mars: Implications for Recent Volcanic and Fluvial Activity and the Origin of Martian Meteorites
McEwen, A.; Turtle, E.; Burr, D.; Milazzo, M.; Lanagan, P.; Christensen, P.; Boyce, J., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent impact craters on the Moon, Mercury, and icy Galilean satellites have produced bright rays extending hundreds or thousands of kilometers from the crater rims. A large rayed crater has never previously been seen on Mars, and it has been assumed that the active aeolian environment would quickly remove the ephemeral ray material. Here we report the discovery of a 10-km diameter crater in the young volcanic plains of Cerberus (SE Elysium Planitia) with rays (apparent in THEMIS IR mosaics) extending more than 800 km. The rays are associated with approx.10(exp 5) to 10(exp 7) secondary craters ranging from 15 to 100 m in diameter. This quantity of secondary craters, if typical, suggests that most small craters seen in NA-MOC images are secondaries. About 75% of the craters superimposed over Athabasca Valles originated from this single impact event. Attempts to date very young surfaces from the density of small craters are limited by the fact that secondary cratering is highly clustered in space and time, increasing the uncertainties by a factor of 30 or more. The 10-km Cerberus crater may be the youngest crater on Mars of this size class, perhaps < 10(exp 6) yrs old. The presence of flow ejecta suggests that ground ice was present at depths of a few hundred meters even in very recent times at this equatorial location. Mars meteorite EET79001 (basaltic glass) has an ejection age of less than 1 Ma and could have originated from this crater.
Derived from text
Mars Surface; Mars Craters; Planetary Craters

20030111288 Centre de Recherches Petrographiques et Geochimiques, Nancy, France
Evidence for High Temperature Condensation of Moderately-Volatile Elements During Chondrule Formation
Libourel, G.; Krot, A. N.; Tissandier, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In our quest to comprehend chondrule formation processes, significant efforts have been placed until recently to unravel the behavior of moderately-volatile elements in chondrules, and notably the factors that control their concentrations in chondrule melts. Amongst these elements, alkalies received much of the attention because of their dual behavior, i.e., lithophile at low temperature, they become volatile at high temperature and/or under reducing conditions, and hence may help to put some valuable constraints on chondrule formation processes. Although recent petrologic studies have suggested that chondrules may have formed in open systems, as shown by zoning of moderately-volatile elements, no consensus exists yet on the extent to which chondrules exchanged and reacted with the surrounding medium, nor on the nature of the reactions involved, i.e., evaporation vs. condensation, and neither on the effects of such interactions on chondrule characteristics. In order to tackle these questions, we report here a systematic study of the petrology of Type I chondrules from unequilibrated ordinary and carbonaceous chondrites. We particularly striven to document glass and high-Ca pyroxene compositions.
Derived from text
Chondrule; Alkalies; Meteoritic Composition; Pyroxenes; Carbonaceous Chondrites

20030111289 Tennessee Univ., Knoxville, TN, USA
New Insights into the Origin of 14053: The Only Basaltic Rock Returned by Apollo 14
Mayne, Rhiannon G.; Taylor, Lawrence A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Apollo 14 Mission brought back a large number of lunar rocks, the majority of which were breccias. Of the four rocks that were believed to be basaltic, 14310 and its pair, 14073, turned out to be our type specimens of melt rocks, at the time, a new concept for the lunar community. The remaining two, 14053 and its small-sized pair, 14072, are unique among the rocks in the lunar collection, in that they possess evidence for being the most reduced of all lunar basalts. It is to the origin of these unusual rocks to which this study is addressed. The sample studied, 14053, has a mass of 251g and is commonly used as an example of a pristine high-Al basalt. Rb-Sr studies yielded a well-defined age of 3.92 0.04Ga; however, when 14053 was reinvestigated by Snyder and Taylor, the Sm-Nd data were determined to be disturbed, indicating that some of the components formed before the 3.92 Ga, Rb-Sr age. This is highly unexpected as Rb-Sr isotope systematics are almost always more easily disturbed then those of the Sm-Nd system. These results led to the hypothesis that 14053 and other Apollo 14 hi-Al basalts actually had an impact-melt origin, with the pre-4.0 Ga ages representing melt rocks that were not reset after impact. Likewise, unique petrographically observed, reduction features also led to questions about its origin. We have revisited these unusual features as they relate to the origin of 14053.
Derived from text
Basalt; Breccia; Impact Melts; Lunar Rocks

20030111290 Wheaton Coll., Norton, MA, USA
Strain Across Ridges on Europa
McBee, J. H.; Hartmann, D.; Collins, G. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Europa's surface is covered with double ridges and more complex ridge sets. Though their specific mode of origin remains mysterious, several studies have shown that many ridges accommodate strike-slip motion and extension. Recently, a few ridges have been recognized which accommodate compression. Strike-slip motion could be driven by shear from diurnal tidal stresses, and may also lead to melting and compression. Since understanding the strain across these ridges is important for examining the way in which they are formed, we have been developing ways to rapidly determine the strain across Europan ridges. This study is motivated by the observation that some ridges which initially appear to have simple strike-slip deformation appear on closer inspection to have variable amounts of offset along the ridge. This appearance could be due to an element of extension or compression in addition to the horizontal shear. Here we present our results from analysis of a few ridges, including a feature in the E17 DISSTR area that exhibits strike-slip and compressional deformation.
Derived from text
Europa; Diurnal Variations; Shear Stress; Melting

20030111291 National Air and Space Museum, Washington, DC, USA
Erasure of First-Order Tributaries Via Climate Change: Lessons for Mars from Earth
Maxwell, Ted A.; Grant, J. A.; Campbell, B. A.; Irwin, R., III; Bourke, M.; Johnston, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since Mariner 9 first imaged fluvial channels on the surface of Mars thirty years ago, one of the continuing problems of its hydrologic history has been the apparent absence of small, first-order tributaries to the large outflow channels and the larger integrated channels of the highlands. Drawing on terrestrial examples from the northeast Sahara, where Quaternary climate has cycled between a savannah and hyperarid environment, the Mars-analogous landscape has been used in the past to promote the efficiency of aeolian processes and the fluvial processes of sapping and headwall erosion. Following up on the work of Haynes more recent work on the landscape of the Sahara has emphasized the role of climate change in sculpting surface features. Although we have yet to determine whether climate change on Mars was monotonic or cyclic during the late Noachian/early Hesperian, the processes may have the same end product. Discussed here are the processes of tributary obscuration based on terrestrial examples of aeolian infilling, landscape lowering and stabilization by development of a lag surface, and planation due to sand sheet formation and bedrock erosion.
Derived from text
Climate Change; Mars Surface; Tributaries; Erosion; Climatology

20030111292 Arizona State Univ., Tempe, AZ, USA
Non-Impact Origin for Nevada's Elko Crater Field
McHone, John F.; Killgore, Marvin; Verish, Robert S.; Roddy, David J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In northern Elko County, Nevada there are nearly 300 rimmed craterlike depressions scattered among the valley floors and walls of McClellan, Susie, and Dorsey Creeks. The best developed and most numerous of these craters lie along the eastern margins of Dorsey Creek s flood plain, locally known as Wieland Flat, in the vicinity of a former stagecoach stopover at Dinner Station. During the 1970's, one of the authors (DJR) flew repeated aerial surveys over a roughly 25 km by 10 km ground area, producing more than 200 overlapping 9-inch format aerial photos of the craters and their surrounding terrain. Flights were reinforced with brief field visits in order to determined general morphology and surface composition. Rim-to-rim diameters vary from less than 5 m to more than 250 m and a maximum depth of about 6 m. Central bowls contain wind-blown silt and mud, and rims are lightly armored with deflation gravels. In 1980, Ketner and Roddy produced a US Geological Survey map suggesting multiple impacts from a meteorite shower as a possible origin for the Elko craters. Since that time, although they were occasionally featured in the popular literature, the craters have remained relatively obscure to public and scientific attention.
Derived from text
Craters; Surface Layers; Sediments; Composition (Property)

20030111293 Harvard Univ., Cambridge, MA, USA
The Initial W-182/W-183 and Hf-182/Hf-180 of the Solar System and a Consistent Chronology with Pb-Pb Ages
Yin, Qingzhu; Jacobsen, Stein B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The utility of the Hf-182 (bar-tau ==13 x 10(exp 6) yr) -W-182 chronometer for early solar system processes is now well established. At the 2002 LPSC meeting we first reported new Hf-W data for chondritic meteorites showing that some crucial data as well as interpretations of Lee and Halliday for chondrites were incorrect. Our results were confirmed by reports of two other groups. This new data imply a much-shorter timescale for the early Solar System evolution and the formation of the Earth s core more consistent with the original conclusions of Harper and Jacobsen. Thus, the chondritic Hf-W evolution is now well established as beginning with epsilon(sub W)(0) = -3.45 +/- 0.25 at the time of origin of the solar system and evolving to -2.2 by 20 Myr and -1.9 +/- 0.20 at present. However, there are a number of iron meteorite data that suggest the existence of initial W lower than those measured for chondrites. If the low epsilon(sub W)(0) of -4 to -5 are correct then we face an embarrassing dilemma of differentiated iron meteorites being older than the primitive chondrites, or we would have to conclude that there is an additional pre-history of 5-10 Myr in primitive chondritic meteorites prior to the closure of the Hf-182 - W-182 system. Such a prolonged early time does not seem reasonable to us. We have therefore initiated a study to resolve this issue.
Derived from text
Tungsten Isotopes; Hafnium Isotopes; Solar System; Chronology; Lead (Metal)

20030111294 Massachusetts Univ., Amherst, MA, USA

Kinematics of a Linear Deformation Belt; the Evolution of Pandrosos Dorsa, Venus

McGill, George E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper reports results of a detailed analysis of Pandrosos Dorsa, a large and complex linear deformation belt in Vinmara Planitia. Pandrosos Dorsa is part of the 'ridge belt plains-fan assemblage' defined from Venera data. More recently, Magellan data have demonstrated that Pandrosos Dorsa consists of both contractional and extensional structures that are in many places about parallel to each other, in contrast to the deformation belts of Lavinia Planitia where the ridge and fracture belts are separate and trending at high angles to each other. The proponents of the directional model for venusian crustal evolution argue that the materials and structures of these deformation belts are older than the widespread regional plains on a global scale.

Derived from text

Deformation; Planetary Crusts; Venus Surface; Fracturing

20030111295 Community Coll. of Rhode Island, Lincoln, RI, USA

Analysis of the Sub-Surface of Alba Patera, Mars Using Pit Craters

Zuromski, K. K.; Jager, K. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Alba Patera is located on the Tharsis rise at the edge of the northern lowlands. Alba is interpreted to have a history of both plinian-style (explosive) eruptions producing pyroclastic flows and ash deposits, as well as effusive mafic eruptions These eruptions formed the edifice of the volcano. A layer of atmospheric dust composed of silicates, oxides, and sulfates covers most of the surface on Mars. Therefore, both basalt and less consolidated ash and dust are expected on Alba. Pit chains, or catenae, are found on the southern and eastern flanks of Alba within some of the grabens. These pits were formed by either the collapse of overlying rock material into a void space created by a gas cavity formed at the top of a stalled dike, or by the collapse of a tension fracture opening underground. The collapse of these pits creates unaltered cross-sections of the Martian crust, giving a threedimensional perspective into the uppermost layers of Alba Patera. This will ultimately give us a better understanding of the surface of Mars.

Author

Mars Volcanoes; Mars Surface; Image Analysis

20030111296 Lunar and Planetary Inst., Houston, TX, USA

Olympus Mons Aureole Deposits and Basal Scarp: Structural Characteristics and Implications for Flank Failure Scenarios

McGovern, P. J.; Smith, J. R.; Morgan, J. K.; Bulmer, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Olympus Mons is an immense (23 km height above base, 600-800 km wide) volcano located to the northwest of the Tharsis Rise on Mars. The volcanic edifice is partially bounded by an escarpment of height up to 10 km, known as the Olympus Mons basal scarp. Lobate deposits with rugged morphology (the Olympus Mons aureole deposits, abbreviated as OMAD) extend outwards from the base of the scarp for hundreds of kilometers, with greatest extents and widths to the northwest of the edifice. Formation of the OMAD has been attributed to mass movements related to failure of portions of the flanks of Olympus Mons or to flows of material (perhaps subsequently eroded) derived and emplaced locally. Formation of the basal scarp has been attributed to thrust faulting, to the coalescence of mass-movement-related headscarps, or as a consequence of subglacial volcano growth. While the proximity of scarp segments to aureole lobes is suggestive of a causal relationship, the limited resolution of available datasets has made it difficult to conclusively prove such a link. However, new high resolution datasets, including Mars Orbiter Laser Altimeter (MOLA) topography, offer the potential for vital new insights into the structure and evolution of the Olympus Mons edifice, scarp and aureole. Thus, we examine the structure of the basal scarp and OMAD, as revealed by MOLA topography, from the perspective of evaluation of flank failure scenarios.

Derived from text

Coalescing; Failure; Structural Design; Mars Surface; Deposits; Mars Volcanoes

20030111297 Brown Univ., Providence, RI, USA

Stratigraphy of Young Deposits in the Northern Circumpolar Region, Mars

Kreslavsky, M. A.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

High-resolution MGS MOC images showed that all terrains in the north polar region of Mars lack fresh impact craters and, hence, are geologically young. Malin and Edgett noted 'the relatively thin, plain-covering materials observed in the northern plains (and southern highlands at comparable latitudes)' and suggested that they are 'the result of latitude depended processes'. Earlier we noted the latitudinal trend of subkilometer-scale topographic roughness and suggested that smoothing at high latitudes is caused by a climate-controlled high-latitude surface layer (HLL) having a specific decameter-scale surface pattern. A specific dissected pattern interpreted as a result of desiccation of a several-meter-thick ice-rich layer has been observed in a latitude band at the peripheral part of the smoothed area. Recently, a high concentration of hydrogen has been detected by Odyssey spacecraft at high latitudes. These measurements refer to an uppermost layer of approx. 1 m thick. Thus, the ice in the HLL material is responsible for the detected high ice concentration. To understand the properties and the origin of the HLL, we are carrying out a systematic survey of the textures and features observed in the HLL in the northern hemisphere of Mars in the high-resolution MGS MOC images. In the northern hemisphere the HLL covers homogeneous, topographically smooth northern plains. These 'boring' geological settings allow us to focus on intrinsic characteristics of the HLL itself, in contrast to the southern hemisphere, where in each place we encounter steep topography and a unique set of geological settings. Here we report our observations on stratigraphic relationships between the HLL and other circumpolar deposits and present an initial synthesis.

Author

Stratigraphy; Mineral Deposits; Planetary Geology; Mars (Planet)

20030111298 NASA Ames Research Center, Moffett Field, CA, USA

Mars: Always Cold, Sometimes Wet?

Lee, Pascal; McKay, Christoper P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A synthesis of a diverse suite of observations of H2O-related landforms that are possible Mars analogs from terrestrial polar regions (Devon Island in the Arctic; the Dry Valleys of Antarctica) put into question any requirement for extended episode(s) of warm and wet climate in Mars past. Geologically transient episodes of localized H2O cycling, forced by exogenic impacts, enhanced endogenic heat flow, and/or orbit-driven short-term local environmental change under an otherwise cold, low pressure (=10(exp 2) mbar) global climate, may be sufficient to account for the martian surface's exposed record of aqueous activity. A Mars that was only sometimes locally warm and wet while remaining climatically cold throughout its history is consistent with results (difficulties) encountered in modeling efforts attempting to support warm martian climate hypotheses. Possible analogs from terrestrial cold climate regions for the recent gully features on Mars also illustrate how transient localized aqueous activity might, under specific circumstances, also occur on Mars under the present frigid global climatic regime.

Author

Climatology; Cycles; Drying; Mars Environment; Mars Surface; Planetary Geology

20030111300 Kautz Environmental Consultants, Inc., Reno, NV, USA

Promoting a Well-established Study Site for Mars Analog and Desert Process Studies

Metzger, S. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Extensive spatial data sets which characterize desert surfaces are herein made available for collaborative investigations into arid region surficial processes, dust devil behavior, and Mars analogs. This work continues a long-term research program into the fundamental near-surface processes of dust devil vortices, as well as the aeolian erosion susceptibility of diverse natural surfaces conducive to dust devil generation. Such detailed research provides important insight to Martian conditions that otherwise fall below the resolution of spacecraft investigations to date. Furthermore, because every analog has its limits, the field program clarifies bounds in the application of terrestrial lessons to Martian processes. Finally, the accessibility of the Las Vegas area is one of many logistical advantages to this site.

Derived from text

Mars Environment; Dust; Deserts; Wind Erosion

20030111301 Vermont Univ., Burlington, VT, USA

Siderophile Elements in Metal Segregated from Partially Molten Ordinary Chondrite: Implications for Early Differentiation Processes

Rushmer, T.; Humayun, M.; Campbell, A. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Core formation scenarios growing planetesimals include a variety of possible segregation mechanisms for separating metal from silicate. Metal segregation can occur in solid or partially molten silicate body and the presence of deformation may both enhance kinetics and efficiency of the physical segregation process. To explore the relationship between core formation scenarios and geochemistry, deformation experiments have been conducted the Kernouve H6 ordinary chondrite at different stages of melting. The physical segregation Fe-rich metallic liquids from silicate during the partial melting of chondrites imparts a geochemical signature on the composition of the resulting metallic liquids, as evidenced by the diverse compositions of iron meteorites. These chemical signatures vary according to parent body composition, segregation mechanisms and the degree to which early core-forming liquids (S-rich, and possibly O-rich) were extracted. We present results on siderophile concentrations metal dynamically segregated during partial melting and deformation of an ordinary chondrite. Geochemical analyses of metal quench in several experimental charges and on metal grains the Kernouve H6 starting material have been performed by LA-ICP-MS using the methods

Derived from text

Chondrites; Silicates; Protoplanets; Geochemistry

20030111302 Tokyo Univ., Japan

Mineralogical Comparison of Y000593 with Other Nakhlites: Implications for Relative Burial Depths of Nakhlites

Mikouchi, T.; Koizumi, E.; Monkawa, A.; Ueda, Y.; Miyamoto, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nakhlites are martian clinopyroxenites with minor amounts of olivine and mesostasis. All the known nakhlites show similar mineralogy to each other as well as common crystallization and ejection ages and are believed to have formed in the same igneous body on Mars. The discovery of new nakhlites could offer substantial information to better understand the formation condition and geological setting of these unique martian meteorites. In this abstract, we present mineralogy and petrology of Y000593, a new nakhlite from Antarctica, and compare with other nakhlites to understand relative burial depths of each nakhlite.

Derived from text

Nakhlites; Mineralogy; SNC Meteorites

20030111303 NASA Johnson Space Center, Houston, TX, USA

Shock Heating and Subsequent Cooling of Basaltic Shergottites: The Cases for QUE94201 and Dhofar 378

Mikouchi, T.; McKay, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Shock metamorphism is one of the most fundamental processes in the history of Martian meteorites. Especially, shergottites experienced strong shock effects (>30 GPa) most likely when they were ejected from Mars. 'Maskelynitization' of plagioclase and formation of shock melts are major effects due to this severe shock. QUE94201 (QUE) and Dhofar 378 (DHO) are basaltic shergottites that are mainly composed of pyroxene and plagioclase glass. These two shergottites suffered severe shock, which generated abundant impact melt and vesiculated flow textures. In spite of similar degrees of shock between two meteorites, they are distinct in several mineralogical aspects. In this abstract, we discuss their differences to understand differences in their shock heating and subsequent cooling histories.

Derived from text

Shergottites; Shock Heating; Basalt; Cooling; Mineralogy; Impact Melts

20030111304 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Admittance Survey of Type 1 Coronae on Venus: Implications for Elastic Thickness

Hoogenboom, T.; Smrekar, S. E.; Anderson, F. S.; Houseman, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Coronae are volcano-tectonic features on Venus which range from 60km to 2600km and are defined by their nearly circular patterns of fractures. Type 1 (regular) coronae are classified as having >50% complete fracture annuli. Previous work has examined the factors controlling the morphology, size, and fracture pattern of coronae, using lithospheric properties, loading signature and geologic characteristics. However, these studies have been limited to Type 2 (topographic) coronae (e.g. coronaes with <50% fracture annuli), and the factors controlling the formation of Type 1 coronae remain poorly understood. In this study, we apply the methodology of to survey the admittance signature for Type 1 coronae to determine the controlling parameters which govern Type 1 coronae formation.
Author
Planetary Geology; Planetary Crusts; Signature Analysis; Signatures; Wavelet Analysis; Venus (Planet); Elastic Properties

20030111305 Max-Planck-Inst. fuer Chemie, Mainz, Germany
A NanoSIMS Study of Titanium-Isotopic Compositions of Presolar Corundum Grains
Hoppe, P.; Nittler, L. R.; Mostefaoui, S.; Alexander, C. M. O'D.; Marhas, K. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A rare but important constituent of presolar dust in primitive meteorites is corundum (Al2O3). Most of these grains are believed to originate from red giant branch (RGB) and asymptotic giant branch (AGB) stars as evidenced from O-isotopic signatures and abundances of now extinct (26)Al. Models of RGB/AGB stars with initially solar O predict lower than solar (18)O/(16)O and higher than solar (17)O/(16)O in the envelope, a result of the dredge-up of matter that experienced H burning. A detailed comparison between the grain data and model predictions suggests that parent stars with different initial compositions (metallicities) must be considered, i.e., the grains carry not only the signature of stellar nucleosynthesis but also that of the Galactic chemical evolution (GCE). Other elements that clearly show imprints of stellar nucleosynthesis and GCE in their isotopic patterns are Si and Ti in presolar SiC. Presolar Al2O3 grains generally have lower Ti concentrations than presolar SiC from AGB stars, making precise isotopic measurements more difficult. Consequently, only a few presolar Al2O3 grains have been previously studied for Ti-isotopic compositions and only very limited information on the GCE and nucleosynthesis of the Ti isotopes can be inferred from the Al2O3 data. Here, we report new Ti-isotopic data for four presolar Al2O3 grains, 1-4 m in size, from ordinary and enstatite chondrites, measured with the NanoSIMS 50 ion microprobe at the Max-Planck-Institute for Chemistry. These data allow to put additional constraints on the GCE of Ti isotopes and to test theoretical predictions of Ti-isotopic compositions in AGB stars.
Author
Titanium Isotopes; Aluminum Oxides; Stellar Composition; Enstatite; Chondrites

20030111306 Washington Univ., Saint Louis, MO, USA
Titanium and Oxygen Isotopic Compositions of Sub-Micrometer TiC Crystals Within Presolar Graphite
Stadermann, F. J.; Bernatowicz, T.; Croat, T. K.; Zinner, E.; Messemger, S.; Amari, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Low-density presolar graphite spherules from the Murchison (CM2) density separate KE3 were found to contain large numbers of internal TiC crystals which range in size from 30 to 500 nm. We have studied one such graphite grain in great detail by successive analyses with SEM, ims3f SIMS, TEM and NanoSIMS. The NanoSIMS measurements indicated C and O isotopic gradients from center to rim of the grain and showed variations of O isotopic compositions among the internal TiC crystals that are distinct from those of the surrounding graphite matrix. The results of the O isotopic measurements are summarized. We have now extended this NanoSIMS study to the measurement of all 5 Ti isotopes in individual TiC subgrains.
Derived from text
Titanium Isotopes; Oxygen Isotopes; Titanium Carbides; Crystals; Graphite; Isotopic Labeling

20030111307 Los Alamos National Lab., NM, USA
Regional Elemental Abundances Within South Pole-Aitken Basin as Measured with Lunar Prospector Gamma-Ray Spectrometer Data
Lawrence, D. J.; Pieters, C. M.; Elphic, R. C.; Feldman, W. C.; Gasnault, O.; Maurice, S.; Prettyman, T. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

South Pole-Aitken (SPA) basin is one of the largest impact basins in the solar system and is a target of intense study since

it is thought that SPA basin excavated deep into the lunar crust and possibly even the mantle. These conclusions are supported by the observed mafic and thorium composition anomalies seen across the entire basin. One of the major goals of lunar and planetary science has been to measure and understand the composition of the non-mare materials within SPA basin. It is expected that this information will help to increase our understanding of the formation and differentiation processes that occurred early on the Moon. We now have information from a fully reduced Lunar Prospector Gamma-ray Spectrometer (LP-GRS) dataset so we can evaluate the broad compositional differences within SPA basin. Here we present the results of a study where we have examined the abundances for both mare and non-mare materials within SPA basin using the LP-GRS data. In addition, we compare these results to the abundances that are seen in the anorthositic highlands to the north of SPA basin.
Derived from text
Lunar Crust; Lunar Prospector; Mineralogy; Structural Basins

20030111308 Los Alamos National Lab., NM, USA
Multispectral Thermal Imager Observations of the Moon During Total Eclipse
Lawson, S. L.; Rodger, A. P.; Henderson, B. G.; Bender, S. C.; Lucey, P. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar eclipse temperature measurements are sensitive to rock populations because surfaces with abundant exposed rock have much higher mean thermal inertias than surfaces dominated by fine powders. When the Moon passes into the Earth s shadow, the abrupt reduction in insolation causes surface elements to cool at rates which are functions of their thermal inertia. The rock population is a function of the exposure of a surface unit, originally composed of solid igneous rock or impact melt, to the impact flux of modest sized projectiles. With time, a competent surface such as a lava flow field or an impact melt sheet will be comminuted by the impact flux reducing the ratio of coarse to fine particles. In principle, thermal measurements taken during lunar eclipse can be used as a measure of the relative age of surface units.
Derived from text
Eclipses; Temperature Measurement; Thermal Emission; Lunar Eclipses; Image Analysis

20030111309 Lancaster Univ., UK
Heating and Cooling of Rocks on Mars: Consequences for Weathering
Leask, H. J.; Wilson, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Focusing on rock surface temperatures rather than atmospheric temperatures, we show that rates of surface and near-surface rock temperature variation on Mars due to sudden obscuration of the sun by topographic obstacles, especially at high latitudes, may be large enough to cause mechanical weathering by exfoliation of granular disintegration.
Author
Heating; Cooling; Rocks; Mars Surface; Weathering

20030111310 Tennessee Univ., Knoxville, TN, USA
A Wet, Dry, or Hot Gusev Crater?: Using THEMIS and MER to Test Depositional Hypotheses
Milam, K. A.; McSween, H. Y., Jr.; Moersch, J. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The unifying theme of the Mars Exploration Program is the search for evidence of past or present liquid water. The underlying assumption behind this is that areas on Mars exposed to liquid water would have had the highest probability of capturing and preserving biomarkers. As a part of this program strategy, two Mars Exploration Rovers (MERs) will launch toward Mars in 2003, with early 2004 landings. Each will carry the Athena science package with instruments suitable for gathering evidence of ancient water on Mars. Thus, one of the considerations in landing site selection has been sites showing possible evidence for past water.
Derived from text
Mars Exploration; Water; Hypotheses; Landing Sites; Probability Theory

20030111311 Tennessee Univ., Knoxville, TN, USA

THEMIS Characterization of the MER Gusev Crater Landing Site

Milam, K. A.; Stockstill, K. R.; Moersch, J. E.; McSween, H. Y., Jr.; Tornabene, L. L.; Ghosh, A.; Wyatt, M. B.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Gusev crater is a 160 km diameter complex impact structure (at 14.64degS 175.36deg E in the Aeolis Quadrangle) that has been proposed as a candidate landing site for one of the Mars Exploration Rovers (MER). The crater lies at the terminus of Ma'adim Vallis, a 900 km fluvial system that dissects the martian highlands, and at the southern highland/northern lowland transition. Others have interpreted Gusev as the depocenter for the Ma adim Vallis fluvial lacustrine system, making it a site for potential preservation of hydrological activity and possible biomarkers. Although much suggests an ancient lacustrine environment at Gusev, no unequivocal evidence has been found to confirm the proposed hypothesis. With this in mind, we take a first look at new data from the Mars Odyssey Thermal Emission Imaging System (THEMIS), supplemented by data from the Thermal Emission Spectrometer (TES), Mars Orbiter Camera (MOC), and Mars Orbiter Laser Altimeter (MOLA) to characterize the geology of Gusev crater.

Derived from text

Landing Sites; Highlands; Geology; Mars Surface; Mars Exploration

20030111312 Arizona Univ., Tucson, AZ, USA

The Formation of Columnar Joints on Earth and Mars

Milazzo, M. P.; Keszthelyi, L. P.; McEwen, A. S.; Jaeger, W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is hypothesized that volcanic eruptions on Mars may trigger major outbursts of liquid water. Since the lava and the water will follow the same paths, it is plausible that water flowed over some Martian lava flows while they were hot. Such lava-water interactions should produce morpohologic features such as columnar jointing, hyaloclastites, and possibly pillows. The size and frequency of such features are an indication of the amount of water interacting with the lava. It would be highly desirable to estimate the volume of water that flowed over Martian lava flows that exhibit these features. In this abstract we focus on the formation of c olumnar jointing and estimating the cooling rate by water necessary to produce various column sizes. From the estimated cooling rate, we can estimate the flux of water, which will be an indication of the minimum flux of water across the lava flow. It will be possible to apply this model by looking at the jointing within Martian lava flows with very high resolution imaging from rovers, aerial vehicles, and possibly even from orbit. Even where the joints themselves are not visible, the size of blocks falling from cliffs of frozen lava provide a good sense of the spacing of the joints.

Derived from text

Mars Volcanoes; Lava; Water; Planetary Geology; Fluid Flow; Actuators

20030111313 NASA Johnson Space Center, Houston, TX, USA

Impact Melting of Ordinary Chondrite Regoliths and the Production of Fine-grained Fe(sup 0)

Hoerz, Friedrich; Cintala, Mark J.; See, Thomas H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The detailed study of individual lunar soil grains provides evidence that the major optical properties of the lunar surface are primarily related to the production of fine-grained (< 20 nm, super-paramagnetic) Fe-particles in agglutinitic impact melts and to iron-rich vapor deposits on the surfaces of individual grains. These Fe-rich materials are derived from oxidized species due to high post-shock temperatures in the presence of solar-wind derived H2; part of the Fe-rich grain surfaces may also be due to sputtering processes. Identical processes were recently suggested for the optical maturation of S-type asteroid surfaces, the parent objects of ordinary chondrites (OCs). OCs, however, do not contain impact-produced soil melts, and should thus also be devoid of impact-triggered vapor condensates. The seeming disparity can only be understood if all OCs resemble relatively immature impact debris, akin to numerous lunar highland breccias. It is possible to assess this scenario by evaluating experimentally whether impact velocities of 5- 6 km/s, typical for the present day asteroid belt, suffice to produce both impact melts and fine-grained metallic iron. We used 125-250 m powders of the L6 chondrite ALH85017. These powders were aliquots from fines that were produced by collisionally disrupting a single, large (461g) chunk of this meteorite during nine impacts and by subjecting the resulting rubble to an additional 50 impacts. As a consequence, the present shock-recovery experiments employ target materials of exceptional fidelity (i.e., a real chondrite that was impact pulverized). The target

powders were packed into tungsten-alloy containers to allow for the potential investigation of freshly produced, fine-grained iron and impacted by stainless-steel and tungsten flyer plates; the packing density varied between 38 and 45% porosity. Peak pressures ranged from 14.5 to 67 GPa and were attained after multiple reverberations of the shock wave at the interface of the silicate powder and metal container. Pressures in the 50 to 70 GPa range should be fairly typical for asteroid impacts at approx. 5-6 km/s, yet we note that these pressures refer to those at the projectile/target interface only and that most crater ejecta on OC parent-bodies will have experienced much lower stresses.
Author
Impact Melts; Impact Tests; Lunar Soil; Chondrites; Iron Oxides; Fines; Asteroid Collisions

20030111314 Boeing Co., Seattle, WA, USA
Material Motions and Ejection Velocities for Impacts in Porous Targets
Housen, K. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many asteroids and some satellites have remarkably low densities, in some cases as low as approx. 1 gm/cu cm, as demonstrated by spacecraft and telescopic observations. The interiors of these objects may be comprised of as much as 70% void space. In contrast, much of our empirical knowledge of impact cratering is based on experiments in materials with only moderate porosity, about 35% or less. Highly porous materials might respond much differently to impacts because of the energy expended in irreversible compaction of pore spaces and the scattering of the shock when it encounters large voids. Experiments conducted over the past few years have demonstrated an interesting characteristic of crater formation in highly porous materials. Small craters are formed with the usual substantial deposit of ejecta surrounding the crater. On the other hand, large impacts form craters without ejecta blankets. This unusual behavior was explained as follows. Whereas craters in moderately porous materials, like sand, form by shearing and excavation, impacts into highly porous materials form mostly by crushing and permanent compaction. Ejection velocities should be relatively low in porous materials because of the rapid decay of the peak stress as the shock proceeds from the impact point. The slow ejecta would not be able to escape from the crater. Even with this 'fall back' of ejecta, a crater is still formed because of the volume created by compaction. This explanation was based solely on observations of the final crater and ejecta deposit. The purpose of this report is to summarize recent experimental observations of the dynamics of crater growth in porous materials. These experiments largely support the explanation given above, but show some interesting differences as well.
Author
Cratering; Asteroids; Porous Materials; Ejecta; Velocity

20030111315 California Inst. of Tech., Pasadena, CA, USA
Experimental Divalent Element Partitioning Between Anorthite and CAI Melt
Miller, S. A.; Burnett, D. S.; Asimow, P. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A quantitative description of crystal-liquid trace element partitioning is critical to understanding the igneous differentiation history of the terrestrial planets. Anorthitic plagioclase is the type mineral of terrestrial planet crusts, and for the Moon, specifically, quantitative understanding of trace element partitioning in anorthite is key to testing models of the lunar magma ocean.
Derived from text
Trace Elements; Crystals; Magma; Feldspars; Crusts; Minerals

20030111316 Virginia Univ., Charlottesville, VA, USA
Tongue Ridges and Rumpled Crater Floors in Mid-Southern-Latitude Martian Craters
Howard, A. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At the base of a few, mostly south-facing crater slopes in mid-southern latitudes tongue-like concave depressions with sharp, elevated bounding ridges extend a short distance onto the crater floor. These are almost universally associated with superjacent recently-gullied crater walls of enigmatic origin. These ridge-bounded depressions resemble terminal moraines of terrestrial glaciers. They are sometimes associated with lineated or rough-textured crater floors. Individual tongues are small, ranging from 30-500m in width, but they generally abut one another, merging headwards and presenting an overall scalloped planform. The tongues extend a maximum of a few hundred meters into the crater interior. In some craters a sharp terminal

ridge extends around the base of the crater with negligible scalloping. The surface contained behind the bounding ridge is generally smooth and broadly concave. In some cases the tongue interior and bounding ridge appear to crest a broad ridge extending into the crater, but in many cases the interior concave surface is depressed below the adjacent crater floor by as much as 100m. The larger tongues are generally associated with alcoves in the crater wall, which also commonly serve as sources for superjacent gullied aprons, but the latter are usually superimposed on the older tongues.
Author
Mars Surface; Mars Craters; Slopes; Ridges; Planetary Geology

20030111317 Wyoming Univ., Laramie, WY, USA
Mutual Event Observations of Hot Spots on Io
Howell, R. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Series of mutual events, where one Galilean satellite occults another, occur every six years as Earth passes through the equatorial plane of Jupiter. These events provide the highest spatial resolution observations of Io's volcanic hot spots obtainable from Earth. A new series of events is now underway, with the first observations having been obtained at the Wyoming Infrared Observatory (WIRO) on Dec. 24, 2002 UT. Beyond the results which are be obtained from the new series, improvements to the ephemerides of the Galilean satellites (resulting from the Galileo mission) now make it possible to better interpret data from previous series. Several past series have coincided with brightenings of the Loki hot spot, and those observations can help address the issue of the nature of the brightenings at Loki. Two models of the brightenings have been proposed; episodic lava flows spreading over the caldera, or episodic disruption of the surface of a lava lake, with the latter one currently being the favored model. A reanalysis of the existing data, using the new ephemerides, is now under way and will be presented along with any new observations obtained in the ongoing event series.
Author
Io; Volcanoes; Infrared Astronomy; Space Observations (From Earth); Occultation

20030111318 Academy of Sciences (USSR), Moscow, USSR
Formation of Unipolar Arcs Under Meteorite Action
Nikitushkina, O. N.; Ivanov, L.I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the problems on development of advanced long terms functioning space vehicles and orbital stations is protection of constructions and individual elements against influence of meteorite flows and various particles of artificial origin, so-called space dust. The impacts of natural and artificial particles on the surface of spaceships may result in the change of both surface and bulk properties of structural materials. The results of laboratory simulation experiments on the high speed collision of hard microparticles with metal target show that both craters and so-called micro-crater fields were created. The formation of the micro-crater fields is explained by dissipation of the energy of shock waves arising while collision of supersonic particle with target material which takes place on the structural and phase inhomogeneities of the surface layer. It has been marked that the formation of a crater is accompanied by emission of high-temperature and density plasma which being distributed along the surface of the sample can also damage the surface of the material. The present work is devoted to investigation of near-crater regions found on the surface of aluminum specimens exposed in the open space.
Derived from text
Meteorites; Microparticles; Metallography; Aerospace Environments; Meteorite Collisions; Arc Discharges

20030111319 Washington Univ., Seattle, WA, USA
Petrology of NWA 1460: A Baddeleyite-bearing Shergottite Paired with NWA 480
Irving, A. J.; Kuehner, S. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A new 70.2 gram basaltic shergottite acquired in Morocco in December 2001 is a complete square-ellipsoidal stone (47 mm by 34 mm by 27 mm) with a very fresh, black fusion crust (Figure 1). The results reported here were obtained on small fragments. The analyzed material was broken from near one end of the stone, and includes portions of the crystalline interior and the fusion crust. This very fresh sample is coarse grained with a subophitic to intersertal texture (Figures 2, 3), and is composed dominantly of large grains of pale yellow-green low- Ca pyroxene (up to 4 mm) with grey, glassy maskelynite laths

(1 mm). Accessory phases are merrillite, Cl-F-bearing apatite, exsolved Fe-Ti oxides (ilmenite lamellae in titanomagnetite), ilmenite, chromite, pyrrhotite, K-Al-Si-rich glass, silica and baddeleyite.
Derived from text
Shergottites; Petrology

20030111320 NASA Johnson Space Center, Houston, TX, USA
The Optical Properties of Nanophase Iron: Investigation of a Space Weathering Analog
Noble, S. K.; Pieters, C. M.; Keller, L. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-11763; NGT9-66; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is known that space weathering, in particular the nanophase iron (npFe(sup 0)) created via vapor and/or sputter deposition, has distinct and predictable effects on the optical properties of lunar soils. In addition to the attenuation of absorption bands, weathering introduces a characteristic continuum which is controlled by the amount of npFe(sup 0) present. The shape of this continuum may also be controlled by the size of the npFe(sup 0) grains. It is thought that small npFe(sup 0) grains result in reddening, while larger grains only darken the material. To investigate this phenomenon we have created a lunar weathering analog by impregnating silica gel powders with npFe(sup 0) following the methods presented.
Derived from text
Iron; Optical Properties; Space Weathering; Nanoparticles; Analogs; Lunar Soil

20030111321 Smithsonian Institution, Washington, DC, USA
Dichotomy Boundary at Aeolis Mensae, Mars: Fretted Terrain Developed in a Sedimentary Deposit
Irwin, R.P., III; Watters, T. R.; Howard, A. D.; Maxwell, T. A.; Craddock, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Situated near the martian equator at the crustal dichotomy boundary, Aeolis Mensae provides a pristine example of fretted terrain development without the younger landforms attributed to ice. We examined an area bounded by 10oS, 10oN, 120oE, and 150oE, adjacent to the cratered and dissected area described by Irwin and Howard [7]. Here we present evidence for a compositional difference between the Aeolis Mensae and the adjacent highland crust, and we discuss the interaction of fluvial valley networks with the dichotomy boundary in this region. Our observations indicate that Aeolis Mensae fretted terrain developed in a thick sedimentary deposit. Sedimentary layers were emplaced and eroded as fluvial activity declined, with minimal influence from highland valley networks.
Derived from text
Mars Surface; Landforms

20030111322 NASA Johnson Space Center, Houston, TX, USA
The Kaidun Meteorite: Where Did It Come From?
Ivanov, Andrei; Zolensky, Michael; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): RFBR-01-05-64239; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Kaidun meteorite, which fell on 3.12.1980 at lat. 15 deg N, long. 48.3 deg E, holds a special place in the world meteorite collection. Kaidun is characterized by an unprecedentedly wide variety of meteorite material in its makeup. The high degree of variability in this meteorite s material is evidenced by the richness of its mineral composition - nearly 60 minerals and mineral phases have been identified in Kaidun, including several never before found in nature, such as florenskiite FeTiP, the first known phosphide of a lithophilic element.
Author
Meteorite Parent Bodies; Meteoritic Composition; Mineralogy; Meteorites

20030111324 Arizona Univ., Tucson, AZ, USA
The Main Belt and NEA Size Distributions: Linked Collisional and Dynamical Evolution
O'brien, D. P.; Greenberg, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The size distribution of the main belt is governed by collisional evolution as well as by the noncollisional removal of

bodies due to the combination of radiation forces and resonances. The NEA size distribution is governed in part by the size distribution of the main belt, it's primary source, but differs somewhat from the main belt due to the size dependent processes which deliver asteroids from the main belt to nearEarth space. These two size distributions provide a powerful constraint on any model of asteroid collisional evolution and NEA delivery. Additional constraints are provided by the cratering records on observed asteroids, such as Gaspra, Ida, Mathilde, and Eros, and by the cosmic ray exposure (CRE) ages of meteorites, which indicate that metersized bodies have collisional lifetimes on the order of 10 Myr or more in the main belt. A collisional evolution model for the main belt can fit most of these constraints with reasonable parameter choices. In addition, our results show that noncollisional removal processes, such as the Yarkovsky effect, are not strong enough to significantly alter the cratering records on asteroids (i.e. incapable of causing a significant depletion in small craters, as seen on Eros).
Derived from text
Size Distribution; Asteroid Collisions; Near Earth Objects; Cosmic Rays; Asteroid Belts

20030111326 Washington Univ., Saint Louis, MO, USA
TEM Study of Internal Crystals in Supernova Graphites
Croat, T. K.; Bernatowicz, T.; Stadermann, F. J.; Messenger, S.; Amari, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our coordinated TEM and isotopic study of ten different supernova (SN) graphite spherules from the KE3 size separate of the Murchison meteorite has revealed the presence of many internal crystals, mostly titanium carbides (TiCs), which were accreted during the graphite growth [1]. The morphology and chemical composition of the internal grains indicate that these formed first, underwent variable amounts of weathering, and were finally incorporated into the graphite during its growth. The micrometersized graphites were apparently effective at capturing previously formed grains (some graphites contained hundreds of grains). These graphites thus acted as a time capsules that preserved the morphology and isotopic and chemical compositions of encapsulated grains formed at earlier times and higher temperatures.The KE3 graphite spherules were mounted on gold foil, characterized in the SEM, and then analyzed for C, O, and Si with a Cameca IMS3f ion probe. After isotopic characterization, graphites with O and/or Si compositions indicative of a SN origin [2] were picked from the mount, embedded in resin, and sliced with an ultramicrotome. The 70 nm thick slices were retrieved on holey carbon-coated copper TEM grids and examined in a JEOL 2000FX analytical TEM equipped with a NORAN Energy Dispersive X-ray Spectrometer (EDXS).
Derived from text
Graphite; Spherules; Supernovae; Isotope Ratios

20030111327 University of Southern Queensland, Toowoomba, Australia
Isopach Mapping of Lunar Basalts in the Northern Oceanus Procellarum Region, Using Clementine Data
Jackson, Noel W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analysis of Clementine remote sensing data permits new observations and therefore results to be obtained of basalt flow stratigraphy and underlying morphology and thus the geological evolution of the Moon. In particular the northern section of Oceanus Procellarum contains numerous impact craters that have penetrated the basalt to different depths, providing natural probes for estimating the number and thickness of flows. These estimates when mapped allow an understanding of the underlying morphology.
Author
Mapping; Lunar Surface; Basalt; Lunar Maria

20030111328 Johns Hopkins Univ., Laurel, MD, USA
Eros Spectral Properties and Geologic Processes from Combined NEAR NIS and MSI Data Sets
Izenberg, N. R.; Murchie, S. L.; Bell, J. F., III; McFadden, L. A.; Wellnitz, D. D.; Clark, B. E.; Gaffey, M. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We improve and extend the effective spectroscopic dataset for Eros acquired by the Near Earth Asteroid Rendezvous (NEAR) Shoemaker spacecraft to better understand the properties and geologic processes of the asteroid. We improve the Near Infrared Spectrometer (NIS) calibration by remediation of internally scattered light and extend its effective spectral range from a shortest wavelength of 812 nm to 754 nm by deriving a 'pseudo channel' for NIS at 754 nm using Multispectral Imager

(MSI) Eros approach color maps. We synthesize a 3127-spectrum high-resolution (footprint sizes from 213x427 m to 394x788 m) northern hemisphere dataset with the improved calibration and expanded wavelength coverage to investigate global and localized spectral variation with respect to mineralogy, composition, and space weathering of Eros.
Author
Asteroids; Near Earth Objects; Near Earth Asteroid Rendezvous Mission; Mapping; Infrared Spectra

20030111329 NASA Johnson Space Center, Houston, TX, USA
Shades of Grey: Iapetus' Secrets Aren't Just Black and White
Jarvis, K. S.; Barker, E. S.; Vilas, F.; Owen, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Until the Cassini mission flies to the Saturnian satellite Iapetus, we are limited to ground-based data and Voyager I and II flyby data to puzzle together the secrets of this moon that displays extreme albedo contrasts. Iapetus' leading side is carbon black with an albedo of 0.081; its trailing side is brilliant ice with an albedo of 0.41. Very few moderate-resolution visible/near IR spectra of Iapetus exist. New spectra of both the leading and trailing sides covering a wavelength range of 0.575 - 1.03 micron were taken in 2000. The new leading side spectra fail to match spectra of either Vilas et al. or Bell et al. in both inflections and slope (where slope is defined here as change in reflectance with changing wavelength). The new spectra do, however, appear to match Buratti et al.'s spectrum of the leading side.
Author
Iapetus; Infrared Astronomy; Infrared Spectra; Visible Spectrum

20030111330 Fernbank Science Center, Atlanta, GA, USA
Schiaparelli Basin: Crater Count Chronology and Geologic Evolution of an Ancient Martian Impact Structure
Jaret, S. J.; Crane, A. N.; Albin, E. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Schiaparelli is a 470-km diameter impact structure found in eastern portion of the Terra Meridiani region of Mars. In this investigation we seek to map the distribution of geomorphic units within and immediately about this impact structure. In conjunction with our ongoing mapping efforts, cratering statistics were utilized in order to formulate a geologic history depicting the timing for the emplacement of various map units. Martian basins, such as Schiaparelli, are of significant importance for several reasons: 1) large impact basins excavate basement rock that would not otherwise be exposed at the surface of the planet, 2) basin ejecta serve as an important stratigraphic marker within the cratered uplands, 3) exhumed plutonic features (e.g., dikes) may be associated with rich hydrothermal ore deposits, and 4) they may have served as depositional sinks for layered (lacustrine?) deposits.
Author
Mars Surface; Structural Basins; Geomorphology; Mars Craters; Planetary Evolution; Planetary Geology

20030111331 Tokyo Univ., Japan
Oxygen Isotopes in Isolated and Chondrule Olivines of Murchison
Jabeen, I.; Hiyagon, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Olivine in carbonaceous chondrites is one of the dominant components of chondrules and occurs as isolated grains in matrix as well. The origin of such isolated grains is still under debate whether these are condensates or crystallized from chondrule melts. Only a few oxygen isotope studies have been made in recent decade to understand the origin of such isolated grains in CI and CO chondrites. Murchison is one of the most studied CM with respect to oxygen isotopes. We choose Murchison to carry out extensive chemical and isotopic studies on such isolated olivine grains and chondrule olivines to look at their origin and formation processes. We conducted major and minor element analysis by SEM-EDS and in-situ oxygen isotope analysis by secondary ion mass spectrometry (SIMS) for olivines from chondrules and as isolated grains in the matrix of Murchison. Five analyses groups were selected; (i) Mg-rich isolated olivines (MgOl), (ii) Mg-rich chondrule olivines (MgChOl), (iii) Fe-rich 'isolated' olivines (FeOl), (iv) Fe-rich chondrule olivines (FeChOl) and, (v) isolated olivines with Mg rich core (Ol-core) and Fe rich rim (Ol-rim). The isolated olivines from 125 to 250 micron mesh size separated by freeze-thaw cycles and ultrasonic treatment were handpicked and mounted with epoxy along with San Carlos olivine standard for the

analyses. We also prepared a thin section of Murchison, with which a San Carlos olivine grain was mounted and polished together, and used for the analysis.
Author
Meteoritic Composition; Oxygen Isotopes; Chondrule; Olivine; Carbonaceous Chondrites

20030111333 Academy of Sciences (USSR), Moscow, USSR
Track-Thermoluminescence Analysis of the Luna-24 Silicate Grains: The Degree of Shock-Thermal Reworking
Ivliev, A. I.; Kashkarov, L. L.; Kalinina, G. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Olivine (Ol) and plagioclase (Pl) crystals (about 30 grains) from the Luna-24 soil sample No 24184 of 0.127-0.200 mm size fraction were taken for the investigation. Track and TL-technique have been described by us. Some additional details are the next: simultaneous measuring of the track and TL-parameters in the same micro crystals, the size of which do not give possibility to use 'part by part' procedure of crushing, it was performed by measuring of track parameters after TL-investigation. Because during sample heating for TL glow-curve detecting crushed up to <30 micron microcrystals were under approx. (300-400) C temperature only during about ten sec, that is not affected on the characteristics of the storage in these crystals fossil tracks. TL-intensity was detected for each individual Ol and Pl grain with help of the high-sensitivity modified equipment.
Derived from text
Thermoluminescence; Samples; Lunar Soil; Silicates; Crystals

20030111334 NASA Ames Research Center, Moffett Field, CA, USA
Planetesimal Break-Up and the Feeding of Solids to the Satellite Disk: Consequences for the Formation Timescale and Composition of the Satellites of Jupiter and Saturn
Mosqueira, I.; Estrada, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In order to create a coherent scenario of satellite formation. the source of the solids (rock-metal and ice) that will eventually make up the satellites must be considered. While it is customary to use a solar composition mixture with a gas/solid mass ratio of about 100, at the tail end of the formation of the giant planet (when satellite formation is thought to have taken place) the fraction of solids entrained in the gas (particles with sizes lower than the decoupling size about 1 m for typical nebula parameters) is likely to be significantly lower than cosmic. In particular, in the core accretion model of giant planet formation one expects low dust and rubble content at late times due to particle coagulation leading to a collisional distribution of particle sizes with most of the mas residing in objects 1 km or larger, which are not coupled to the gas and whose dynamics must be followed independently. As a result, flow of gas into circumplanetary orbits is not sufficient to constrain the mas available to form satellites.
Derived from text
Jupiter Satellites; Planetary Evolution; Protoplanets; Saturn (Planet); Saturn Satellites; Gas Giant Planets; Natural Satellites

20030111335 Kharkov Univ., Kharkov, Ukraine
Swirl Formation: Cometary Wind or Meteoroid Swarm Encounter?
Starukhina, L. V.; Shkuratov, Y. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578 Contract(s)/Grant(s): INTAS-2000-0792; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cometary encounter with the lunar surface was proposed and actively developed as a mechanism of swirl formation. In particular, the assumed low maturity of the swirl regolith was supposed to be due to interaction of the regolith with dust and gas components of cometary comas. However, the scenarios of such an interaction were limited to qualitative descriptions. A step to quantitative analysis of different cometary effects was taken in where regolith processing by cometary debris was shown to be the most important for swirl formation. Estimating cometary effects: Here we consider three effects that accompany cometary encounter with an atmosphereless body: (1) interaction of cometary gas with regolith, (2) plowing of regolith by meteoroid stream, and (3) interparticle collisions in ejecta.
Derived from text
Cometary Atmospheres; Meteoroids; Lunar Surface; Lunar Dust; Space Debris

20030111336 Academy of Sciences (USSR), Moscow, USSR

Evolution of Three Largest Coronae on Venus, Heng-O, Quetzalpetlatl, and Artemis: Preliminary Results

Ivanov, M. A.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The vast majority of coronae on Venus cluster around a diameter of approx. 200-300 km, but three extremely large examples also occur; coronae are thought to be the surface manifestation of rising mantle instabilities (plumes, diapirs, thermals) and the differences in geological features and history between the two sizes may reveal important information about the nature of interior thermal evolution and patterns of mantle convection. The largest coronae, Quetzalpetlatl (Q), Heng-O, and Artemis, have dimensions approx. 1000-2500 km. Analysis of such coronae will help to document the relative timing of any such instabilities, characterize interaction of large mantle diapirs with the lithosphere, and help distinguish between the origin of the larger and smaller features. In this study, we analyzed the stratigraphic relationships of the key material units, structures and topography in order to outline the key aspects of their evolution.

Author

Planetary Geology; Venus Surface; Topography; Planetary Evolution; Stratigraphy

20030111337 Max-Planck-Inst. fuer Chemie, Mainz, Germany

Evidence for Live Iron-60 in Semarkona and Chervony Kut: A NanoSIMS Study

Mostefaoui, S.; Lugmair, G. W.; Hoppe, P.; Goresy, A. El; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the most debated subjects in meteoritics is the time scale of events that occurred during the early history of the solar system. Chronometers based on short lived nuclides, such as Al-26, Mn-53, Fe-60, Pd-107, I-129, Sm-146, were extensively studied during the last decades. Some of them were shown to afford chronological resolutions on the order of a few Ma to less than one Ma. This considerably helped resolving the sequence of events that occurred since the formation of the first solid objects. Considering the high iron and aluminum contents of meteorites, special attention was devoted to Fe-60 and Al-26, as they would have been the most powerful heat sources for inducing planetary melting and differentiation. The search for Ni-60 isotopic anomalies produced by the decay of short lived Fe-60 (T = 1.5 Ma) had been successful in the eucrite Chervony Kut. Correlated with the Fe/Ni ratio, 60Ni excesses were found for several bulk samples. A large 5 excess was measured in a 'troilite', which, however, does not follow the trend of the bulk samples. While this evidence shows that Fe-60 was alive in the early solar system, the apparent mobility of Ni between the major phases of this meteorite limits the usefulness of the Fe-Ni system as a chronometer. In this report we present an in situ Nano-SIMS study of the Fe-Ni system in iron sulfides in the Chervony Kut (CK) eucrite and in the Semarkona (LL3.0) ordinary chondrite. We chose CK to perform a follow-up study on a micro-scale on this highly Ni depleted planetary differentiate. Semarkona was selected because it is a highly unequilibrated chondrite where a disturbance of the Fe-Ni system during parent body processing is assumed to be minimal. Derived from text

Isotopes; Meteorites; Meteoritic Composition; Planetary Evolution; Cosmochemistry

20030111338 Geological Survey, Flagstaff, AZ, USA

Environmental Conditions of Origin of Surface Morphologies of Martian Glacier-like Flows

Kargel, J. S.; Wessels, Rick; Molnia, Brice; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Glacier-like flows are among the most characteristic landforms in the latitude belts between +/- 30 deg-60 deg on Mars. These features include what are termed lineated valley fill (or striped valleys), lobate debris aprons, and concentric crater fill, so named depending on the geometry of the flows and the topographic features they are associated with. They exhibit many characteristics of terrestrial debris-covered glaciers and rock glaciers, and there have been no compelling models that would indicate that they are something other than these types of features. Here we explore details of lineated valley fill and other elongated Martian icy flows. While there are many striking similarities to valley glaciers on Earth, there are also major differences, especially in that the Martian glacier-like features lack the degree of hierarchical structure of tributaries that are common among terrestrial alpine valley glaciers. There are other differences as well. Our emphasis here is on the development of longitudinal lineations that are roughly parallel to valley sides. The analog is terrestrial medial moraines. We find that this analog serves well in some cases, but not so well in many others. In addition, there are many fine details of the ablated surfaces of Martian glacierlike flows, resolved in spectacular MOC and THEMIS imagery, that need explanations either in the context

of terrestrial meltwater-driven ablation or sublimation-dominated ablation.
Author
Mars Environment; Mars Surface; Planetary Geology; Morphology; Ice; Valleys; Glacial Drift

20030111340 Image Again, Middletown, NJ, USA
Correction of Image Motion Smear in Photo from Lunar Orbiter Mission I
Byrne, Charles J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Lunar Orbiter camera compensated for image motion during an exposure by moving the platen that held the film. During the first Lunar Orbiter mission the image motion compensation device did not work properly, resulting in smear that made the high resolution images nearly useless. The second mission reexamined the potential Apollo landing sites, so no attempt was made to improve the smeared images. However, one early exposure of Mission I was of sufficient interest to be included in the book by Bowker and Hughes and digitized by Jeff Gillis and the Lunar and Planetary Institute staff.
Derived from text
Image Motion Compensation; Smear; Exposure; Cameras

20030111341 California Univ., Los Angeles, CA, USA
Initial 26Al/27Al Ratios in Carbonaceous Chondrite Chondrules
Kunihiro, T.; Rubin, A. E.; McKeegan, K. D.; Wasson, J. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ion-probe studies of chondrules in ordinary chondrites (OCs) have shown small excesses in (26)Mg that correlate with the Al/Mg ratio; from these data initial (26)Al/(27)Al ratios of (5-10)x10(exp -6) have been inferred. Only one well defined (26)Al-(26)Mg isochron has been reported for a carbonaceous chondrite (CC); the initial ratio is similar to the lowest ratios reported for ordinary chondrites. Because chondrules provide the best estimate of the maximum (26)Al/(27)Al ratio present when asteroids formed, it is important to determine this ratio in carbonaceous chondrite chondrules. We therefore studied the (26)Al-(26)Mg system in one of the most primitive carbonaceous chondrites, CO3.0 Yamato 81020 (Y81020). Our preliminary results show that the initial ratios in CC are lower than those in OC chondrules.
Author
Isotope Ratios; Magnesium Isotopes; Aluminum Isotopes; Meteoritic Composition; Chondrule; Carbonaceous Chondrites

20030111342 Arizona State Univ., Tempe, AZ, USA
Nature and Origin of Sedimentary Materials in Western Arabia
Presley, M. A.; Ruff, S. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Western Arabia is an intriguing geological region of Mars that has been the subject of numerous investigations [1-6]. Despite this attention, the origin and history of Western Arabian sediments remains unclear. The determination of the geologic history of this region would represent a significant improvement to our understanding of the climatic history of Mars.
Author
Mars Surface; Mars Craters; Geomorphology

20030111343 Washington Univ., Saint Louis, MO, USA
Terrain Distributions in Meridiani Planum and Probability of Sampling by the Mars Exploration Rover
Koeppen, W. C.; Seelos, F. P., IV; Arvidson, R. E.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars Odyssey's THEMIS instrument has provided nearly full coverage over Meridiani Planum of moderate resolution (~100m/pxl) nighttime IR data. Additionally, MOC NA frames cover 56% of the Meridiani Planum landing ellipse (as of E21) at high resolutions (~1.5-6.0 m/pxl). THEMIS and MOC NA frames were utilized to generate a terrain map for the landing

ellipse. The map was then used to estimate the probability of landing in a particular terrain as well as rover accessibility to the Etched Unit and overlying dark materials within different terrains.
Author
Mars Landing Sites; Mars Surface; Probability Theory

20030111344 Brown Univ., Providence, RI, USA
Looking Inside the Early-Time Radiation Plume for Hypervelocity Impacts
Eberhardy, C. A.; Schultz, P. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous studies describe the evolution of impact generated vapor plumes from above. Here, a new approach is tested whereby early-time self-luminous ejecta products are examined using quarter-space experiments with spectral measurements. At early times, the forming cavity is on the order of centimeters. Hence, the pointing accuracy and small detection regions are necessary. This method allows a view exclusively inside the forming crater. To prove the usefulness of this method we impacted into several materials. The radiating gas plume due to impact has four components: the jetting phase, a downrange-moving vapor cloud, a slower expanding vapor cloud and a vapor plume that grows from containment in the cavity. In addition, significant thermal debris evolves inside the growing transient crater. This study probes the fourth component as well as the thermal component and compares it with the downrange jetting phase and slower moving expanding phases.
Derived from text
Vapors; Spaceborne Experiments; Ejecta; Plumes; Spectrum Analysis; Craters

20030111345 Academy of Sciences (USSR), Moscow, USSR
Pre-Accretion and/or Regolith History of the Pesyanoe Obrite Matter
Kashkarov, L. L.; Ivliev, A. I.; Kalinina, G. V.; Lavrentjeva, Z. A.; Lyul, A. Y.; Kuyunko, N. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are continuing our fossil track and artificially induced thermoluminescence (TL) studies if the radiation-thermal history of the meteoritic material. Early it was indicated in the significant effect of the local shock-thermal events. As a result of this influence in a number of meteorites it was observed of silicate grains with the certain cosmic ray fossil tracks and TL characteristics. A general conclusion of our previous work is that the radiation and shock-thermal history of some meteorites is very complex and multi-stage process and this history for the individual silicate grain is practically different. In this context it is interesting to investigate the shock induced features, observed in the En crystals of different chemical-petrology and size separated fractions of the achondrite Pesyanoe. This meteorite characterized by the presence of very high solar gases concentration, that indicate the irradiation of this meteorite matter on the non-shielding conditions Now we report here on new results of the physical chemistry analysis of this meteorite with the aim to further investigation of the irradiation, shock and thermal history of cosmic matter by common petrology.
Author
Achondrites; Meteoritic Composition; Petrology; Physical Chemistry; Thermoluminescence

20030111346 Academy of Sciences (USSR), Moscow, USSR
Regularities of the 'Mercury Breath' of the Earth
Stakheev, Y. I.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Fourier analysis of 19040 hourly measurements of the mercury vapor flow 'earth crust-atmosphere' were performed. Six distinct lines in power spectra were found. The frequencies of these lines coincide with frequencies of the Earth tides deformations. This coincidence implies a direct influence of the cosmic process (Earth tides) on the geochemical process (mercury vapor flow). Earth atmosphere contains approximately 3000-4 000 tons of mercury and anthropogenic impact (mainly as a results of the combustion of fossil fuel) is ca. 1300 - 2150 tons, and increases by a factor of three for 100 years. In this research we conducted a series of hourly measurements during 2.5 years of the mercury vapor flow density through the interface between Earth's crust and atmosphere. Totally 25,000 measurements were performed. These measurements allow us to estimate the value of the natural flow of mercury vapor and reveal several factors affecting this value. The measurements

were carried out in a seismic region in Dushanbe suburb (1st point) at a distance of 20 km from the 1st point in Ordzhonikidzeabad (2-nd point).
Author
Earth Atmosphere; Earth Crust; Mercury (Metal); Mercury Vapor; Mineralogy

20030111347 Arizona State Univ., Tempe, AZ, USA
A Tale of Two Deserts: The Southwestern U.S. and Mars in the Classroom
Kadel, S. D.; Greeley, R.; Figueredo, P. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

'A Tale of Two Deserts' is a set of educational exercises that introduces educators, students and the public to water-formed features in desert environments on Earth and potentially similar landforms on Mars. These computer-based exercises familiarize educators and students with landforms important to NASA s 'follow the water' strategy for Mars exploration to help them share more actively in the discoveries from ongoing and future Mars missions. The exercises are student-centered, inquiry-based, and have been designed in direct alignment with state and national science teaching standards (e.g., the National Research Council s National Science Education Standards. Educators may determine which portions of the NSES are being covered by particular sections of the exercises by clicking on an icon. The exercises synergistically combine satellite images of desert landforms on Earth with those from recent Mars missions (e.g., Mars Global Surveyor and Mars Odyssey), and climate data from Earth and Mars to allow users to explore the stability of water on both planets, as well as the landforms themselves. A hands-on model-building exercise is also included, that gives students the opportunity to create an analog landform of sedimentary strata and then erode it with simulated 'wind' and 'rain'. Due to the large size of the exercise files, standard distribution has been via CD-ROM. However, the exercises will also be made available online in English and Spanish at http://europa.la.asu.edu by following the links to the educational exercises page.
Author
Computer Programs; Planetary Geology; Deserts; Earth Surface; Mars Surface; Schools; Education; Landforms

20030111348 Washington Univ., Saint Louis, MO, USA
Mountain Building on Io: Variable Volcanism and Thermal Stresses
Kirchoff, M. R.; McKinnon, w. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mountain formation on Io is likely tectonic in nature as almost none of the approximately 100 mountains discovered so far appear to have classic volcanic mountain features. However, volcanism may still perform an important role in mountain building. Io's heat is advected through the crust by magma. Therefore, when the eruption rate changes, the crust's thermal profile adjusts producing thermal stress. Previous work has shown that for a complete regional cessation of volcanism, thermal stresses are generated that will exceed Byerlee's rule in compression in approximately 0.5 Myr for a crust 25 km thick. Here, to further solve for if and when thermal stresses reach failure, we extend this model to include various rate decreases/increases, an initial thermal stress state, and crustal thickness changes. Two different (end-member) scenarios of the asthenospheric heat budget as related to eruption (and hence subsidence) rate changes are considered. The first assumes that they are directly coupled, implying a fixed crustal thickness as rate changes occur. The coupling assures that the rate of heat input into the crust s base will equal the rate of heat removal by advection, which is equivalent to the eruption rate. The second scenario assumes the heat supply to (or within) the asthenosphere is not affected by eruption rate changes. Therefore, when the rate decreases, extra heat will remain at the crust's base, melting and thinning it. In addition, when the subsidence rate increases, heat is removed from the base such that new layers will freeze out producing a thicker crust.
Derived from text
Thermal Stresses; Volcanology; Mountains; Io; Tectonics

20030111350 Agency of Industrial Science and Technology, Tsukuba, Japan
Timing of Basaltic Volcanism in Ureilite Parent Body Inferred from the 26Al Ages of Plagioclase-bearing Clasts in DaG-319 Polymict Ureilite
Kita, N. T.; Ikeda, Y.; Shimoda, H.; Morishita, Y.; Togashi, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ureilitic meteorites are ultramafic rocks with highly depleted REE abundance, while showing primitive signatures, such as abundant noble gases and oxygen isotopic heterogeneities. A lack of basaltic components among ureilitic meteorites is the major cause of our poor understanding of their evolution. Especially, chronological studies of ureilites are limited because of depletion of incompatible trace elements (U, K, Rb, REE) used for radiometric dating. DaG-319 polymict ureilites contains variety of plagioclase-bearing clasts, corresponding to the products of basaltic magma generated on the ureilite parent body. In-situ oxygen isotopic analyses of these clasts showed that they plot along CCAM line, thus confirming their ureilitic origins. The SIMS trace element analyses in plagioclase indicated that (1) ureilite parent body evolved from a chondritic precursor with CI-like alkali to refractory elements ratios, and (2) low degree (1% -10%) partial melts were extracted repeatedly from solid residue to produced depleted mafic residue. Here we report the results of the Al-26-Mg-26 age determination in DaG-319 plagioclase-bearing clasts. Previous studies on similar clasts in other polymict ureilites gave only the upper limits of initial Al-26/Al-27 ratios (less than 10(exp -6); greater than 3.5 m.y. after CAIs). The high precision (less than or equal to 1%o) SIMS Mg isotopic analyses are newly developed in order to detect a small Mg-26 excess in ureilitic plagioclase. Our new results demonstrate a short time scale of million years or less for the igneous differentiation of their parent body.
Derived from text
Basalt; Ureilites; Volcanology; Aluminum Isotopes; Geochronology; Breccia

20030111351 Washington Univ., Saint Louis, MO, USA
Northwest Africa 773: Lunar Mare Breccia with a Shallow-formed Olivine-Cumulate Component, Very-Low-Ti Heritage, and a KREEP Connection
Jolliff, B. L.; Korotev, R. L.; Zeigler, R. A.; Floss, C.; Haskin, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-4172; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Northwest Africa 773 is one of the more unusual lunar meteorites found in recent years because it contains a prominent clast lithology, which appears to be an olivine-rich cumulate and because it is a very-low-Ti (VLT) mare breccia with relatively high incompatible-trace-element concentrations and LREE/HREE enrichment. A lunar origin was verified by Fagan and coworkers on the basis of noble-gas contents, oxygen isotopes, and mineral compositions. Fagan et al. described two lithologies: (1) heterolithic impact breccia with a regolith component and (2) cumulus olivine gabbronorite. Here, we refer to these as the breccia (Bx) lithology and the olivine-cumulate (OC) lithology. The impact breccia components are predominantly volcanic (basaltic), and, in this context, the occurrence of the cumulus lithology is especially significant: is it related to the volcanic components or does it represent a deep-seated rock entrained by the basaltic magma as it rose to the surface? Elevated incompatible-element concentrations with more or less KREEP-like inter-element ratios and very-low-Ti concentrations distinguish both lithologies of this meteorite from Apollo mare basalts. Here, we summarize key compositional information (bulk and mineral), especially related to the OC lithology, to show that it formed at shallow depth and comes from a VLT ultramafic precursor that mixed with a KREEP-like trace-element component deep in the crust or upper mantle.
Author
Lunar Maria; Breccia; Meteorites; Meteoritic Composition

20030111352 Indiana Univ., Bloomington, IN, USA
Estimating the Average Diameter of a Population of Spheres from Observed Diameters of Random Two-Dimensional Sections
Kong, Maiying; Bhattacharya, Rabi N.; James, Christina; Basu, Abhijit; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-9369; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Size distributions of chondrules, volcanic fire-fountain or impact glass spherules, or of immiscible globules in silicate melts (e.g., in basaltic mesostasis, agglutinitic glass, impact melt sheets) are imperfectly known because the spherical objects are usually so strongly embedded in the bulk samples that they are nearly impossible to separate. Hence, measurements are confined to two-dimensional sections, e.g. polished thin sections that are commonly examined under reflected light optical or backscattered electron microscopy. Three kinds of approaches exist in the geologic literature for estimating the mean real diameter of a population of 3D spheres from 2D observations: (1) a stereological approach with complicated calculations; (2) an empirical approach in which independent 3D size measurements of a population of spheres separated from their parent sample and their 2D cross sectional diameters in thin sections have produced an array of somewhat contested conversion equations; and (3) measuring pairs of 2D diameters of upper and lower surfaces of cross sections each sphere in thin sections

using transmitted light microscopy. We describe an entirely probabilistic approach and propose a simple factor of 4/x (approximately equal to 1.27) to convert the 2D mean size to 3D mean size.
Derived from text
Two Dimensional Models; Size Distribution; Spheres; Diameters; Estimating; Statistical Analysis; Impact Melts

20030111353 NASA Johnson Space Center, Houston, TX, USA
Characterization of the Effects of Precursor Mineralogy on Hematite Spectra: Application to Martian Hematite Mineralization
Glotch, Timothy D.; Morris, Richard V.; Sharp, Thomas G.; Christensen, Philip R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Thermal Emission Spectrometer (TES) instrument aboard Mars Global Surveyor discovered several isolated deposits of gray, crystalline hematite in Sinus Meridiani, Aram Chaos, and Valles Marineris. A variety of formation mechanisms has been proposed for the martian hematite deposits, including aqueous and nonaqueous processes. Comparison of the average Sinus Meridiani hematite spectrum measured by TES to laboratory emissivity spectra for a variety of naturally occurring hematites shows small but potentially important differences. In particular, the emissivity minimum at 300 and 445/cm in the Sinus Meridiani (SM) spectrum is displaced 10-25/cm to lower frequencies compared to some natural hematite samples. In addition, these bands in the TES data are narrower than the broad bands seen in many natural hematite spectra. These differences may imply that the natural variability of hematite spectra has not been fully characterized, especially with respect to the reaction pathway (precursor mineralogy and temperature of hematite formation) and crystal morphology. Here, we describe the thermal infrared spectral characteristics of several series of synthetic hematite samples derived by direct precipitation, dehydroxylation of fine-grained goethite and the oxidation of magnetite. Several natural hematite sample spectra are also presented for comparison. Transmission electron microscopy (TEM) and Mossbauer spectral analyses of selected samples were performed in order to help determine the causes of the changes seen in the infrared spectra.
Author
Mars Surface; Mineralogy; Planetary Geology; Hematite; Spectrum Analysis

20030111354 Delaware Univ., Newark, DE, USA
Australasian Microtektites in the South China Sea: Implications Regarding the Location and Size of the Source Crater
Glass, B. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Australasian microtektites have been found in over 50 sites in the Indian and western equatorial Pacific Oceans; the Philippine, Sulu, and Celebes Seas; and more recently in the South China Sea. Glass and Pizzuto used geographic variations in concentrations of microtektites (number >125 micron dia./sq cm) to predict the location of the source crater. The location that explained the geographic distribution the best was 12 N, 106 E. This location was supported by Lee and Wei based on data from two additional cores. Previous estimates of the source crater diameter range from 17 to 114 km. I report here additional microtektite/impact ejecta data for Core 17957-2 taken in the South China Sea (10 deg 53.9 min N, 115 deg 18.3 min E) during the SONNE-95 cruise. I also report the discovery of abundant Australasian microtektites and associated shock-metamorphosed grains in Ocean Drilling Program (ODP) Hole 1144A, in the northern South China Sea (20 deg 3.18 min N, 117 deg 25.14 min E). ODP Site 1143 (9 deg 21.72 min N, 113 deg 17.11 min E) was also searched for microtektites, but the layer was not found at this site. The new data from Core 17957-2 and Hole 1144A, as well as from other Australasian microtektite-bearing sites, were used to reevaluate the location and size of the source crater.
Author
Tektites; Micrometeorites; Meteorite Craters

20030111355 Arizona Univ., Tucson, AZ, USA
Locations of Hotspots on Io from Galileo SSI Eclipse Images
Radebaugh, J.; Phillips, C.; McEwen, A. S.; Milazzo, M.; Keszthelyi, L. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Galileo SSI obtained many images of Io in eclipse by Jupiter, in which the only light that reached the camera was due to hotspot emissions from active volcanoes and from diffuse atmospheric/plume glows [1]. During the first orbits of the Galileo mission, there were full disk eclipse images taken of nearly the entire surface of Io. We correlated these images with

high resolution basemaps of Io in order to determine the locations of all hotspots with respect to surface features. This process helps us know which small paterae (volcanic depressions) or lava flows were thermally active at a given time. In addition, it tells us where in a large lava flow field or giant patera (such as the 200 km diameter Loki) the active eruption was occurring during the observations. We use this work to monitor changes over time at various hotspots on Io, as well as global waxing and waning of hotspot activity.
Author
Io; Volcanic Eruptions

20030111356 Southwest Research Inst., San Antonio, TX, USA
Influence of Gravity on the Geometry of Martian Normal Faults
Ferrill, D. A.; Morris, A. P.; Waiting, D. J.; Franklin, N. M.; Sims, D. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Extensional fault scarps on Mars bear a striking resemblance to fault scarps on Earth, including geometric features such as horsts, grabens, relay ramps and breached relay ramps, en echelon arrangement of faults and grabens, and scaling characteristics. Other surface features associated with extensional faulting on Mars are lines (chains) of circular topographic depressions, referred to as pit craters. These pit chains are easily observed in remotely sensed data from Mars. Although rare, pit chains also occur on Earth associated with extensional deformation. Based on the similarity in map view, one might surmise that the subsurface geometry of faults on Mars would similarly mimic structural style on Earth. However, a fundamental difference exists between Earth and Mars, which may have a profound effect on fault architecture the difference in the gravitational acceleration on the two planets. We consider likely fault dips and fault profiles on Mars by accounting for Mars gravity, likely rock types, fluid pressure conditions, and analogs from Earth. The results demonstrate that fault profiles on Mars are likely to be similar in shape to analogs on Earth, but that depth-dependent fault dip transitions are likely to occur deeper than on Earth and occur more gradually with depth. These results provide the basis for more robust structural interpretations of remote sensing data from Mars, and technically more sound models of faulting and related processes on Mars. Dilational faulting, found in the upper ~2 km on Earth, may extend to depths of 5 km or more on Mars. This dilational faulting may influence subsurface fluid flow, as well as dissolution and mineralization along faults. Similarly, the seismogenic zone on Mars is likely to be considerably deeper than on Earth.
Derived from text
Geological Faults; Gravitational Effects; Mars Surface; Planetary Geology; Topography

20030111357 Geological Survey, Flagstaff, AZ, USA
Reviving Lunar Orbiter: Scanning, Archiving, and Cartographic Processing at USGS
Gaddis, L.; Becker, T.; Weller, L.; Cook, D.; Richie, J.; Bennett, A.; Redding, B.; Shinaman, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report on the status of a project to digitize, archive, and process a subset of the Lunar Orbiter (LO) photographic data. Following a successful pilot project, our goal is to produce a global, cartographically accurate, cosmetically enhanced, digital photographic mosaic of the Moon using LO data. This mosaic will be coregistered to the Clementine 750-nm global mosaic.
Derived from text
Geological Surveys; Lunar Orbiter; Planetary Mapping; Scanning; Imaging Techniques

20030111358 Tennessee Univ., Knoxville, TN, USA
Petrology and Oxygen Isotopic Compositions of Anomalous Achondrite NWA 011
Promprated, P.; Taylor, L. A.; Anand, Mahesh; Rumble, D., III; Korochantseva, E. V.; Ivanova, M. A.; Lorentz, C. A.; Nazarov, M. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Northwest Africa (NWA) 011 is a single stone of 40 g and has been discovered in the Moroccan Sahara desert in 1999 [1]. This pyroxeneplagioclase meteorite was classified as noncumulate eucrite, on the basis of petrography and geochemistry [1]. However, certain characteristics of this meteorite such as the high Fe/Mn values in pyroxene (~65) and particularly the bulk-rock oxygen isotopic compositions (18O = +2.54, 17O = -0.48) are not of typical eucrites and may suggest a new type of basaltic meteorite [2]. In an attempt to resolve this issue, we have investigated mineral chemistry and oxygen isotopic

compositions on portions of NWA 011. Trace-element chemistry and Ar-Ar age is presented in a companion paper [3].
Author
Meteoritic Composition; Petrography; Achondrites

20030111360 Oxford Univ., Oxford, UK
The Variability of Transverse Aeolian Ripples in Troughs on Mars
Bourke, M. C.; Wilson, S.A.; Zimbelman, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG1-1075; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A precursory glance at MGS images of the surface of Mars show an abundance of aeolian transverse ridges. These ridges are located in a variety of geological terrains. Zimbelman and Wilson have separated the small-scale aeolian features of Syrtis Major into six categories: ripples associated with obstacles, ripple bands, ripple fields, ripple patches, isolated ripple patches and ripples associated with dunes. This paper focuses on one of these categories, that of ripple bands which tend to accumulate within linear troughs. As the origin of these features is still being studied (i.e. ripples versus dunes), we refer to them simply as transverse aeolian ridges.
Derived from text
Variability; Troughs; Dunes; Terrain; Ripples

20030111361
First Airborne Thermal Infrared Hyperspectral Imaging of a Dry Lake: Site Geology and TES/THEMIS Interpretations of Mars
Burt, Don; Adams, Paul; Kirkland, Laurel; Herr, Ken; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Researchers seek to identify dry lake bed deposits on Mars, if present. Primary tools in this search include the 1996 Mars Global Surveyor Thermal Emission Spectrometer (TES) and the 2001 Mars Odyssey multi-channel radiometer THEMIS. Interpretations are based on a comparison of the recorded signatures to laboratory spectra. Texture affects both the shape and contrast of the spectral signatures. Materials in the field have a diverse range of textures over multiple scales. In contrast, TES/THEMIS interpretations use laboratory spectra measured of a very narrow range of textures. This leaves a critical gap in the search for evaporites on Mars: the TES laboratory data have never been compared to hyperspectral (spectrometer) airborne spectra of dry lake deposits. We present the first such study, and here focus on the impact of texture.
Derived from text
Infrared Imagery; Thermal Mapping; Mars Exploration; Planetary Geology; Sedimentary Rocks

20030111363 Lunar and Planetary Inst., Houston, TX, USA
The Limits of Theoretical Modeling and Geomorphic Interpretation in Assessing the Present Distribution of Subsurface H2O on Mars
Clifford, S. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The search for water has been identified as the principal objective and common thread of Mars research. Of the planet s estimated 0.5 - 1 km global inventory of H2O, approx. 0.000001% is found in the atmosphere and approx. 5 - 10% is thought to be stored as ice in the perennial polar caps and layered terrain. This leaves approx. 90 - 95% of the planetary inventory of H2O that is unaccounted for, the vast bulk of which is believed to reside, as ground ice and groundwater, within the planet s crust. The expected distribution and state of subsurface water on Mars, as well as plausible values of the large-scale physical, thermal, and hydraulic properties of its crust, have been discussed by a number of investigators. To a first order, subsurface conditions on Mars are expected to resemble those found in cold-climate regions on Earth, particularly the unglaciated, continuous permafrost regions of Antarctica, Siberia, and North America. This similarity is likely to extend to an equivalent level of geologic complexity and spatial variability in such characteristics as lithology, structure, stratigraphy, porosity, volatile content, permeability, and mechanical and thermal properties.
Derived from text
Numerical Analysis; Geomorphology; Surface Water; Mars Environment; Ground Water

20030111365 Universidad San Pablo CEU, Madrid, Spain

Tectonic and Fractal Analysis of Conamara Chaos Area (Europa, Jupiter): Strike Slip and Compressional Features in an Expansive Satellite

Pascua, M. A. Rodriguez; Lopez, R. Perez; Ballesteros, O. Prieto; Kargel, J. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent geological activity has produced resurfacing on Europa's satellite by tectonism and magmatism. It is representative of Europa the formation of areas with chaotic texture, where the crust has been fractured in several blocks which are surrounding by a more fine and lower topographical matrix materials. Clasically, two processes for the chaotic terrain formation based on the interpretation of the Galileo SSI sensor's images have been discussed: a) Solid state convection processes into a thick ice layer, b) Melt through processes in a thin layer over a water ocean. Recently, modifications to these processes that take into account the presence of salty materials in the crust of Europa have been proposed.

Derived from text

Europa; Tectonics; Geophysics; Crusts; Geology

20030111366 Los Alamos National Lab., NM, USA

Atmospheric Corrections for Neutrons Reveal Variations in Surface Composition in the Tharsis Region

Prettyman, T. H.; Feldman, W. C.; Boynton, W. V.; McKinney, G. W.; Lawrence, D. J.; Mellon, M. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The output of neutrons from Mars is sensitive to atmospheric mass (areal density in units of g/cm2), which changes seasonally and with elevation. A portion of the neutron population observed at orbital altitudes is generated within the atmosphere directly by cosmic ray interactions. In addition, neutrons emitted from the surface are slowed down by interactions with atmospheric nuclei. We have calculated the dependence of the neutron output on atmospheric mass using a radiation transport model and have developed a correction algorithm to remove artifacts of topography from neutron counting data. Here, we remove the effect of the atmosphere from neutron count rate maps measured by the neutron spectrometer subsystem of the gamma ray spectrometer on 2001 Mars Odyssey to reveal spatial variations in surface composition and stratigraphy in the Tharsis region.

Author

Mars Surface; Radiation Transport; Stratigraphy

20030111367 NASA Ames Research Center, Moffett Field, CA, USA

3D Simulations of Comet Impacts into the Atmospheres of Titan and Venus

Korycansky, D. G.; Zahnle, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present results of three-dimensional numerical hydrodynamical calculations of the impacts of comets into the atmosphere of Titan. Our goal is to develop formulae that may be used to predict the sizes and distributions of craters that are expected to exist on Titan's surface and be found by the Huygens probe of the Cassini mission that will arrive at the Saturn system in 2004. We also compare our results with similar calculations done by us for asteroid impacts into the atmosphere of Venus

Derived from text

Cometary Collisions; Comets; Titan; Venus Atmosphere; Computerized Simulation; Three Dimensional Models

20030111371 Tokyo Inst. of Tech., Tokyo, Japan

An Extreme O-16-rich Chondrule from Acfer 214 CH Chondrite

Kobayashi, S.; Imai, H.; Yurimoto, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Oxygen isotope systematics between O-16-rich and poor reservoirs is well known in the solar system. Since O is account for over 50 atomic % of terrestrial planets and also dominant in the solar nebular gas next to H and He, range and distribution of the systematics is an important tracer recording origin and global evolution of early solar system. The O-16-rich endmember, about 5% enrichment relative to the terrestrial mean value, has been observed only in refractory inclusions that

are less than 5 volume % constituents of chondrites. Other 95 volume % of chondrite is relatively depleted in O-16 close to the terrestrial value. Therefore, it has been believed that O-16-rich reservoirs existed at refractory inclusion forming event corresponding to the oldest dating in the solar system. Here we report a chondrule consisting of about 8% enrichment of O-16 relative to the terrestrial value. This value corresponds to the lightest atomic weight of O in the solar materials ever found. The lightest oxygen found in abundant constituents of chondrites strongly suggests that O-16-rich reservoir contained gaseous species with isotopically almost pure in O-16 or were universally distributed as dusts in the early solar system. In either case, O isotopic heterogeneities in the early solar system were at least two times greater than conventional thought.
Derived from text
Chondrites; Chondrule; Oxygen Isotopes; Solar System; Mineralogy

20030111373 Institut de Physique du Globe, Paris, France
Recent Advances in Lunar Seismology
Khan, A.; Lognonne, P.; Gagnepain-Beyneix, J.; Chenet, H.; Mosegaard, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The most detailed knowledge that we have on the interior structure so far concerning planetary bodies besides the Earth is the Moon. The Apollo seismic data have provided us with a unique opportunity to elucidate the internal structure of the Moon. The primary data set employed here are the Apollo seismic data which were obtained in the period from 1969 to 1972 when the US Apollo missions landed seismographs on the lunar surface. The Apollo-era seismic studies concentrated mainly on the use of linearized methods in dealing with the inverse problem, thereby obviating the analysis of resolution and uncertainty which are important items when having to infer scientific conclusions from inverse calculations. Generally these studies were successful in determining the gross features of the lunar interior with details remaining perfunctory. Recent investigations using the same data set as Nakamura as well as employing a much more adequate inverse Monte Carlo sampling scheme in having to deal with the nonlinear inverse problem of estimating structural parameters from a set of arrival times, has resulted in the enhancement of some details. However, with the given data set a truely detailed lunar velocity structure remains at present outside our reach. The purpose of the present study is twofold. On the one hand we want to present results from a Monte Carlo inversion of a slightly different set of arrival times obtained by Lognonne et al. (henceforth abbreviated IPGP data set) through a complete reanalysis of the entire Apollo lunar seismic data. On the other hand we want to discuss the differences among the two data sets, since the IPGP data set consists of 59 events of which 8 are artificial impacts, 19 meteoroid impacts, 8 shallow moonquakes and 24 from deep moonquakes, whereas the Nakamura data set consists of 7 artificial impacts, 18 meteoroid impacts, 14 shallow moonquakes and 41 deep moonquakes. The significance of this difference as well as its implication for the inversion will also be discussed.
Author
Lunar Seismographs; Moonquakes; Information Analysis

20030111374 National Museum of Natural History, Paris, France
Boron and Lithium Isotopic Composition in Chondrules from the Mokoia Meteorite
Robert, F.; Chaussidon, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Large Boron isotopic variations have been reported in individual chondrules from the Semarkona, Hedjaz and Allende meteorites. These variations were interpreted as resulting from the incomplete mixing of two isotopically distinct sources of Boron. Spallation is the only known nucleosynthetic process that can yield Boron in substantial amounts at the scale of the Universe. Therefore it has been proposed that the two sources observed in chondrules correspond to two different types of spallation reactions, namely at high and low energies. Indeed, in the case of Boron, the B-11/B-10 ratio is sensitive to the energy at which the spallation reaction takes place. In the present work we have used the ion microprobe Cameca IMS 1270 (i) to improve this reproducibility at low B contents and (ii) to better control the removal of surface contamination. As previously put into light from the IMS-3f data on Semarkona, the present results data reveal significant intra-chondrule and chondrule-to-chondrule Boron isotopic heterogeneities in the case of the Mokoia meteorite.
Derived from text
Boron; Chondrule; Isotopes; Lithium; Meteoritic Composition; Chondrites

20030111375 Arizona Univ., Tucson, AZ, USA

Io's Interior: A Synthesis View at the End of the Galileo Era

Keszthelyi, L.; Jaeger, W. L.; McEwen, A. S.; Turtle, E. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Galileo spacecraft has collected its last data from Io, Jupiter s enigmatic and hyperactive moon. The new data from Galileo, supported by additional observations from Earth-based telescopes and the Cassini spacecraft, have revealed many new facets of the geologic processes acting within Io. The objective of this work is to synthesize these new data into a coherent view of the interior of Io. While we do not claim to actually know what is within Io, the picture presented here is at least consistent with the observations. Counter-intuitively, our understanding of Io is best at the center and progressively poorer as we approach the surface. Therefore we describe Io from the inside out, ending with some hypotheses for how the processes within Io affect the surface.

Author

Io; Planetary Mantles; Chondrites; Planetary Crusts

20030111376 Northwestern Univ., Evanston, IL, USA

Missing Craters on Eros, Phobos, and the Moon: Crater Erasure in a Thick Regolith?

Robinson, M. S.; Thomas, P. C.; Veverka, Thomas J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NEAR Shoemaker images provided the first reliable observations of sub-100 m craters on an asteroid. Veverka et al. and Chapman et al. found that much of the surface approached 'empirical saturation', but at sizes below about 100 - 200 m the crater density was progressively lower than predicted for nearly saturated surfaces and did not have a slope expected of production populations. We have subsequently made additional small crater density measurements on Eros and use these data to compare to other bodies, for which comparable resolution data exist. From MOC images crater densities were measured for Phobos, including a global data set (>700 m diameter), and local data at good viewing down to pixel scales of approximately 4 m. The Phobos and Eros crater densities between 30 and 200 m are similar except for the region of steep topography (slopes ~20) within Stickney crater, which has a substantially lower crater density. The similarity of the maximum crater densities on the two objects, and the presence on both objects of decreasing relative densities between crater sizes of approximately 150 m to 30 m, suggests that the decrease in relative density in this size range is due to a mechanism that is not unique to Eros. Furthermore, on both objects the decrease is observed for areas having different crater densities: these are not saturation curves, nor are they consistent with usual expectations of production populations. Additionally, we note that from moderate resolution Galileo images of Gaspra (approximately 60 m/pixel) Carr et al. postulated a drop off in crater densities below 200 m and attributed this to preferential degradation of smaller craters formed in a thick regolith (>20 m). We speculate that the explanation of the decreased R plot slope at small diameters on Eros and Phobos is primarily due to the destruction of small craters by processes in addition to those predicted whereby new craters remove some fraction of pre-existing craters. Mutual obliteration by craters is the process apparently responsible for producing saturation slopes (-2 on cumulative plots, -3 on differential plots, horizontal on standard R-plots).

Derived from text

Asteroids; Craters; Regolith; Topography; Degradation

20030111377 Arizona State Univ., Tempe, AZ, USA

Global Bedrock Composition Mapping on Mars Using THEMIS and TES Data

Rogers, D.; Bandfield, J. L.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Global Surveyor Thermal Emission Spectrometer (TES) has a spatial resolution of approximately 3 x 6 km/pixel, with 143 spectral bands between 50-6 micron (about 200-1600/cm). Previous compositional studies using TES data have been conducted at the multi-pixel (tens to thousands) level. At these spatial scales (>30 km), outcrops of bedrock cannot be resolved, therefore surface composition determined previously with TES data was detected from sand-sized particles or a mixture of rocks and fines. Infrared images from the Thermal Emission Imaging System (THEMIS) aboard the 2001 Mars Odyssey spacecraft have a spatial resolution of approximately 100 m/pixel, with 10 spectral bands between 14.9-6.8 m (approximately 672-1474/cm). The higher spatial resolution of THEMIS allows for areally-small regions of bedrock to be resolved. In this work, nighttime temperatures measured with THEMIS are used to locate bedrock surfaces on Mars. Where

available, corresponding daytime THEMIS images are converted to emissivity, and are then used to determine the general composition of these bedrock surfaces. Finally, TES data, used together with THEMIS data, can be used to extract a more precise mineralogy.
Derived from text
Mars Surface; Planetary Mapping; Planetary Composition; Bedrock; Mars Exploration

20030111378 Oklahoma Univ., Norman, OK, USA
The Sooner Lunar Schooner Mission
Roman, M. J.; Hunt, T. S.; Yoon, J.; Miller, D. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Sooner Lunar Schooner is a multidisciplinary ongoing project at the University of Oklahoma to plan, design, prototype, cost and (when funds become available) build/contract and fly a robotic mission to the Moon. The goal of the flight will be to explore a small section of the Moon; conduct a materials analysis of the materials left there by an Apollo mission thirty years earlier; and to perform a selenographic survey of areas that were too distant or considered too dangerous to be done by the Apollo crew. The goal of the Sooner Lunar Schooner Project is to improve the science and engineering educations of the hundreds of undergraduate and graduate students working on the project. The participants, while primarily from engineering and physics, will also include representatives from business, art, journalism, law and education. This project ties together numerous existing research programs at the University, and provides a framework for the creation of many new research proposals.
Derived from text
Moon; Robotics; Lunar Surface; Lunar Roving Vehicles; Selenology; Lunar Exploration

20030111379 California Univ., Berkeley, CA, USA
Lunar Impact History from Apollo 12 Glass Spherules
Levine, J.; Karner, D. B.; Muller, R. A.; Renne, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Glass spherules in lunar soils are formed by meteoroid impacts on the lunar surface, though some are believed to be due to volcanic fire-fountaining events. We recently reported the ages of 155 lunar spherules from Apollo 14 soil sample 14163, determined by the Ar-40/Ar-39 isochron technique. These spherules are all inferred to have been formed in impacts, and, since the sample was from the ejecta blanket of the approx.25 Ma Cone Crater impact, the dated spherules constitute a random sampling of the lunar regolith. The distribution of their ages, therefore, represents a measure of the impactor flux in the vicinity of the Earth and Moon throughout the last approx.3.8 Ga. The most surprising observation of was the abundance of young spherules; on this basis, an increase in the lunar cratering rate by a factor of 3.7+/-1.2 in the last 400 Myr was inferred. This conclusion was challenged by, who suggested instead that a bedrock-exposing event 400 Ma could have led to an increase in spherule production without requiring an increase in the impactor flux. Though continuous approx.1 Ga rays of Copernicus ejecta across the Apollo 14 landing site indicate that the regolith was not locally removed 400 Ma, it is nevertheless possible that the increase in production of <400 Ma spherules was the result of a phenomenon local to the Apollo 14 landing site and not, as we suggested in, the result of increased impacts on the Moon.
Derived from text
Spherules; Glass; Lunar Surface; Craters; Hypervelocity Impact; Landing Sites; Lunar Rocks

20030111380 Universidad Complutense, Madrid, Spain
Dextral Shear Deformation Belt on Southern Margin of Central Ovda Regio, Venus: Preliminary Results
Romeo, I.; Capote, R.; Anguita, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Crustal plateaus are a major class of tectonic features on Venus surface, and its study is essential in order to understand the geological evolution previous to the global resurfacing process. These regional units are flat topped highlands formed by tessera terrain, characterized by superposition of cross-cutting structures, with complex tectonic patterns; also intratessera volcanic plains with different roughness appear flooding depressions. There are two principal and opposite hypothesis explaining the origin of crustal plateaus. One of them advocates a mantle downwelling process as the driving mechanism,

producing thickening and shortening of the lower ductile crust above mantle downwelling flows, but some other authors point out that crustal plateau formation is controlled by plumes in a thin crust geodynamic regime where crustal thickening is produced by flood volcanism. The greatest crustal plateau is Ovda Regio (western Aphrodite Terra), with three major groups of structures, folds, ribbons and grabens, and a history of contractional and extensional tectonic stages which understanding is highly significant for getting a genetic model. Strike-Slip tectonism has not been described in Ovda Regio, though it has been found in other areas of Aphrodite Terra. In this paper we describe a zone with brittle strike-slip faults at Ovda Regio southern margin and discuss its implications in crustal plateaus tectonic evolution.
Derived from text
Deformation; Geodynamics; Geology; Planetary Crusts; Topography; Venus Surface; Venus (Planet)

20030111381 Cologne Univ., Germany
Silicon Concentrations in Metal Grains of CB-, CH- and CR-Chondrites - Implications for Their Formation
Schoenbeck, T. W.; Palme, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

FeNi-metals are common in ordinary and enstatite chondrites but rare or even absent in the conventional groups of carbonaceous chondrites, except in CR-chondrites. Recently identified new groups of carbonaceous chondrites, such as CH-and CB-chondrites contain, however, abundant FeNi-metal. Whereas CV-chondrites have only about 2 vol.% metal, CH-chondrites contain up to 20 vol.% and members of the CB-chondrite grouplet as much as 60 vol.%. The origin of these metals is not clearly understood. Subchondritic Fe/Ni and Fe/Co ratios in CM-, CR-, CH-and CB-chondrite metals favor the formation by condensation from a gas of solar composition. The discovery of zoned metal grains in CH-and CB-chondrites provides evidence supporting the condensation origin of these metals. Zanda et al. have, however, argued that the composition of metals in Renazzo is indicative of metal/silicate equilibration. The concentrations of siderophile and lithophile trace elements in carbonaceus chondrite metals should ultimately allow to resolve the question of their origin. To distinguish between these two formation processes we began a systematic study of the concentration of moderately siderophile and lithophile elements in metals from metalrich carbonaceous chondrites. These new data, primarily on Si, and earlier literature provide the basis for distinguishing among the various modes of formation.
Derived from text
Silicon; Concentration (Composition); Metals; Chondrites; Crystals

20030111382 Arizona State Univ., Tempe, AZ, USA
Applicability of Complexity Theory to Martian Fluvial Systems: A Preliminary Analysis
Rosenshein, E. B.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the last 15 years, terrestrial geomorphology has been revolutionized by the theories of chaotic systems, fractals, self-organization, and selforganized criticality. Except for the application of fractal theory to the analysis of lava flows and rampart craters on Mars, these theories have not yet been applied to problems of Martian landscape evolution. These complexity theories are elucidated below, along with the methods used to relate these theories to the realities of Martian fluvial systems.
Derived from text
Fluid Flow; Geomorphology; Mars (Planet); Topography; Complexity

20030111383 Smithsonian Institution, Washington, DC, USA
Possible Hydroisostatic Influences on the Collective Geometry of Strandline Features Formed in Association with Ancient Martian Oceans
Leverington, D. W.; Ghent, R. R.; Irwin, R. P., III; Craddock, R. A.; Maxwell, T. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Some workers have proposed that large Martian basins contained extensive water bodies in the past, and have hypothesized that an ancient ocean extended over much or all of the northern lowland plains. With considerable depths over large areas, these water bodies would have represented massive surficial loads. The irregular form of some Martian basins, as well as spatial inhomogeneities in crustal and mantle properties, would have caused the magnitudes of vertical crustal displacements related to water loading to vary spatially. Similarly, the magnitudes of crustal displacements related to crustal unloading, associated with the gradual removal of water mass, would also have varied spatially. Terrestrial studies demonstrate

that spatial variation in the displacement effects of oceanic loading and unloading can exceed 10% of the magnitude of vertical changes in water level (and when occurring in concert with other mass-transfer processes associated with e.g. glacial cycles, can exceed 200% of this magnitude). This suggests by analogy that hydroisostatic processes alone may be sufficient to cause ancient Martian oceanic shorelines of common age to vary in elevation today by hundreds of meters. The modern horizontality of sets of possible strandline features should therefore not be considered a necessary precondition for their interpretation as having formed in association with a large water body; in some cases, the modern horizontality of such features may in fact act as evidence against their formation in this manner. Quantitative models of large water bodies on Mars are being constructed for use in the estimation of the effects of hydrological loading and unloading on the collective geometry of strandline features.
Derived from text
Surface Water; Unloading; Mars (Planet); Loads (Forces); Spatial Distribution

20030111384 Arizona State Univ., Tempe, AZ, USA
Identifying Compositional Heterogeneity in Mars' Nili Patera Caldera Using THEMIS and TES Data
Ruff, S. W.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spectral anomalies in Nili Patera, a central caldera of the Syrtis Major shield volcano, were first observed by using Thermal Emission Spectrometer (TES) data. With the advent of data from the Thermal Emission Imaging Spectrometer (THEMIS), it is now possible to explore in greater detail the nature of the volcanic materials that give rise to both spectral and spatial anomalies within and adjacent to the caldera.
Derived from text
Anomalies; Calderas; Heterogeneity; Identifying; Mars Surface

20030111385 Texas Univ., Austin, TX, USA
Moessbauer Spectroscopy of Mars-Analog Rocks from an Acid Saline Sedimentary Environment
Schaefer, M. W.; Dyar, M. D.; Benison, K. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-10424; NAG5-12687; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is increasing evidence that some parts of Mars may at one time have been covered by a layer of water [1, 2, 3, 4]. Some efforts have been made to model the geochemical interaction of this layer of water with the atmosphere and the rocks of the surface [5, 6], but the abundant carbonates produced by a simple system of water under a thick carbon dioxide atmosphere have not been observed to exist on the present-day surface of Mars [7 and others]. There are two possible reasons for this discrepancy. First, the deposited carbonates may have been altered or covered up in the eons since their deposition, or second, the simple model does not accurately describe the weathering and depositional environment in the early Martian seas. We will here discuss a new analog for Martian rock-water interactions.
Author
Mars Surface; Fluid-Solid Interactions

20030111386 NASA Ames Research Center, Moffett Field, CA, USA
Large Impact Features on Saturn's Middle-sized Icy Satellites: Global Image Mosaics and Topography
Schenk, P. M.; Moore, J. M.; McKinnon, W. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the approach of Cassini to the Saturn system, attention naturally focuses on the planet, its rings and Titan, but the Saturn system is also populated by a number of smaller satellites. The seven middle-sized icy satellites, along with those of Uranus, (between 400 and 1500 km wide) are distinctly different geophysically and geologically from their much larger Galilean-class brethren [e.g., 1]. Topographic mapping of these bodies is a critical part of understanding their geologic evolution. Here we describe our recent efforts to map the topography of these satellites using Voyager data.
Author
Icy Satellites; Saturn (Planet); Topography

20030111387 Indiana Univ., Bloomington, IN, USA

Nannobacteria as a Byproduct of Organic Tissue Degradation by Bacteria

Schieber, J.; Arnott, H. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are nannobacteria culture experiments with human and cow sera [6] that have been construed as proof for the actual existence of nannobacteria. Research in other labs, however, suggests that the supposedly biogenic hydroxyapatite mineralization associated with nannobacteria was actually caused by the nucleating activities of self-propagating microcrystalline centers [7], and that proteins most likely mediate their nucleation, growth, and morphology [8]. In this contribution we report on tissue decay experiments that produced abundant proteinaceous spheroids in the size range of nannobacteria (described as nannoballs in the remainder of this paper). Subsequent mineralization of these spheroids may be a common formative process for nannobacteria observed in the rock record.

Derived from text

Bacteria; Mars Surface; Mineralogy

20030111389 Lunar and Planetary Inst., Houston, TX, USA

Tectonic and Regional Topography of Io: A New High

Schenk, P. M.; Wilson, R. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Regional topography, volcanic and tectonic patterns, and gravity signatures (the latter not yet available for Io) are the primary manifestations of a planets internal dynamics [1,2]. This report is motivated by several new developments, the most important of which are significant upgrades to our stereo topographic mapping capabilities and the successful application of shape-from-shading (photoclinometry, PC) techniques to Io s photometrically complex surface. We summarize these developments and the topographic observations and resulting elevation maps completed to date, focusing here on the topographic characteristics of mountains at high resolution and of Io on regional (~1000 km) scales.

Author

Io; Topography

20030111391 Los Alamos National Lab., NM, USA

Single-Grain Optical Dating Properties of JSC Mars-1: Preliminary Measurements of Radiation Dose Response and Sensitivity Change

Lepper, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Martian surface deposits, including polar deposits, represent a vast storehouse of data recording the evolution of Mars climate and surface environment. However, the greatest challenge to deciphering these martian geo-records is the need for absolute dating techniques, particularly those techniques applicable to the timeframes and surface processes of the 'Martian Quaternary'. Lepper and McKeever have proposed developing optical dating, an established terrestrial chronometric dating method based on principles of solid-state physics, for remote in-situ dating of martian surface sediments. We report here the results of ongoing experiments with JSC Mars-1, a terrestrial analog of martian surface materials, to establish a broad fundamental knowledge base from which robust dating procedures for robotic missions may be developed. Such data will be critical for determining the engineering requirements of remote in-situ optical dating equipments intended for use on Mars.

Derived from text

Radiation Effects; Sensitivity; Dosage; Mars 1 Spacecraft; Mars Surface; Optical Properties; Time Measurement; Chronology

20030111392 Hawaii Univ., Honolulu, HI, USA

A New Measurement of the Absolute Spectral Reflectance of the Moon

Lawrence, S. J.; Lau, E.; Steutel, D.; Stopar, J. D.; Wilcox, B. B.; Lucey, P. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

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The spectral reflectance of the Moon is an important property for studies of lunar geology, quantitative physical modeling

of the moon, and in-flight calibration of spacecraft sensors. Previous studies have claimed that telescopic absolute reflectance values for the Moon are greater than laboratory reflectance measurements by a factor of two. In order to confirm these results, we performed ground-based observations of the lunar surface using a visible/near-infrared spectroradiometer and compared the measured lunar surface radiance to solar radiance corrected for atmospheric scattering and absorption. These data were compared to previously obtained laboratory reflectance measurements from Apollo soil samples.
Derived from text
Spectral Reflectance; Lunar Surface; Atmospheric Scattering; Moon; Near Infrared Radiation

20030111393 NASA Ames Research Center, Moffett Field, CA, USA
Imino Acids in the Murchison Meteorite: Evidence of Strecker Reactions
Lerner, N. R.; Cooper, G. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Both alpha-amino acids and alpha-hydroxy acids occur in aqueous extracts of the Murchison carbonaceous meteorite. The Strecker-cyanohydrin reaction, the reaction of carbonyl compounds, cyanide, and ammonia to produce amino and hydroxy acids, has been proposed as a source of such organic acids in meteorites. Such syntheses are consistent with the suggestion that interstellar precursors of meteoritic organic compounds accreted on the meteorite parent body together with other ices. Subsequent internal heating of the parent body melted these ices and led to the formation of larger compounds in synthetic reactions during aqueous alteration, which probably occurred at temperatures between 273K and 298K. In the laboratory, imino acids are observed as important by-products of the Strecker synthesis.
Derived from text
Amino Acids; Carbonaceous Meteorites; By-Products; Carbonyl Compounds; Organic Compounds

20030111394 Washington Univ., Seattle, WA, USA
Comparative Study of Equilibrated and Unequilibrated Eucrites: Subsolidus Thermal History of Haraiya and Pasamonte Eucrites
Schwartz, J. M.; McCallum, I. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The source and duration of the heating event responsible for eucrite metamorphism is not well constrained. Three hypotheses have been proposed for the source of heat: Impact, conduction from the mantle, and rapid production of successive flows. Textural and chemical relationships of noncumulate eucrites are investigated to constrain the thermal and temporal conditions responsible for eucrite equilibration to provide insight into the evolution of the HED parent body. Pasamonte and Haraiya were chosen as they represent extremes on the metamorphic scale. Pasamonte (Type 2) retains primary textures and compositions, but has been partially equilibrated during metasomatism. Haraiya (Type 7), with coarsely exsolved, partially inverted pigeonite, experienced prolonged metamorphism at subsolidus temperatures.
Derived from text
Heating; Metamorphism (Geology); Numerical Analysis

20030111395 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Scientific Benefit of a Mars Dust Sample Capture and Earth Return with SCIM
Leshin, L. A.; Clark, B. C.; Forney, L.; Jones, S. M.; Jurewicz, A. J. G.; Greeley, R.; McSween, H. Y., Jr.; Richardson, M.; Sharp, T.; Thiemens, M., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Sample Collection for Investigation of Mars (SCIM) mission, presently a finalist for flight as a Mars Scout, proposes to return martian atmospheric dust to Earth for mineralogical, chemical, isotopic, and other studies. The returned sample will consist of least 1000 martian dust particles =10 m in diameter plus millions of smaller particles. Here we discuss the science gained from analyzing such a sample in terrestrial laboratories. An accompanying abstract discusses the SCIM atmosphere sample return science.
Derived from text
Mars Missions; Dust; Sample Return Missions; Particle Size Distribution; Mineralogy

20030111396 Arkansas-Oklahoma Center for Space and Planetary Sciences, USA

The HERA Multiple Near-Earth Asteroid Sample Return Mission: Selection of the Target Asteroids

Sears, D. W. G.; Scheeres, D. J.; Binzel, R. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The spectacular success of the NEAR Shoemaker mission suggests that sample return from near-Earth asteroids is within our technological grasp. At the same time, many major questions posed by the laboratory investigation of meteorites and the astronomical study of asteroids can only be satisfactorily addressed by the return of samples. Returned samples will enable us to understand the rocks in terms of their geological context, and they will provide ground truth for astronomical observations. Returned samples offer the best opportunity to resolve questions that have occupied an entire career.

Derived from text

Near Earth Asteroid Rendezvous Mission; Geology; Meteorites; Rocks

20030111397 Cornell Univ., Ithaca, NY, USA

Crust and Mantle Structure of Large Coronae on Venus

Senft, Laurel; Kiefer, Watler S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Coronae are circular to elliptical tectonic structures on Venus, typically a few hundred kilometers across and often associated with volcanic activity. They are generally believed to be the surface expression of upwelling mantle diapirs. Gravity modeling can provide insight into the subsurface structure of coronae. Previous gravity models of coronae have emphasized determining parameters such as the average crustal and lithospheric thicknesses. In this work, we analyze the spatial variability of crustal thickness and mantle densities at the two largest coronae, Artemis and Heng-O, as well at large coronae in Central and Eastern Eistla and near Diana and Dali Chasma.

Author

Crusts; Coronas; Venus (Planet)

20030111398 Arizona Univ., Tucson, AZ, USA

Olivine-Orthopyroxene Equilibrium in Metal-rich Systems: Applications to Achondrites and Equilibrated Chondrites

Lauretta, D. S.; Benedix, G. K.; McCoy, T. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-11355; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Olivine and orthopyroxene are major minerals in every type of stony meteorite. The majority of achondritic meteorites and silicate-bearing iron meteorites have experienced high temperatures. If these temperatures persisted for an extended period of time then the iron contents of olivine and orthopyroxene should be in equilibrium. In their study of ungrouped clasts and chondritic meteorites, suggested that the equilibrium compositions of olivine and orthopyroxene should fall on a mixing line between LL chondrites and aubrites. Here we show that this is not necessarily the case and that a range of FeO contents in olivine and orthopyroxene can be in equilibrium with each other. The key parameters that determine the equilibrium Fe content in these minerals are temperature, oxygen fugacity (fO2), and silica activity (aSiO2).

Derived from text

Olivine; Achondrites; Chondrites; Iron Meteorites; Meteoritic Composition; Breccia

20030111399 Minnesota Univ., Duluth, MN, USA

Geologic Mapping of the Greenaway Quadrangle (V24), Venus

Lang, N. P.; Hansen, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The V24 quadrangle (120-150E; 0-25N) comprises parts of the Aphrodite plains region and Aphrodite Terra and displays evidence of volcanic and tectonic processes at multiple scales. Coronae and small shields source volcanic flows that interact with tectonic elements of the planitiae including broad scale topographic basins, ribbon-bearing tessera terrain, spaced lineaments, wrinkle ridges, and penetrative fractures resulting in a geologically complex and interesting region. Detailed mapping of this region may help constrain models of plains evolution. Geological mapping, according to standard guidelines, is conducted digitally using a 225-m/pixel Magellan SAR base. Synthetic stereo, Magellan altimetry data, and full-resolution

(75-m/pixel) normal and inverted Magellan SAR framelets are used in mapping. Use of ENVI software allows additional image processing to aid in detailed mapping.
Author
Venus Surface; Planetary Geology; Thematic Mapping; Planetary Mapping; Geological Surveys

20030111400 Brown Univ., Providence, RI, USA
Decoupling of REE in Plagioclase and Orthopyroxene in the Lunar Ferroan Anorthosite
Liang, Y.; Hess, P. C.; Cherniak, D. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

According to the canonical lunar magma ocean (LMO) model, ferroan anorthosites (FANs) were part of the lunar anorthosite crust formed via plagioclase flotation and subsequent solidification in a globally distributed LMO. The solidification time for a globally distributed LMO is model dependent and ranges from 10(exp 4)-10(exp 8) yrs. At a given time during lunar crust formation, a highly simplified lunar crust would consist of a protocrust with perhaps higher mafic mineral abundance than typical FANs at the top, a growing plagioclase-rich crust largely free of intercumulus melt in the middle, and a mush layer composed of plagioclase, smaller quantities of pyroxene olivine and a relatively dense, FeO-enriched melt of the LMO at the bottom. Due to their negative buoyancy relative to the plagioclase the intercumulus melts tend to 'lift' the plagioclase matrix, forming 'rockbergs' and perhaps even forcing the matrix to deform (compact) against the completely solidified crust. The ability to segregate and expel significant amount of intercumulus melts from the plagioclase mush is a necessary condition for the formation of an anorthosite crust that is characterized by small mafic mineral fraction and low incompatible trace element abundance.
Derived from text
Anorthosite; Olivine; Lunar Crust; Decoupling; Feldspars; Trace Elements; Pyroxenes

20030111401 Wisconsin Univ., Madison, WI, USA
Ancient Zircons Suggest Melt from Very Large Terrestrial Impacts Produced First Continents
Schmitt, H. H.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Early impacts on the continental scale of South Pole-Aitken and Procellarum, occurring in water-rich environments such as the Earth and Mars, would create thick sheets of impact generated rock melt more than a 2500 km across and many kilometers thick. As these magma sheets crystallized, zirconium concentrations may have reached levels sufficient to produced zircons such as those recently described. Erosion of these protocontinents would release the zircon crystals for inclusion as sand grains in ancient sediments. As zircons are extremely hard and durable, they can survive several cycles of erosion. The very old terrestrial zircons that have been dated and had their oxygen isotopic ratios determined apparently formed in the presence of water (3,4) consistent with this hydrous impact melt sheet hypothesis.
Derived from text
Impact Melts; Lunar Craters

20030111402 Tokyo Metropolitan Univ., Hachiouji, Japan
Chemical Compositions of Three Antarctic Monomict Eucrites A87272, A881467, and A881747
Setoyanagi, T.; Ebihara, M.; Yamaguchi, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most noncumulate eucrites have been considered as early crustal rocks of the HED parent body. Almost all noncumulate eucrites are metamorphic rocks. They have been classified into 7 metamorphic types mainly based on the pyroxene mineralogy. If eucrites were metamorphosed by burial of countless lavas during crust formation, the degree of metamorphism may be directly related to the timing of eruption. Therefore, there might be a correlation between the degrees of metamorphism, bulk compositions, and radiometric ages. For geochemical study, it is essential to examine unbrecciated eucrites or monomict eucrites since some 'monomict eucrites' (e.g., Pasamonte and Sioux County) have been reclassified into polymict eucrites. We performed a geochemical and petrologic study of two unbrecciated eucrites, Asuka (A) 87272 and A881467 and one monomict eucrite A881747. These meteorites are petrologically well-characterized eucrites and give us an

excellent opportunity to compare the petrogenesis of individual meteorites with the early evolution of the eucritic crust.
Derived from text
Chemical Composition; Antarctic Regions; Meteoritic Composition; Rocks; Crusts

20030111403 Arizona State Univ., Tempe, AZ, USA
Pressure-Temperature Histories of Shock-induced Melt Veins in Chondrites
Sharp, T. G.; Xie, Z.; Aramovich, C. J.; DeCarli, P. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is generally accepted that the melt veins observed in many chondrites were formed by shock loading. Possible mechanisms of vein formation include shock collisions, adiabatic shear, and the collapse of previously existing porosity. Melt veins commonly contain newly crystallized grains of silicate, oxide, sulfide and metal that are sometimes accompanied by silicate glass or altered silicate glass. These minerals may comprise low-pressure minerals in some occurrences; or metastable high-pressure phases such as ringwoodite, majorite, and hollandite that crystallized from the melt at high pressure. Those portions of the chondrite that are more than a few vein widths from the nearest vein do not appear to have been strongly heated or as highly shocked as the material adjacent to the melt vein. In addition to crystallization form the melt, high-pressure minerals form in highly shocked samples by solid-state transformation of chondrite silicates that are entrained in the melt veins or occur at the melt-vein margin. These transformations only occur in materials that are in contact with melt, suggesting that such transformations are only kinetically possible in the highest temperature regions of the sample. Although it has been argued that the solid-state transformation to high-pressure minerals, requires local pressure as well as temperature anomalies, the distribution of high-pressure minerals around melt veins is consistent with melt veins quenching by conduction to the surrounding cooler chondritic material. Thermal quench of melt veins was first investigated in Zagami by Langehorst and Poirier, who demonstrated that melt veins quench quickly by conduction to the surrounding chondrite matrix. They also demonstrated that the quench times are strongly dependent on the thickness of the melt vein and can range from nanosecond to second time scales for microns to mm thick veins.
Derived from text
Temperature Distribution; Low Pressure; High Pressure; Shock; Melting; Chondrites; Veins (Petrology)

20030111404 Hawaii Univ., Honolulu, HI, USA
Telescopic Raman Measurements of Glasses of Mineral Compositions to a Distance of 10 Meters
Sharma, S. K.; Beall, G. H.; Hubble, H. W.; Musra, A. K.; Chio, C. K.; Lucey, P. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-7139; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Reflectivity spectra of Martian bright regions and laboratory experiments on synthetic glasses have indicated the presence of glass on the surface of Mars. Glass formation on Mars can be from both volcanic and impact processes. Because of the broad nature of the reflectance bands, the exact composition and amount of glass on the surface of Mars is still a subject of discussion. The Martian meteorites (SNC, Shergottite-Nakhlite-Chassignite) contain diaplectic glass 'maskelynite' formed by shock melting of feldspars. For example, in Shergottite the composition of maskelynite is normally in the range anorthite (An) 45 % to An 60 % (An-45 to An-60), where An=CaAlSi3O8, with a few sodic outliners. Potassium is found to increase with albite (Ab, NaAlSi3O8) content. Raman spectroscopy of isochemical minerals and glasses, and micro-Raman measurements on thin-sections of Martian meteorite, have shown that Raman spectroscopy can easily distinguish between crystalline and glassy phases. In this work, an improved version of a previously presented pulsed telescopic Raman system has been used to explore the possibility of detecting and characterizing glasses of mineral compositions at a distance of approx. 10m. Remote Raman measurements are carried out on synthetic glasses along the join An-100 to An-31, as well as on a glass sample of fused quartz.
Derived from text
Raman Spectroscopy; Telescopes; Measurement; Glass; Minerals; Composition

20030111405 Arizona Univ., Tucson, AZ, USA
Thermodynamics with a Pinch of Salt: Martian Landscape Energetics
Lorenz, R. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A purely energetic approach sheds instructive light on the history of Mars. The vigor of the past Martian hydrological cycle can be estimated from vertical convective heat fluxes, and the corresponding transport of salts into the Northern lowlands can be calculated. The conversion of incident sunlight into advective motions (and specifically, into mechanical work) allows an estimation of surface modification by winds. The expression of geothermal heat flow as tectonics and volcanism can similarly be estimated and shows good agreement with photogeologic studies. The ratios of the energies associated with these processes and with impact cratering can be compared with the corresponding ratios for other planets and with the observed geological character of Mars.
Author
Mars Surface; Planetary Geology; Thermodynamics; Salts; Mars Atmosphere; Mars Environment; Hydrological Cycle; Convective Heat Transfer; Heat Flux

20030111406 Brown Univ., Providence, RI, USA
Pavonis Mons Fan-shaped Deposits: A Cold-based Glacial Model
Shean, D. E.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Each of the three Tharsis Montes volcanoes on Mars has unusual fan-shaped deposits located exclusively to the northwest of each shield. The fan-shaped deposits of the Tharsis Montes generally share three major facies: 1) Ridged facies, 2) Knobby facies, and 3) Smooth facies. Here we examine the Pavonis fan-shaped deposits using new Mars Global Surveyor and Mars Odyssey data. Any explanation for the origin of the fan-shaped deposits must take into account both the similarities and differences in their morphologies, their approximately similar Amazonian age, and the fact that all three occur on the west-northwestern sides of the volcanoes. Based on Viking Orbiter data, several models have been proposed for their formation, including massive landslides, glacial processes and pyroclastic flows. Williams and Lucchitta suggest that the fanshaped deposits are the result of the deposition of moraines due to recession of local ice caps that formed on the volcanoes from mixtures of emanated volatiles and erupted ash. Scott et al suggest an explanation combining glacial and volcanic processes.
Derived from text
Planetary Geology; Mars Volcanoes; Mars Surface; Landslides; Glacial Drift; Deposits

20030111407 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Reuniting the Solar System: Integrated Education and Public Outreach Projects for Solar System Exploration Missions and Programs
Lowes, Leslie; Lindstrom, Marilyn; Stockman, Stephanie; Scalice, Daniela; Klug, Sheri; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Solar System Exploration Education Forum has worked for five years to foster Education and Public Outreach (E/PO) cooperation among missions and programs in order to leverage resources and better meet the needs of educators and the public. These efforts are coming together in a number of programs and products and in '2004 - The Year of the Solar System.' NASA's practice of having independent E/PO programs for each mission and its public affairs emphasis on uniqueness has led to a public perception of a fragmented solar system exploration program. By working to integrate solar system E/PO, the breadth and depth of the solar system exploration program is revealed. When emphasis is put on what missions have in common, as well as their differences, each mission is seen in the context of the whole program.
Author
Solar System; Space Exploration; Education; NASA Programs

20030111408 New Mexico Univ., Albuquerque, NM, USA
Melting in the Deep Lunar Mantle
Shearer, C. K.; Neal, C.; Draper, D.; Papike, J. J.; Agee, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Whereas previous experimental studies and interpretation of Apollo seismic experiments are permissive for garnet in the deep lunar mantle, interpretations of Lu-Hf isotopic systematics and trace element data [7] seem to require garnet in the source of selected mare basalts. Understanding the mineralogy of the deep lunar mantle is critical to our further interpretation of the

structure of the Moon and modeling early lunar differentiation. Also, as it has been suggested that some mare basalts may be the product of melting that was initiated at depths to 1000 km, the stability of phases such as garnet may affect basalt composition and magma transport. To better understand melting in the deep lunar mantle we have initiated a study that focuses upon both the trace element characteristics of mare basalts and pyroclastic glasses and the high pressure (greater than 2.5 GPa) phase equilibria of pyroclastic glass compositions. Here we report the initial high pressure results on picritic glass compositions and ion probe trace element study of the pyroclastic glasses with an emphasis on elements that could potentially be fractionated by garnet. In addition to continuing this line of experiments, an additional facet of this study will focus upon a comparison of trace elements between mare basalts and pyroclastic glasses using comparable ion probe- ICP-MS data sets. Derived from text

Flat Surfaces; Lunar Mantle; Magma; Melting; Mineralogy; Volcanology

20030111409 Case Western Reserve Univ., Cleveland, OH, USA

Evidence for a Second Generation of Magnesite in Martian Meteorite Allan Hills 84001

Corrigan, C. M.; Harvey, R. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

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Single-stage formation mechanisms for carbonate and other secondary minerals in ALH84001 are rapidly being revised to include multiple stages of carbonate growth and later thermal and mechanical events including alteration. In an effort to confirm some of these more complex histories we have been studying carbonate-bearing regions within this meteorite. Magnesitic carbonates found in contact with unique 'slab' carbonates in two thin sections of ALH84001 show indications of being of a later generation. The results of our observations help clarify the origins of the carbonate and related minerals in ALH84001, and how these minerals can be used to understand the history of interactions between the martian crust and its volatile inventory.

Author

SNC Meteorites; Magnetite; Meteoritic Composition

20030111410

Pavonis Mons Fan-shaped Deposits: Smooth Terrain Surface Ice Deposits

Shean, D. E.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The fan-shaped deposits of the Tharsis Montes generally share three major facies: 1) Ridged facies, 2) Knobby facies, and 3) Smooth facies. The ridged facies consists of narrow, parallel, concentric ridges interspersed in places with small hills. The hummocky or knobby facies consists of dense concentrations of small sub-km scale circular to irregularly shaped hills which are clearly highlighted by the 0.6 km wavelength in roughness maps of the area. Finally, the smooth facies consists of broad convex-outward plains superposing both the ridged and knobby units. Elsewhere, we have presented evidence supporting a cold-based glacial origin for the Pavonis deposits. Here, we present evidence suggesting that the smooth facies represents residual ice deposits that have persisted until the present. Previous Suggestions for Origin: Based on Viking

Derived from text

Terrain; Surface Roughness; Mars Surface; Ice; Deposits

20030111411 Arizona Univ., Tucson, AZ, USA

Reduction of Silicates at High Temperature: Fulgurites and Thermodynamic Modeling

Sheffer, A. A.; Melosh, H. J.; Jarnot, B. M.; Lauretta, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

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The high temperature processing of silicates often results in very reduced products, such as Si-bearing Fe metal in type-1 chondrules and in lunar regolith agglutinates. Previous work on fulgurites (the glassy products of the lightning strike fusion of sand, soil, or rock) found silicon metal and iron-silicon alloys inside the silicate glass. In this work, we present a new

fulgurite that contains many reduced phases, and we model condensation of the Al-Fe-Si-O system.
Derived from text
Silicates; High Temperature; Models; Thermodynamics; Chondrule; Meteoritic Composition

20030111413 Washington Univ., Saint Louis, MO, USA
Raman Spectroscopic Characterization of the Feldspars: Implications for Surface Mineral Characterization in Planetary Exploration
Freeman, J. J.; Wang, Alian; Kuebler, K. E.; Haskin, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-12114; NAG5-10703; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The availability in the last decade of improved Raman instrumentation using small, stable, intense lasers, sensitive CCD array detectors, and advanced fast grating systems enabled us to develop the Mars Microbeam Raman Spectrometer (MMRS), a field-portable Raman spectrometer with precision and accuracy capable of identifying minerals and their different compositions. For example, we can determine Mg cation ratios in pyroxenes and olivines to +/-0.1 on the basis of Raman peak positions. Feldspar is another major mineral formed in igneous systems whose characterization is important for determining rock petrogenesis and alteration. From their Raman spectral pattern, feldspars can be readily distinguished from ortho- and chain-silicates and from other tecto-silicates such as quartz and zeolites. We show here how well Raman spectral analysis can distinguish among members within the feldspar group.
Derived from text
Raman Spectra; Spectrum Analysis; Feldspars; In Situ Measurement; Mineralogy; Raman Spectroscopy

20030111414 Scripps Institution of Oceanography, La Jolla, CA, USA
Manganese-Chromium Isotope Systematics of Ivuna, Kainsaz and Other Carbonaceous Chondrites
Shukolyukov, A.; Lugmair, G. W.; Bogdanovski, O.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-4145; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have shown earlier that the bulk samples of carbonaceous chondrites [CC] reveal excesses in both Cr-53 (Cr-53*) and Cr-54 (Cr-54*) as compared to the terrestrial standard value. The Cr-53/52 ratios in bulk samples of Orgueil (CI), Murray (CM), Allende (CV), and the Bencubbin/CH-like meteorite Hammadah Al Hambra 237 (HH237) are correlated with the respective Mn/Cr ratios. In contrast to CC, HH237 is characterized by a deficit of Cr-53 (-0.15 +/- 0.10(epsilon)) at a low Mn/Cr ratio of 0.07. The HH237 data point, however, falls on the CC line. Here we report new Mn-53 - Cr-53 results for the CC Kainsaz (CO) and Ivuna (CI).
Derived from text
Manganese Isotopes; Chromium Isotopes; Carbonaceous Chondrites

20030111415 Eotvos Lorand Univ., Budapest, Hungary
The Role of Subsurface Melting in the Global Climate Cycles on Mars
Kereszturi, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The cryosphere of Mars is made up of ice and carbon dioxide plus rock fragments and pore gases. If we would like to find liquid water on Mars it is more probable to find it below than on the surface because the low atmospheric pressure and temperature. In this work we would like to outline a possible process for the subsurface melting of ices. Aside from the possible existence of deep subsurface water layer, the pressure driven melting is a possibility to get water near to the surface under present conditions. Episodic melting can take part in the following processes: 1. climate changes by water vapour and carbon dioxide release into the atmosphere, 2. water outbreaks to the surface and sculps outflow structures, 3. chaos formation by the changes in the consistency of matters, 4. surface movements and crustal deformation by changes in the consistency of matters too. We had analised the possible ice content based on the poposity values. In the model only the pressure driven melting of ice was taken to account aside from the temperature, and the model was made only for water ice and not clathates. Because under special circumstances the lithostatic pressure can force to the pore ices, increasing the pressure inside the pores this can cause subsurface melting.
Author
Melting; Ice; Mars (Planet)

20030111416 Colorado Univ., Boulder, CO, USA

Modeling Surface Stresses on Europa

Stempel, M. M.; Pappalardo, R. T.; Barr, A. C.; Wahr, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modeling of the surface stresses on Europa has been performed to date, considering tidal, nonsynchronous, and polar wander sources of stress. The results of such models can be used to match lineament orientation with the candidate stress patterns. Moreover, stratigraphic analysis can be used in combination with stress modeling to infer the evolution of Europa s surface back through time. We are creating a surface stress model for Europa (in MATLAB) that will facilitate comparison of principal stresses to lineament orientation, and which will be available in the public domain.

Derived from text

Europa; Structural Properties (Geology); Mathematical Models; Stress Analysis

20030111417 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Berlin, Germany

Ganymede Craters: Relationships Between Spectral Properties and Crater Retention Age

Stephan, K.; Jaumann, R.; Wagner, R.; Hibbitts, C. A.; Hansen, G. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Both bright and dark craters occur on Jupiter's satellite Ganymede. The Near Infrared Mapping Spectrometer (NIMS) onboard the Galileo spacecraft performed spectroscopic measurements of Ganymede in the spectral range of 0.7 to 5.2 microns. Observations of Ganymede s craters acquired at sufficiently high spatial resolution coordinated with Galileo SSI (Solid State Imaging) observations and additionally with medium- and low-resolution SSI and Voyager observations were used for investigating relationships between the spectral properties, morphology and relative retention age of Ganymede's impact crater material, and of substrate material.

Derived from text

Ganymede; Geochronology; Lunar Craters; Infrared Spectrometers; Planetary Mapping

20030111418 Tokyo Univ., Japan

Examination of High Temperature Annealing of Amoeboid Olivine Aggregates: Heating Experiments of Forsterite and Anorthite Mixtures

Komatsu, M.; Miyamoto, M.; Mikkouchi, T.; Kogure, T.; Krot, A. N.; Keil, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Amoeboid Olivine Aggregates (AOAs) are irregularly-shaped, 100 microns to 5 mm in size, fine-grained objects that constitute a few vol% of meteorites in most carbonaceous chondrite groups. Previous studies concluded that AOAs are aggregates of solar nebula condensates which continued to react with the solar nebula vapor to the temperature to form phyllosilicates. However, these studies are largely from the AOAs from the oxidized CV3 chondrite Allende which experienced secondary alteration. Based on the mineralogical study of the reduced CV3 chondrites, we have recently suggested that AOAs experienced high temperature annealing without substantial melting and were subsequently isolated from high temperature nebular gas, possibly by physical removal, e.g. by X-wind. Annealing and a small degree of melting of AOAs is supported by olivine triple junctions, doughnut-shaped forsterite, the presence of rounded FeNi-metal nodules in some AOAs and relatively compact textures. In order to examine the possibility of high temperature annealing of AOAs, isothermal and cooling experiments of constituent minerals of AOAs have been performed.

Derived from text

Aggregates; Annealing; Forsterite; High Temperature; Olivine; Amoeba; Mixtures

20030111419 Muenster Univ., Germany

TOF-SIMS Analysis of Isotopically Anomalous Phases in Interplanetary Dust and Renazzo

Stephan, T.; Leitner, J.; Floss, C.; Stadermann, F. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Deuterium and N-15 enrichments are widespread in interplanetary dust particles (IDPs) and primitive meteorites. However, little is known about the carrier phases of these two types of anomalies, which are in general not correlated with

each other. Recent developments in analytical techniques with sub-micrometer spatial resolution now give us the opportunity to investigate the lateral distribution of isotopically anomalous phases within single IDPs in order to shed light on their origins. In a continuation of our previous work on other dust grains, we investigated Kipling (L2011- R12), the particle with the highest N-15 enrichment ever reported in an IDP. In contrast to the other IDPs, which only showed N-15 enrichments in distinct regions, Kipling is dominated by heavy nitrogen, but also contains two hot spots with delta N-15 = +1250%o and delta N-15 = +1090%o, respectively, that were found with the Washington University NanoSIMS. An O-17 rich presolar grain has recently been found in another area of this IDP. In the present study we used time-of-flight secondary ion mass spectrometry (TOFSIMS) to identify the different carriers of these anomalies. With the intention of comparing the results on IDPs with other primitive chondritic material, we also investigated matrix material of the CR chondrite Renazzo. This meteorite is well known for its deuterium and N-15 enrichments. The material we used is part of a series of matrix samples heated to various degrees in vacuum and in air. The purpose of our comparative study is to investigate the origin, history, and nature of isotopically anomalous phases in primitive solar system material, how they survived in their respective parent bodies, and what they endured while they traveled to Earth, especially during atmospheric entry.
Derived from text
Anomalies; Interplanetary Dust; Secondary Ion Mass Spectrometry; Time of Flight Spectrometers; Chondrites; Isotopic Enrichment

20030111420 NASA Johnson Space Center, Houston, TX, USA
Vertical Analysis of Martian Drainage Basins
Stepinski, T. F.; OHara, W. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have performed a vertical analysis of drainage basins on Mars that were computationally extracted from DEMs based on the MOLA data. Longitudinal profiles of main streams are calculated and the slope-area relation is established for 20 basins coming from assorted martian locations. An identical analysis is done for 19 terrestrial river basins. Our results show that, in comparison to terrestrial basins, martian basins have more linear longitudinal profiles, more frequent existence of knickpoints, predominance of asymmetric location of the main stream in the basin, and smaller values of concavity exponent. This suggests a limited role for surface runoff on the global scale. However, two basins extracted from the slopes of martian volcanoes show a strong similarity to terrestrial basins, indicating a possible local role for the process of surface runoff.
Author
Drainage; Mars (Planet); Mars Volcanoes; River Basins; Topography

20030111421 Hawaii Univ., Honolulu, HI, USA
A Reinterpretation of ISM Data: Quantitative Analysis of Pyroxene Compositions
Steutel, D.; Lucey, P. G.; Hamilton, V. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Near-infrared spectra of pyroxenes have distinct absorption features at approximately 1 and 2 m. The positions of these features are dependent on the composition of the pyroxene. Pyroxene spectra have been observed on the Martian surface, and at high spectral resolution by the ISM imaging spectrometer on board the Phobos-2 spacecraft in 1989. Previous researchers have deconvolved ISM spectra to identify the components of the spectra which comprise the pyroxene signal and determined the 1 and 2 m band center locations. We have developed a quantitative model for determining pyroxene Ca/Fe/Mg composition from the center position of the 1 and 2 m features in laboratory pyroxene spectra. We have applied our model to the identified band centers of the ISM pyroxene spectra to more precisely estimate the compositions of pyroxenes on the Martian surface.
Derived from text
Quantitative Analysis; Pyroxenes; Infrared Spectra; Mars Surface; Composition (Property)

20030111422 Arizona Univ., Tucson, AZ, USA
Ca and Mg Tracer Diffusion in Diopside: Experimental Determination and Applications to Cooling History of Planetary Samples
Stimpfl, M.; Ganguly, J.; Hervig, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Clinopyroxenes in slowly cooled igneous rocks in both planetary and terrestrial environments commonly show exsolution

lamellae of augite and pigeonite (which may be inverted to orthopyroxene) normal to the c-axis. The lamellar thickness and Ca-Mg-Fe zoning in the exsolved phases can be modeled to retrieve the cooling rates of the host rocks if the diffusion properties of these cations are known. We have, thus, undertaken a study to measure the self diffusion coefficient of the divalent cations in clinopyroxene as a function of temperature. We report here the data that we have obtained so far in this on-going project, and discuss their potential implications.
Derived from text
Calcium; Magnesium; Igneous Rocks; Cooling; Planetary Environments; Diffusion

20030111423 NASA, Washington, DC, USA, Academy of Sciences (USSR), Moscow, USSR
Mars: Detaching of the Free Water Signature (FWS) Presence Regions on the Base of HEND/ODYSSEY Data and Their Correlation with Some Permafrost Features from MOC Data
Kuzmin, R. O.; Mitrofanov, I. G.; Litvak, M. L.; Boynton, M. V.; Saunders, R. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first results from global mapping of the neutron albedo from Mars by HEND instrument have shown the noticeable deficit of both the epithermal (EN) and the fast (FN) neutrons counts rate in the high latitudes regions of both hemispheres of the planet. The deficit is indicative for high enriching of the surface regolith by hydrogen, which may correspond to amount of any water phases and forms. The objectives of our study are the spatial and temporal variations of the free water (ice) signature in the Martian surface layer on the base of HEND/ODYSSEY data and their correlation with spatial spreading of some permafrost features, mapped on the base of MOC images. For the study we used the results of the global mapping (pixel 5 x5) of EN and FN albedo, realized by HEND/ODYSSEY in the period from 17 February to 10 December 2002 year.
Author
Mars Surface; Permafrost; Water; Albedo; Fast Neutrons

20030111424 Academy of Sciences (USSR), Moscow, USSR
Polygonal Terrains on Mars: Preliminary Results of Global Mapping of their Spatial Distribution
Kuzmin, R.; Zabalueva, O.; Zabalueva, E. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the permafrost zones on the Earth the polygonal terrains are most widespread features, which serve as the basic morphological indicator of ice-reaching deposits presence. The polygonal-like features on Mars with scale similar to the terrestrial ice-wedge polygons have been described in first on the base of the Viking Lander 2 panoramic images and the separate Viking Orbiter images and their most possible origin have been interpreted as result of the thermal contraction in ice-reach soils. The high resolution imaging of Mars by Mars Orbiter Camera (MOC) during Mars Global Surveyor MGS mission operation have shown much more detailed multiple examples of the polygonal terrains. Recently conducted analyses of the MOC images for separate regions of the planet have shown that the morphology of the Martian polygonal features is very similar with the terrestrial ice-wedges polygons, while their size range (approx. 20-300 m) is some wider. First attempt to conduct the global mapping of the polygonal terrains on Mars, has been undertaken on the base of 68 studied MOC images and has shown that the terrains are located in the both hemispheres of Mars mainly on the latitudes higher than 40 deg. In the work we present our preliminary results of global mapping of the Martian polygonal terrains occurrence on Mars (using our data base of the features occurrence on Mars) and discuss their morphological aspects.
Author
Mars Surface; Terrain; Polygons; Planetary Geology; Planetary Mapping; Spatial Distribution; Landforms

20030111425 Commissariat a l'Energie Atomique, Gif-sur-Yvette, France
Laser Induced Breakdown Spectroscopy Under Martian Conditions: Optimization of Operating Conditions
Lacour, J. L.; Salle, B.; Brennetot, R.; Vors, E.; Fichet, P.; Rivoallan, A.; Fabre, C.; Dubessy, J.; Maurice, S.; Cremers, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The project called MALIS (Mars Analysis by Laser Induced Spectroscopy) aims at performing high accuracy in situ geochemical analyses of Martian soils and rocks toward the end of the decade. This presentation reports on the statistical procedure performed to achieve optimization of Laser Induced Breakdown Spectroscopy (LIBS) under Martian conditions. In the LIBS technique a pulsed laser beam is focused on the sample surface and creates a plasma that emits spectral lines which

are characteristic of elements embedded in the sample. LIBS technique has many advantages, especially a remote capability up to 20 meters and a rapid analysis time (a few minutes). Due to space requirements in terms of size, weight, available power, and telemetry, it is important to characterize the method for optimum performance. To determine optimum operating conditions for accurate and reliable analyses of Mars soils and rocks, we used a Doehlert matrix design for the optimization scheme. Following this, a spectral database for LIBS under Martian conditions is being built in the optimized operating conditions.
Author
Mars Surface; Laser-Induced Breakdown Spectroscopy; Geochemistry

20030111428 Planetary Science Inst., Tucson, AZ, USA
Investigating the Martian Gullies for Possible Brine Origin: A Preliminary Search for Evaporite Minerals Using THEMIS Data
Lane, M. D.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Photographs taken by both the Mars Orbiter Camera (MOC) aboard the Mars Global Surveyor (MGS) spacecraft and the Thermal Emission Imaging System (THEMIS) aboard the Mars Odyssey (MO) spacecraft have shown the presence of young gullies on Mars. These gullies occur at middle and high latitudes (predominantly in the southern hemisphere) in the walls of both impact craters and canyons. They are thought possibly to be formed by the melting of ground ice, groundwater seepage (possibly as brines), surface runoff, or even liquid CO2, activated sporadically as a result of oscillations in Mars orbit. For this work, the hypothesis of gully formation being related to the outflow of brines will be investigated through the observation and study of spacecraft data. Brine rich fluids expunged from underground onto the walls of canyons and craters would either evaporate or freeze and sublimate. Removal of water from a brine by evaporation or sublimation would cause the solutes to precipitate as evaporite minerals on the canyon and crater walls or at the base of the walls, and possibly on the canyon and crater floors. Hence, the gully sites are ideal target areas to search for evaporites using THEMIS data. The objective of this work is to survey the recently acquired THEMIS data for spectral evidence of evaporite minerals, with a focus on areas of gully formation. Identifying salt mineral residues could provide chemical evidence in support of the brine origin of the Martian gullies.
Author
Mars Surface; Landforms; Brines; Planetary Geology; Mars Craters; Canyons; Evaporation; Solutes; Precipitates

20030111429 NASA Johnson Space Center, Houston, TX, USA, Lockheed Martin Space Operations, Houston, TX, USA
Thermal Analysis of Acicular Shaped Magnetite
Lauer, H. V., Jr.; Ming, D. W.; Golden, D. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are in the process of developing a database on the thermal properties of well-characterized Martian analog materials in support of future Mars surface missions. The database contains the thermal behaviors of these analog materials under reduced and Earth ambient pressures. Magnetite in planetary materials has received considerable attention in recent years since the identification of fine grain single-domain magnetite in Martian meteorite ALH84001 and their possible link to past life on Mars (i.e., possible biominerals of magnetotactic bacteria). Because of its possible importance to Mars science, we report here the thermal properties of magnetite particles with acicular morphology, i.e., needle-shaped magnetite. Acicular shaped magnetite can be commercially produced from goethite (FeOOH) as the starting material via a H2 reduction process. However, instead of using this process or procedure, we report here on the thermal characterization of acicular magnetite formed under reducing conditions from well-characterized needle-shaped goethite at low temperature in controlled CO-CO2 1-bar atmosphere gas mixing furnaces.
Author
Analogs; Mars (Planet); Thermal Analysis; Magnetite

20030111431 Brown Univ., Providence, RI, USA
Fe(sup 3+)/Sigma Fe Ratios in Pigeonite as a Function of f(sub O2): A Preliminary Investigation
McCanta, M. C.; Rutherford, M. J.; Dyar, M. D.; Delaney, J. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Magmatic oxidation state reflects the degree of oxidation of the source region and, possibly, the additional effects of magma interaction with near surface rocks and/or fluids. The physical parameter which controls oxidation state is oxygen fugacity (f(sub O2)). f(sub O2) influences the crystallization sequences of magmas, as well as the composition of the resulting minerals. If the intrinsic f(sub O2) of a planet is known at depth (i.e. the magma source region), insight can be gained into magmatic and non-magmatic processes which may have overprinted the primary f(sub O2). Silicate melt Fe(3+)/SFe ratios and Fe-Ti oxide equilibria are the best studied and most commonly used oxybarometers in terrestrial igneous rocks. It's long been known that the Fe3+/SFe ratio in silicate melts is a function of oxygen fugacity. This ratio has been calibrated experimentally and can be used to measure the crystallization f(sub O2) of a magma. The dependence of Fe-Ti oxide equilibria on fO2 has also been quantified experimentally for use as a oxybarometer. Mafic minerals and possibly plagioclase have Fe(3+)/SFe ratios that are a function of two factors: 1) crystal chemistry and 2) their crystallization f(sub O2). Olivine and low-Ca pyroxene, for example, have steric constraints on the extent to which Fe(3+) can be incorporated in their structures, and may not record changes in magmatic f(sub O2). The chemistry of high-Ca pyroxene, however, allows for extensive incorporation of Fe(3+) in its crystal structure, making it a useful oxybarometer. To date, there has been no systematic experimental study of the variation of the Fe(3+)/SFe ratio as a function of f(sub O2) in mafic silicates (or feldspar). If a systematic variation of mafic mineral Fe(3+)/SFe with f(sub O2) is discovered, this could provide a valuable new way of measuring f(sub O2) in rocks which lack residual glass or in which the oxides are not present or in equilibrium. A good candidate rock set to investigate is the group of basaltic Martian meteorites, which are holocrystalline and contain oxides which exhibit complex subsolidus reequilibration features. The measurement of crystallization f(sub O2) in these samples is notoriously difficult and a new oxybarometer would be of great use. This study seeks to address the lack of a calibration of the variation of mafic mineral Fe(3+)/SFe ratio with f(sub O2) through a series of experiments and analyses of the products . We have completed a sequence of controlled f(sub O2) experiments on a synthetic basaltic shergottite starting composition, crystallizing the low-Ca pyroxene pigeonite (Pgt). The Fe(3+)/SFe ratios have been measured in these pyroxenes in a first attempt to actually quantify their possible variation with f(sub O2).
Author
Iron Isotopes; Isotope Ratios; Oxygen; Volatility; Shergottites; Crystallinity

20030111432 Planetary Science Inst., Tucson, AZ, USA
Impact Delivery of Organics to Mars: Oblique Impacts
Pierazzo, E.; Chyba, C. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Apart from Earth, Mars and Europa are the most likely worlds in our solar system on which evidence of present or past life may be found. In the case of Earth, we concluded that impact delivery of organics, in particular amino acids, could have played an important role in the organic inventory of the early Earth. This was a result more optimistic with respect to organic impact survival that was found in much, though not all, previous work. In the case of Europa, we have found that intact organic delivery is unlikely to be important, although cometary delivery of biogenic elements appears significant.
Derived from text
Organic Compounds; Survival; Biogeny

20030111433 Brown Univ., Providence, RI, USA
New Model for Agglutinitic Glass Formation from LSCC Data
Pieters, C. M.; Taylor, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-10469; NAG5-11978; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the return of the first lunar samples it has been well known that glass-welded aggregates (agglutinates) accumulate in lunar soil as the result of multiple processes, many of which are driven by micrometeorite impacts. The proportion of agglutinates increases with increasing exposure to the space environment, and for an individual soil the proportion of agglutinates also increases with decreasing particle size. Detailed chemical and petrographic analyses of a suite of mare soils and their agglutinate constituents prepared by the Lunar Soil Characterization Consortium appeared to confirm the 'Fusion of the Finest Fraction' model for agglutinate formation (or F3) proposed by Papike et al. However, recent LSCC data for highland soils are not consistent with the F3 model and alternate models for agglutinate formation must be revisited. Instead, we suggest differential melting of soil species may be more consistent with the full range of soil data to date.
Derived from text
Agglutination; Glass; Meteorite Collisions; Micrometeorites; Lunar Geology; Chemical Analysis; Lunar Soil

20030111434 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA

Differentiation of Metal-rich Meteoritic Parent Bodies

Petaev, M. I.; Jacobsen, S. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is now increasing evidence that the timescale between the formation of CAIs and of chondrules is < 1-2 Ma, and that the achondritic parent planets may have formed and differentiated within 2-4 Ma of the origin of the Solar System. Long-lived chronometers (such as Re-187-Os-187) provide some broad constraints on the chronology and differentiation processes in the early Solar System. The isotopic record of extinct radionuclides (such as Pd-107 and Hf-182), may potentially yield more reliable constraints on the rates of accretion, core formation, and the earliest evolution of the mantle and crust in planetesimals and planets. Our goal is to investigate differentiation processes and to establish reliable timescales for the early stages of planetary evolution by modeling the trace element behavior, isotopic evolution, and parent/daughter fractionations of the Re-Pt-Os, Pd-Ag, and Hf-W systems. For the purpose of this study we need high quality elemental and isotopic data on Mo, Re, Os, Pt, Pd, Ag, and W as well as reliable transport models for these elements during planetary differentiation.
Derived from text

Meteoritic Composition; Palladium Isotopes; Hafnium Isotopes; Trace Elements; Radioactive Isotopes; Crusts; Chondrule

20030111435 Geological Survey of Canada, Ottawa, Ontario, Canada

Transient and Disruption Cavity Dimensions of Complex Terrestrial Impact Structures Derived from Magnetic Data

Pilkington, M.; Hildebrand, A. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Transient and disruption cavity sizes are fundamental parameters in the study of impact structures. They are governed by the velocity, size and density of the impacting body, the target density and ambient gravitational acceleration. Hence, knowledge of transient and disruption cavity dimensions allows the calculation of energy release associated with impact. Since the recognition of the devastating environmental effects related to the Chicxulub crater it has been underscored that accurate estimates of transient and disruption cavity dimensions are crucial in evaluating potential environmental degradation from an impact.
Derived from text

Environment Effects; Craters; Magnetic Fields; Degradation

20030111436 California Univ., Los Angeles, CA, USA

The Sublimation and Relaxation of Troughs and Scarps Within the Martian North Polar Layered Deposits

Pathare, A. V.; Paige, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The kilometer-scale topography of the North Polar Layered Deposits (NPLD) is dominated by troughs and scarps: Fig. 1 shows both (a) the ubiquity of troughs throughout the NPLD, and (b) the enhanced steepness of scarps at the margins of the NPLD (e.g., along the inner wall of the channel-like reentrant, Chasma Boreale). Although the surface slopes and total depths of NPLD troughs and scarps are widely presumed to result from surface ablational processes, here we propose that an alternative mechanism, viscous relaxation of subsurface water ice, governs the morphological evolution of NPLD troughs and scarps.
Derived from text

Troughs; Planetary Geology; Mars Surface; Topography; Sublimation; Slopes

20030111438 Aberdeen Univ., UK

Mineral Radioactivity Promotes Organic Complexity on Rocky Planets

Parnell, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Irradiation is widely invoked as a mechanism by which simple carbon-bearing molecules may be polymerized or otherwise reacted to form progressively more complex molecules that could ultimately synthesize life. In our solar system, cosmic irradiation has been invoked as a source of complex molecules on the Galilean satellites, and on Titan, Pluto, Uranus and Neptune. These are icy bodies, where irradiation of a water/carbon dioxide ice mixture may be enough to create a

chemistry that could support life. Cosmic irradiation has also been suggested as the mechanism for organic synthesis on early Earth, in which irradiated atmospheric components could have yielded amino acids and other prebiotic organic molecules. Rocky planets present an alternative energy source. Like cosmic irradiation, energetic particles from heavy radioelements (uranium, thorium) can cause polymerization of organic molecules and enhance prebiotic synthesis and the evolution of DNA. Where uranium/thorium are concentrated in minerals, they can be templates for complexation and precipitation of organic compounds, evidenced by carbonaceous coatings on grains of uraninite, Th-rich monazite, U-rich zircon, U-rich apatite, and other minerals. Recent evidence for zircon crystals, and water at the planetary surface at a time prior to the record of life, invite a reassessment of the potential of mineral radioactivity to promote organic complexation on the early Earth.
Author
Terrestrial Planets; Minerals; Radioactivity; Organic Compounds; Planetary Geology

20030111439 Brown Univ., Providence, RI, USA
Crustal Spreading on Europa: Inferring Tectonic History from Triple Junction Analysis
Patterson, G. W.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Europa, one of the Galilean moons of Jupiter, is 1565 km in diameter with a rocky core and an outer layer of H2O approximately 170 km thick. Galileo magnetometer data suggest that a large portion of the H2O layer consists of liquid water, and that it is capped by an ice layer between approx.1 and 20 km thick. This outer shell is constantly under time-varying stress fields as a result of diurnal tides induced by the moon s proximity to Jupiter, nonsynchronous rotation of the decoupled outer shell, and possibly polar wander. The effect of these fields is to crack and warp the ice shell and subsequently break it into plates.
Derived from text
Crusts; Spreading; Stress Distribution; Diurnal Variations; Magnetic Fields; Rotation; Europa

20030111440 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Platinum in Presolar Nanodiamond Residues: An AMS Approach
Ott, U.; Merchel, S.; Knie, K.; Korschinek, G.; Faestermann, T.; Rugel, G.; Wallner, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Platinum isotopes have been measured in presolar nanodiamond residues from the Allende and Murchison meteorites using accelerator mass spectrometry (AMS). We infer an upper limit to the abundance of 198Pt-H of ~1x10sup14 atoms/g, which is on the order of what is expected from an extrapolation of the apparently mass dependent abundance trend of the associated noble gases.
Author
Murchison Meteorite; Allende Meteorite; Diamonds; Meteoritic Composition

20030111441 Arizona State Univ., AZ, USA
Calderas on Venus: Tectonics, Volcanism and Relationship with Regional Plains
Pace, K. R.; Krassilnikov, A. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): RFBR-02-05-65068; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Calderas on Venus, after 'Magellan', were described as circular to elongate depressions not associated with a well-defined edifice and are characterized mainly by concentric patterns of enveloping fractures. They are most common between 40 and 80 km in diameter, preferentially clustering in the Atla-Beta area. The 'Catalog of Volcanic structures of Venus' includes 97 calderas, which may have formed by similar processes that have been modeled by the well-studied terrestrial calderas. Goals of the study: 1) To study the global distribution of all calderas from the catalog. 2) To study topography and geology of calderas and their surroundings. 3) To study the period of caldera-forming activity.
Derived from text
Calderas; Venus (Planet); Tectonics; Volcanology

20030111443 California Inst. of Tech., Pasadena, CA, USA

USNM 3515: An Allende CAI with Li Isotopic Variations

Paque, J. M.; Burnett, D. S.; Chaussidon, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ion probe analyses of the Allende Type B1 CAI USNM 3515 by Chaussidon et al. [1,2] (CRM) revealed Li isotopic variations over 10% from terrestrial. There is an overall tendency of Li and Be abundances (Figure 1) to correlate, but with considerable scatter. CRM showed that subsets (groups) of the Li-Be trend exhibited good correlations of Li and Be and also showed a correlation of 7Li/6Li with 9Be/6Li, the expected isochron signature of live 7Be (53 day half-life) when 3515 formed. Live 7Be indicates very early formation of planetary materials at a time when the protosun was highly active, producing intense fluxes of particles with sufficient energy to produce 7Be by spallation reactions [3]. Total inclusion data do not show a 7Li/6Li - 9Be/6Li correlation. The case for 7Be rests entirely on the significance of the groups. Given the implications of 7Be, we have carried out a detailed petrographic study of the USNM 3515 section used by CRM. The goals were: (a) search for additional criteria for the (Li, Be) groups by studying the local petrology of the ion probe points; (b) test the 7Be origin of Li isotopic variations; (c) search for alternative interpretations of Li isotopic variations, both empirical and hypothesis-driven; and (d) characterize 3515 and compare with other Type B1 CAIs.

Author

Allende Meteorite; Petrography

20030111445 Tokyo Univ., Hongo, Japan

Formation and Sources of the Shalbatana Valley System

Palmero, A.; Sasaki, S.; Kuzmin, R. O.; Greeley, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A large concentration of seemingly collapsed features and associated outflow channels are found between western Lunae Planum and western Arabia Terra in the cratered highlands (units Npl1 and Npl2 [1]) and the volcanic plains (unit Hr [1]). Comparisons with terrestrial flood channels, such as those of Channeled Scablands in eastern Washington, suggest that the Martian channels were eroded by catastrophic floods [2,3,4]. Most of the Martian channels originate from chaotic terrains interpreted to represent areas where the ground collapsed as water (confined under the permafrost) was released under high hydrostatic pressures within artesian basins [5,6]. Understanding the geologic history of the Shalbatana Valley System (SVS) can improve our knowledge of groundwater recharging and extraction mechanisms, and the derivation of the history of valley formation in the highlands. Shalbatana Vallis was interpreted as an outflow channel excavated by water flow from an ice covered paleolake in Ganges Chasma [7] and from catastrophically releases from confined aquifers as the permafrost seal [8] was disrupted at three locations, forming chaotic regions [9]. Palmero and others [10] proposed that the excavation of SVS also involved water released from an extensive underground cavern system. They also proposed an alternative hypothesis for the origin for the Shalbatana upstream chaotic region; they suggest that a highly degraded late Hesperian impact crater (SE part) collapsed over the putative cavernous system. In this work, we have used 128 pixels/ degree MOLA DEMs to derive alternative hypotheses for the origin the Basin-A and its chaotic material, as well as for the origin of the flanking Valley system III (Fig.1).

Author

Mars Surface; Geomorphology; Landforms

20030111446 National Astronomical Observatory, Iwate, Japan

360-Orders and Degrees Spherical Harmonic Model for Lunar Global Topography and the Corresponding Crustral Thickness

Ping, Jinsong; Heki, Kosuke; Matsumoto, Koji; Tamura, Yoshiaka, et al.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Based on different methods, the global lunar surface topography model is expanded by using spherical harmonic function up to 360-orders and degrees from the lunar topographical 0.25deg x 0.25deg grid data, which has been carried out by filtering the laser altimetry measurements of the Clementine mission (http://pds-geophys.wustl.edu/pds/clementine/). This model, NLT180, is compared with the GLTM-2 model. Other important parameters, e.g. the offset between the center of figure (COF) and the center of mass (COM) of the Moon, and the topographical flattening of the Moon, have also been estimated together with the coefficients of the spherical harmonic functions. The results are similar to which obtained by other researchers.

Possibility to get higher degree spherical harmonic model by retrieving more information from the grid data is discussed. Based on the NLT360, the corresponding lunar global Moho topography and crustal thickness are also estimated by assuming a traditional single layered crust on the top of Moho. The method used in this article will benefit the research of the future lunar mission, SELENE (SELenological and ENgineering Explorer).
Derived from text
Crusts; Thickness; Lunar Topography; Harmonic Functions; Center of Mass; Selenology

20030111448 Tokyo Univ., Hongo, Japan
Noble Gas Studies on Martian Meteorites: Dar Al Gani 476/489, Sayh Al Uhaymir 005/060, Dhofar 019, Los Angeles 001 and Zagami
Park, J.; Okazaki, R.; Nagao, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Seven Martian meteorites, Dar al Gani (DaG) 476, Dar al Gani (DaG) 489, Sayh al Uhaymir (SaU) 005, Sayh al Uhaymir (SaU) 060, Dh ofar (DHO) 019, Los Angeles (LA) 001 and Zagami, have been studied for noble gas concentrations and isotopic compositions by stepwise heating and total melting method. These meteorites have been classified as basaltic shergottites. DaG 476 and DaG 489 were found in Libyan Sahara desert (1998 and 1997). SaU 005(1999), SaU 060 (2001) and DHO 019 (2000) were recovered in Oman. LA 001 (1999) was found with LA 002 in the Los Angeles, USA, but the original finding place was somewhere in Mojave desert. Whereas Zagami (1962) fell on Nigeria, six other Martian meteorites were found from hot deserts.
Author
SNC Meteorites; Isotope Ratios; Shergottites

20030111449 Aberdeen Univ., UK
Hydrocarbons in the Haughton Impact Structure, Devon Island, Nunavut, Canada
Parnell, J.; Osinski, G. R.; Lee, P.; Baron, M.; Pearson, M. J.; Feely, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The occurrence of organic matter in terrestrial impact craters is important to astrobiology, as it may offer insight into possible relationships between impact events and the genesis, distribution and preservation of biologically relevant materials on planets. In particular, the processing and mobilization of preexisting organic material in planetary targets is of interest for studies of pathways to chemical complexity. Observations in old (Palaeozoic, Precambrian) craters indicate that organic carbon can survive large impacts. However, limited exposure and superimposed geological events can make the detailed history of organic matter in old craters difficult to decipher. We present here the first identification of hydrocarbons in the young (23 Ma, Miocene) Haughton impact structure.
Derived from text
Hydrocarbons; Craters; Exobiology; Organic Materials; Geology

20030111450 Colorado Univ., Boulder, CO, USA
Furrow Topography and the Elastic Thickness of Ganymede's Dark Terrain Lithosphere
Pappalardo, Robert T.; Nimmo, Francis; Giese, Bernd; Bader, Christina E.; DeRemer, Lindsay C.; Prockter, Louise M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-11616; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The effective elastic thickness of Ganymede's lithosphere tell of the satellite's thermal evolution through time. Generally it has been inferred that dark terrain, which is less tectonically deformed than grooved terrain, represents regions of cooler and thicker lithosphere [1]. The ancient dark terrain is cut by furrows, tectonic troughs about 5 to 20 km in width, which may have formed in response to large ancient impacts [1, 2]. We have applied the methods of [3] to estimate effective elastic thickness based on topographic profiles across tectonic furrows, extracted from a stereo-derived digital elevation model (DEM) of dark terrain in Galileo Regio [4]. Asymmetry in furrow topography and inferred flexure suggests asymmetric furrow fault geometry. We find effective elastic thicknesses ~0.4 km, similar to analyzed areas alongside bright grooved terrain. Data and Analysis: A broken-plate elastic model.
Author
Ganymede; Topography; Lithosphere

20030111451 Brown Univ., Providence, RI, USA

Science Options for Sampling South Pole-Aitken Basin

Pieters, C. M.; Duke, M.; Head, J. W., III; Jolliff, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Sample return from the huge South Pole-Aitken basin is one of the highest priority science missions recommend by the NRC/NAS for solar system exploration by NASA's New Frontiers program, second only to Kuiper Belt/Pluto exploration. The envisioned SPA mission is to address several key science issues concerning early evolution of solid bodies in the solar system. Since the Moon is a differentiated planetary body that shares the 1 AU environment with Earth, and SPA is among the largest basins in the solar system, mission goals identified by the NRC report include: 1) Obtain samples to constrain the early impact history of the inner solar system (including the possible 4.0 By 'cataclysm'). 2) Assess the nature of the Moon s interior and the style of the differentiation process. 3) Develop robotic sample acquisition, handling, and return technologies. Implementation of New Frontiers missions will be competed through a NASA AO process. The sample return mission to South Pole-Aitken Basin (SPA-SR) could be flown as early as 2008/9. Several aspects of this science opportunity involve community participation, most importantly analysis of the returned samples. Optimization of the specific site(s) selected for sampling also benefits from broad input, and several site selection options are discussed here.

Author

Sample Return Missions; Lunar Surface; Sampling; Structural Basins; Lunar Exploration

20030111452 Alaska Univ., Fairbanks, AK, USA

Evidence for an Aeolian Concentration of Crystalline Hematite Deposits Observed Within Sinus Meridiani

Pitiss, S. E.; Sharpton, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Results of our previous work indicate that aeolian infilling has strongly affected the area within the hematite signature in Sinus Meridiani (SM) covered by MOC NA image m0704322 (hereafter, Image 1) and that two distinct surface units exist within this image. We expand upon this work by comparing this area with the results of a detailed examination of image m1801300 (hereafter, Image 2) located just outside the hematite region. The objective of this study is to gain a better understanding of the processes that have produced the hematite enrichment and how they differ from other surface processes in the SM region.

Derived from text

Hematite; Crystallinity; Deposits; Enrichment

20030111453 NASA Johnson Space Center, Houston, TX, USA

Making a Regolith Breccia

Noble, S. K.; Keller, L. P.; Pieters, C. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-11763; NGT9-66; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Regolith breccias are created when regolith is fused together by shock from nearby impacts. Some of these breccias are so friable that they crumble easily back into the soils from which they formed. Others are compacted enough to survive being launched off a parent body and landing on Earth, as evidenced by our collection of regolith breccia meteorites from both the moon and the asteroids. By comparing and contrasting de-lithified soils to their regolith counterparts, insight can be gained into the breccia forming process.

Derived from text

Breccia; Moon; Regolith; Lunar Rocks

20030111455 Centre National de la Recherche Scientifique, Toulouse, France

Iron Isotope Evidence for Formation of the Moon Through Partial Vaporisation

Poitrasson, F.; Halliday, A. N.; Lee, D. C.; Levasseur, S.; Teutsch, N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The currently favoured scenario of the origin of the Moon through a Giant Impact, in which a body approaching the size of Mars hit the proto-Earth and yielded ejecta leading to the Moon remains hypothetical. The alternative theories, especially

the capture or co-accretion hypotheses cannot be totally excluded in the view of the present data available. The Giant Impact theory predicts extremely high temperatures, sufficient to vaporise part of the mantle and cores of the proto-earth and impacting planet Theia. We have thus measured the Fe isotope composition of the Earth, Moon and meteorites thought to come from Mars and asteroid 4 Vesta to see if this highly energetic process left an imprint on the planetary iron isotope signatures.
Derived from text
Iron Isotopes; Vaporizing; Meteorites; High Temperature; Moon; Ejecta

20030111456 Lunar and Planetary Inst., Houston, TX, USA
Volcanic Topography of Io: The Final Chapter
Wilson, R. R.; Schenk, P. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On such a volcanically active world as Io, topography is especially important for understanding lava emplacement, mountain formation, internal dynamics, and volcanic history. Previously we have described our efforts to map Io s topography at large and small scales. This report is motivated by several new developments, the most important of which are significant upgrades to our stereo topographic mapping software and the successful application of shape-from- shading (photoclinometry, PC) techniques to Io s photometrically complex surface. Here we summarize these developments and the topographic observations and resulting elevation maps of volcanic features completed to date, including the first such data for lava channels.
Derived from text
Io; Topography; Volcanoes; Planetary Mapping; Photogrammetry

20030111457 Brown Univ., Providence, RI, USA
Thumbprint Terrain and Sinuous Troughs with Medial Ridges in the Northern Lowlands of Mars: Assessment of the Glacial Hypothesis Using New Spacecraft Data
Pomerantz, W. J.; Head, J. W., III; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many workers have described the thumbprint terrain (TT), terrain consisting of nested curvilinear features visible throughout much of the Northern hemisphere of Mars in Viking data, and the troughs with medial ridges frequently associated with that terrain. Interpretations of TT have included: accumulations of eolian deposits; ice-shoved glaciotectonic features; chains of cinder cones; moraines; and paleocurrent markers is one of the most comprehensive recent treatments of TT. They attribute the entire system to glacial processes, positing the thumbprint terrain as moraines and the troughs as tunnel channels with medial eskers. This study evaluates the mechanism of origin from testing it against new data available from the Mars Global Surveyor (MGS).
Derived from text
Terrain; Cones (Volcanoes); Glacial Drift

20030111459 Rochester Univ., NY, USA
Global Evidence for a Permian-Triassic Impact Event
Poreda, Robert J.; Basu, Asish; Becker, Luann; Nicholson, Craig; Ocampo, Adriana; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several studies of the possible role of bolide (asteroidal or cometary) impact at the PTB were carried out through chemical and mineralogical characterization of boundary sediments. Although shocked quartz, microspherules and iridium anomalies have been detected (Xu and Yan, 1993; Holser and Margaritz 1992; Retallack et al., 1998; Kaiho et al., 2001 Olsen et al., 2002) the abundances of these impact tracers are some 10 to 100-fold lower than those reported at the 65 million year old KTB. Moreover, previous investigations of impact tracers (e.g. iridium) in some PTB locations (e.g. Meishan, China) have produced negative results (Zhao and Kyte, 1988; although the boundary layer for Meishan in this work was located in the middle of Bed 27 rather than the base of Bed 25; see also Xu and Yan, 1993) and no attempt was made to identify shocked metamorphosed grains. Another problem is that the present boundary for Meishan (base of Bed 25) is discontinuous and not present at all outcrop locations further highlighting the difficulties in identifying the PTB and detecting impact tracers in older sediments (Erwin, pers. comm.).
Derived from text
Bolides; Metamorphism (Geology); Sediments; Asteroids; Boundary Layers; Cometary Collisions

20030111460 Arizona State Univ., Tempe, AZ, USA

Using Overlapping MOC Images to Search for Dune Movement and to Measure Dune Heights

Williams, K. K.; Greeley, R.; Zimbelman, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first observations of dunes on Mars were made during the Mariner 9 mission, which revealed dunes within craters in the southern highlands. Dunes associated with the north polar laminated terrain were speculated from Mariner 9 images and confirmed by Viking Orbiter images, and more dunes were observed across the planet in the higher resolution Viking images. The Mars Orbiter Camera (MOC) on MGS has now provided thousands of high-resolution (approximately 5 m/pixel) Narrow Angle images that show the ubiquitous presence of dunes on Mars. These new images give the opportunity to investigate whether Mars dunes have moved recently. Zimbelman compared an early MOC image to a high-resolution Viking image of the Acheron Fossae region and concluded that dunes thee moved less than 8 m during the approximately 21 Earth years spanned by the two images. As part of the MGS Guest Investigator Program, four areas containing dunes imaged earlier in the mission were scheduled for re-targeting. The target areas were dunes within Proctor and Rabe craters, Chasma Boreale, and an unnamed crater at approximately 4N, 5.7W. Re-imaging of the areas took place approximately 2 Earth years after acquisition of each original image. This study used the overlapping images to search for dune movement and took advantage of stereo imaging over Proctor and Rabe craters to measure dune heights. Also, a newly released THEMIS image shows a possible cinder cone within Proctor as the source of some of the crater fill material and possibly some of the dune material. Derived from text

Dunes; Mars Photographs; Mars Surface; Mars Exploration; Imaging Techniques

20030111461 Rutgers - The State Univ., NJ, USA

Electron- and Photon-stimulated Desorption of Alkali Atoms from Lunar Sample and a Model Mineral Surface

Yakshinskiy, B. V.; Madey, T. E.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

We report recent results on an investigation of source mechanisms for the origin of alkali atoms in the tenuous planetary atmospheres, with focus on non-thermal processes (photon stimulated desorption (PSD), electron stimulated desorption (ESD), and ion sputtering). Whereas alkaline earth oxides (MgO, CaO) are far more abundant in lunar samples than alkali oxides (Na2O, K2O), the atmosphere of the Moon contains easily measurable concentrations of Na and K, while Ca and Mg are undetected there; traces of Ca have recently been seen in the Moon's atmosphere (10-3 of Na). The experiments have included ESD, PSD and ion sputtering of alkali atoms from model mineral surface (amorphous SiO2) and from a lunar basalt sample obtained from NASA. The comparison is made between ESD and PSD efficiency of monovalent alkalis (Na, K) and divalent alkaline earths (Ba, Ca).The ultrahigh vacuum measurement scheme for ESD and PSD of Na atoms includes a highly sensitive alkali metal detector based on surface ionization, and a time-of-flight technique. For PSD measurements, a mercury arc light source (filtered and chopped) is used. We find that bombardment of the alkali covered surfaces by ultraviolet photons or by low energy electrons (E>4 eV) causes desorption of hot alkali atoms. This results are consistent with the model developed to explain our previous measurements of sodium desorption from a silica surface and from water ice: electron- or photon-induced charge transfer from the substrate to the ionic adsorbate causes formation of a neutral alkali atom in a repulsive configuration, from which desorption occurs. The two-electron charge transfer to cause desorption of divalent alkaline eath ions is a less likely process.The data support the suggestion that PSD by UV solar photons is a dominant source process for alkalis in the tenuous lunar atmosphere.

Derived from text

Alkalies; Desorption; Electron Transfer; Lunar Geology; Lunar Rocks; Lunar Soil

20030111463 Los Alamos National Lab., NM, USA

Scientific Benefit of a Hypervelocity Mars Atmospheric Sample Capture and Earth Return with the SCIM Mission

Wiens, Roger C.; Thiemens, Mark H.; Leshin, Laurie A.; Clark, Ben; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Atmospheric and volatile measurements are crucial to understanding both Mars climate history and its potential for harboring life. Our present knowledge of the Mars atmosphere comes primarily from the Viking mass spectrometers, gases trapped in the martian meteorites, and from telescopic observations. The Viking landers measured the chemical composition of all major atmospheric species, but gave only high-uncertainty results on a few isotopic compositions. Thus, most of what we believe about the composition of the martian atmosphere is inferred from the martian meteorites. Gases contained in

several of these meteorites are thought to be unfractionated martian atmosphere trapped by shock implantation during ejection from Mars. However, the derivation of the Mars atmospheric composition is not straightforward, as the meteorites also appear to have retained magmatic gases, and contain cosmic-ray spallation products from their journey through space. Additionally, the martian atmosphere found in these meteorites was trapped some time in the past. An important MEPAG goal is the high precision measurement of the present-day atmosphere. The Sample Collection for Investigation of Mars (SCIM) mission, presently in a competed Phase A study, proposes to return 1 liter STP of the Mars atmosphere to Earth for isotopic study. Here we discuss the great importance of obtaining such a sample for analysis in terrestrial laboratories. A companion paper discusses the SCIM dust sample return science.
Derived from text
Mars Atmosphere; Mars Sample Return Missions; Mars (Planet); NASA Space Programs

20030111464 Paris-Sud Univ., Orsay, France
The Surface Composition of Martian Low Albedo Regions Revisited
Poulet, F.; Erard, S.; Mangold, N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Low albedo regions on Mars are often interpreted as outcrops of volcanic rocks. Mineral models of the thermal emission spectra obtained by TES indicate that the martian dark regions are characterized by basaltic surface material: large fraction of feldspar and one high-calcium pyroxene. The data from the IR spectrometer ISM onboard Phobos-2 show that the composition of these layers is rich in pyroxenes and contains a significant signature of hydratation. A systematic comparison of TES and ISM data suggests that variations in the vis-NIR observations could be controlled by dust or other thermally neutral materials. New high resolution visible images from the Mars Observer Camera and IR thermal images of the THEMIS spectrometer onboard Mars Odyssey show that the low albedo regions are correlated with dark sand dunes, sand sheets and eolian mantling. This implies that the dark material may not always correspond to in-situ rock outcrops. Even if it is important to remember that the different observational techniques (visible, NIR and thermal) are sensitive to different characteristics of the martian surface, the understanding of discrepancies of the compositional analysis from different measurements and the nature of low albedo layers is essential 1) to understand their erosional history, and 2) to interpret the IR data of future spectrometers like OMEGA and PFS onboard Mars Express. The purpose of this work is to revisit the surface composition of dark regions by modeling ISM spectra representative of dark regions with a radiative transfer theory.
Author
Mars Surface; Planetary Composition; Mars (Planet); Albedo

20030111465 Institut de Physique du Globe, Saint-Maur-des-Fosses, France
The Thickness of the Lunar Crust: How Low Can You Go?
Wieczorek, Mark A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Seismometers were placed on the lunar surface during the Apollo missions that allowed the seismic velocity of the lunar interior to be crudely determined. One of the major results from these analyses was the existence of a crust that was approximately 60 km thick at the Apollo 12 and 14 landing sites. Recent inversions of the same dataset using a more robust Monte Carlo inversion scheme, however, have cast some doubt on these Apollo-era conclusions. In particular, Khan et al. found that the lunar crust beneath the Apollo seismic network is most likely thinner than previously believed, possessing a thickness of 45 plus or minus 5 km. Using Bayesian hypothesis testing, Khan and Mosegaard further showed that a crustal thickness of 38 plus or minus 3 km was to be highly favored over a crustal thickness between 50 and 70 km. A complete independent reanalysis and inversion of the Apollo seismic arrival times by the IPGP group further supports the notion that the lunar crust is thinner than believed, possessing a thickness of 30 plus or minus 2.5 km. Using a receiver function analysis, Lognonn et al. further suggest that the crustal thickness beneath the Apollo 12 site is about 27 km, or marginally lower than their average value. While these recent crustal thickness estimates represent an average over all the raypaths that were modeled in these studies (excluding the receiver function analysis), the artificial impact data place the most stringent constraints on the seismic velocity of the crust and upper mantle. As the artificial impacts mostly sample the region of the Apollo 12 and 14 sites, these estimates are thus most representative of this region. In this paper I assess whether geophysical models using the known lunar gravity and topography data are compatible with these new seismic constraints.
Derived from text
Lunar Crust; Thickness; Topography; Lunar Surface; Lunar Seismographs

20030111466 National Air and Space Museum, Washington, DC, USA

'How Good is 'Good Enough'?': Analysis of Cost/Quality Trade-Offs in Planetary Remote Sensing for Both Research and Education

Williams, S. H.; Zimbelman, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Subtle, but diagnostic, topographic features are associated with many landforms common to Earth and Mars. Finding and identifying such features is a critical part of image interpretation. However, as is true in so many walks of life, there is a severe trade-off between image quality (spatial and vertical resolution, in most cases) and the cost of image acquisition/processing. Understanding the minimum requirements for data quality in meeting interpretation requirements is essential in ensuring proper landform identification at minimum cost. Ground surveys in the vicinity of a landed space probe have similar minimum resolution needs. How precise must such a survey be in order to detect adequately diagnostic features? Could such a survey be completely automated? Would the judgement of an astronaut in the selection of an interesting survey site and in the set up and troubleshooting of such a survey be required? Answering these questions is of critical importance in designing remote sensing systems for spacecraft. Further, posing and answering such questions make an engaging and educational inquiry-based activity useful for supplementing both formal and informal educational curricula. The authors have recently been awarded a Mars Fundamental Research Program grant to perform detailed surveys of pluvial and aeolian features in the Mojave and Lahontan Deserts of the western USA, with supplemental funding from both NASA HEDS and NASA OSS E/PO, to address the questions above and to create educational activities for use in the National Air and Space Museum; this is a report on our plans for carrying out the work.

Derived from text

Remote Sensing; Topography; Research and Development; Education; Mars (Planet)

20030111467 Nevada Univ., Reno, NV, USA

Fault-controlled Fluid Seep Potential and Surface Strength at the Isidis & Elysium Planitia MER Sites Based on Numerical Modeling of Wrinkle Ridge Topography

Okubo, C. H.; Schultz, R. A.; Tanaka, K. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We utilize topographic inversion models of MOLA-based wrinkle ridge topography to evaluate crustal strength and to predict locations of potential fracture-controlled fluid seeps at Mars Exploration Rover (MER) sites in Isidis and Elysium Planitia.

Derived from text

Mars Surface; Mathematical Models; Topography; Crustal Fractures; Planetary Craters; Mars (Planet)

20030111468 Centre National de la Recherche Scientifique, Paris, France

Conventional and TMAH Assisted Pyrolysis on the Insoluble Organic Matter of Orgueil and Murchison

Remusat, L.; Derenne, S.; Robert, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The organic matter (OM) in carbonaceous chondrites is distributed between a soluble fraction and a macromolecular one, insoluble in water and organic solvents, which accounts for almost 90 % of the OM. This insoluble organic matter (IOM) has been extensively studied through non degradative (such as NMR) and degradative (e.g. pyrolysis) techniques. All the data thus obtained point to an aromatic structure, cross-linked by short and branched aliphatic chains. However, in spite of a significant content in heteroatoms (respectively 16,5 % and 14,5 % of O and 2,8 % and 2 % N in Orgueil and Murchison IOM), very little is known about the polar moieties in the chondritic IOM. In contrast, numerous polar compounds (such as fatty acids, amino acids and polyols) have been identified in the soluble fraction of the meteorites. The identification of polar moieties in IOM should thus be a clue to answer the following question: is there a link between the soluble and the insoluble fractions in carbonaceous chondrites? Thanks to the addition of tetramethylammonium (TMAH) to samples prior to pyrolysis, polar moieties in refractory organic macromolecules can now be revealed. This technique, which was first developed to investigate the chemical structure of lignins, also allowed recently to reveal the presence of proteinaceous moieties protected within the organic macromolecular network in Jurassic sedimentary rocks. The present work thus aimed at determining the polar moieties in the IOM of the Orgueil and Murchison meteorites using pyrolysis with and without TMAH.

Author

Meteoritic Composition; Carbonaceous Chondrites; Organic Compounds; Pyrolysis

20030111469 Institut de Physique du Globe, Paris, France

Carbonaceous or Ordinary Chondrite as the Impactor at the K/T Boundary? Clues from Os, W and Cr Isotopes

Quitte, G.; Robin, E.; Capmas, F.; Levasseur, S.; Rocchia, R.; Birck, J. L.; Allegre, C. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two major events - a bolid impact and an extensive volcanic activity - occurred 65 Myrs ago. Focusing on the extraterrestrial projectile, we try to determine its nature thanks to its isotopic composition in Os, W and Cr. Os and W are both siderophiles. Since high Ir and other siderophile abundances have been reported for the K/T layer all over the world, Os and W should be enriched as well, and thus seem to be a good choice for this study. The Cr isotopic composition has been measured as well. Indeed, each type of meteorite is characterized by a typical pattern of different isotopic signatures. Samples from three marine sites Stevns Klint, Caravaca and Bidart have been analyzed. In Stevns Klint, the K/T boundary is composed of gray clay with thin ochre veins of iron hydroxides and pyrite residues. In Caravaca, the boundary corresponds to a very thin layer of ochre clays. The boundary in Bidart is marked by ochre clay as well. Scarce sulfides are dispersed in the sediments; they have not been encountered on the other sites. In fact, the site of Bidart is in a reducing environment where sulfides have not been reoxidized into goethite contrary to Stevns Klint and Caravaca. For each of the three sites, we have analyzed sediments from the late Cretaceous and the early Danian as reference samples, as well as sediments from the K/T boundary itself. Nirich spinels from Bidart have also been studied.

Author

Meteoritic Composition; Isotope Ratios

20030111470 Oulu Univ., Finland

Kara Crater by Remote Sensing

Raitala, J.; Ojala, K.; Ohman, T.; Badjukov, D. D.; Lorenz, C. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Kara River basin, located between the Pai-Khoi ridge and the Baydarata Gulf of the Kara Sea 200 km to the north of Vorkuta, Russia, was found to be an impact structure in 1970's. The Ar-40-Ar-39 impactite ages vary from 70 to 75 Ma. Actually, two craters were suggested: The Kara crater, 60-65 km in diameter, was defined on the Kara River estuary while the 25 km Ust'-Kara crater was supposed to be mostly in the sea. The impactite outcrops on the Baydarata Gulf shore just to the northeast of the Kara crater were proposed to belong to the Ust'-Kara crater. The competing idea does not find any solid proofs for the Ust'-Kara crater. This would make the deeply-eroded large Kara crater up to 120 km in size. The sparsely inhabited area is important for reindeer herders. Its vegetation is mostly intact with only few signs of old prospecting activities. Only a few fishermen, nenets, and geologists occupy the vast tundra in summertime. The Vorkuta mining area, locating on the lower middle part of the mosaic below, has a population of almost one hundred thousand people while the Ust'-Kara village in the mouth of Kara has only a few hundred inhabitants.

Derived from text

Craters; River Basins; Remote Sensing; Geological Surveys

20030111471 Arizona State Univ., Tempe, AZ, USA

Martian Fluvial Landforms: A THEMIS Perspective After One Year at Mars

Rice, J. W., Jr.; Christensen, P. R.; Ruff, S. W.; Harris, J. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

THEMIS (Thermal Emission Imaging System) began mapping operations on February 19, 2002 and is providing both visible and infrared imaging observations of the martian surface at two scales (18 m/p and 100 m/p respectively). IR observations are being conducted during both day and night. IR imagery records temperature variations, which are primarily due to differences in abundances of rocks, indurated materials, sand, and dust on the surface. THEMIS has imaged all of the major outflow channels and valley networks.

Author

Mars Surface; Landforms; Planetary Geology; Planetary Mapping; Mars Craters; Valleys; Drainage Patterns

20030111472 NASA Johnson Space Center, Houston, TX, USA

Characterization of Martian Soil Fines Fraction in SNC Meteorites

Rao, M. N.; McKay, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Some impact-melt glasses in shergottite meteorites contain large abundances of martian atmospheric noble gases with high (129)Xe/(132)Xe ratios, accompanied by varying (87)Sr/(86)Sr (initial) ratios. These glasses contain Martian Soil Fines (MSF) probably from young volcanic terrains such as Tharsis or Elysium Mons. The composition of the MSF bearing samples is different from the average bulk composition of the host rock. These samples show the following charecteristics: a) simultaeneous enrichment of the felsic component and depletion of the mafic component relative to the host phase and b) significant secondary sulfur/sulfate excesses over the host material. The degree of enrichment and associated depletion varies from one sample to another. Earlier, we found large enrichments of felsic (Al, Ca, Na and K) component and depletion of mafic (Fe, Mg, Mn and Ti) component in several impact melt glass veins and pods of samples ,77 ,78 , 18, and ,20A in EET79001 accompanied by large sulfur/sulfate excesses. Based on these results, we proposed a model where the comminution of basaltic rocks takes place by meteoroid bombardment on the martian surface, leading to the generation of fine-grained soil near the impact sites. This fine-grained soil material is subsequently mobilized by saltation and deflation processes on Mars surface due to pervasive aeolian activity. This movement results in mechanical fractionation leading to the felsic enrichment and mafic depletion in the martian dust. We report, here, new data on an impact-melt inclusion ,507 (PAPA) from EET79001, Lith B and ,506 (ALPHA) from EET79001, Lith A and compare the results with those obtained on Shergotty impact melt glass (DBS). Author

Meteoritic Composition; SNC Meteorites; Shergottites; Mars Surface; Soils; Fines

20030111473 Instituto Nacional de Tecnica Aeroespacial, Torrejon de Ardoz, Spain

Hydrocarbon Related Bleaching of Strata and Hematite Deposition in Red Beds at Moab, Utah: A Possible Analogous Process that Formed Bright Layers and Hematite Deposits on Mars

Ormo, J.; Komatsu, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The existence of large hematite deposits on Mars is now established, yet enigmatic [e.g. 1; 2]. In order to understand the processes behind their formation comparisons are often made with terrestrial hematite occurrences (e.g. Banded Iron Formations). In this study we are investigating an area near Moab, Utah, where large hematite concretions occur within Jurassic continental sandstones and exposed on the surface as weathered-out beds (Fig.1). A common appearance is cylindrical pipes and columns of hematite cemented sandstone that cut the surrounding, primary bedding of the sandstone. In some areas weathered-out pipes generate clusters of towers many meters high [3]. The occurrences are not nearly as extensive as the hematite deposits on Mars, but the process behind their formation is of interest as it provides a link between hematite deposits and hydrocarbons.

Author

Hematite; Planetary Geology; Mars Surface

20030111474 Redlands Univ., CA, USA

Loki, Io: An Update on Activity from Groundbased Data

Rathbun, J. A.; Johnson, S. T.; Spencer, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Loki Patera is a 200km diameter horseshoe-shaped low-albedo feature on Io, located at approximately 10 N 310 W. Rathbun et al., using infrared data from various sources, determined that Loki erupted periodically, with eruptions beginning approximately every 540 days and lasting typically 230 days. They examined high-resolution PPR images which suggested a resurfacing wave moving at a velocity of 2 km/day, resurfacing the entire patera in about 230 days. They also noted a similar darkening wave in Voyager 1 & 2 images with the same velocity. All of the data they examined, including groundbased infrared occultation data, mutual satellite occultation data, voyager images, and Galileo PPR, NIMS, and SSI data were consistent with a hot resurfacing wave traveling counterclockwise around the patera in approximately 230 days. Rathbun et al. proposed that the resurfacing wave was caused by periodic lava lake overturn. This is consistent with all observations. They found a report of Hawaiian lava lake overturn which yielded the same thermal and temporal signal. They found that the solidified crust on the lava lake would overturn on the observed timescale if it had a lower porosity than the underlying liquid

lava. As the solidified crust cools, its density increases eventually leading to gravitational foundering and overturn.
Derived from text
Satellite Imagery; Albedo; High Resolution; Io; Infrared Radiation; Crusts

20030111475 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Galileo PPR at Io: High Resolution Scans Taken in Conjunction with SSA and NIMS Data
Rathbun, J. A.; Spencer, J. R.; Tamppari, L. K.; Martin, T. Z.; Barnard, L.; Travis, L. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Galileo Photopolarimeter-Radiometer (PPR), when used in the radiometry mode which is most often used at Io, is a long-wavelength infrared single-aperture photometer. It is sensitive to temperatures from about 60 to several hundred K, and is thus useful for studying the volcanoes and background temperatures on Io. PPR can take raster scan images when it is the primary instrument being used (these data were discussed last year, see Rathbun et al., 2002). It can also take data in ride-along mode in conjunction with another remote sensing instrument (either SSI or NIMS) producing one-dimensional temperature scans. The best data of this type were taken during the close approach flybys during orbits I24, I25, I27, I31, I32, and I33 and include measurements of the volcanoes Pele, Prometheus, Pillan, Zamama, Tvashtar, Daedalus, Amarani, Gish Bar, Isum, Emakong, Tupan, and Tohil.
Derived from text
Raster Scanning; Remote Sensing; Infrared Photometry; Io; Galileo Spacecraft

20030111476 Lancaster Univ., UK
Recent Silicic Lava Flows on Olympus Mons?
Rawling, E. J.; Mitchell, K. L.; Wilson, L.; Pinkerton, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have used 160 MOC NA and several THEMIS VIS images to classify many volcanic flows on the flanks of Olympus Mons. Of particular note are long, narrow leveed flows, consistent with relatively high viscosity lava emplaced at high mass flux, probably supplied through laterally emplaced dykes. The negligible cratering in this area implies that these are among the youngest volcanic features on the planet.
Author
Silicon Dioxide; Mars Volcanoes; Lava; Fluid Flow

20030111478 Purdue Univ., West Lafayette, IN, USA
The Effect of Temperature-dependent Viscosity on Mantle Convection: Applications Towards the Tharsis Rise
Redmond, Hannah L.; King, Scott D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The currently accepted model of mantle convection on Earth suggests that the pattern of convection in a spherical shell takes the form of subducting plates and upwelling, axisymmetric plumes, defined as buoyant columns of hot mantle rising from the core-mantle boundary. Although the source of plumes remains somewhat controversial, it is generally accepted that a plume originates as instability at a thermal boundary layer in the mantle. As the plume rises, it develops a large mushroom-shaped head followed by a narrow tail less than a few hundred kilometers in diameter. Surface features, such as the Tharsis and Elysium volcanic provinces, are the clearest topographical expressions of convection on Mars. The long-wavelength areoid and topography highs associated with the Tharsis Rise are also attributed, in part, to convective flow. These observations imply that thermal convection in the Martian mantle is very different from that of the Earth's. In particular, Mars may be dominated by one main, long-lived plume, as is indicated by the size and extent of the volcanism in the Tharsis region. In our research we examine various parameters involved in mantle convection and relate the results to observations of magmatism on Mars, especially Tharsis. Mantle convection is driven by a combination of many parameters. We have studied the effect of varying the Rayleigh number, rate of internal heating and temperature-dependent viscosity using a core-mantle thickness ratio appropriate for Mars (1525 km/3394 km). We varied the above parameters to determine their effect on Martian mantle convection by looking at resulting areoid and topography profiles over plumes in a spherical, axisymmetric mantle. For our convection modeling we use a finite element code that takes advantage of the symmetrical shape of plumes

using axisymmetry geometry. This reduces the three-dimensional problem to a two-dimensional computation.
Author
Temperature Dependence; Viscosity; Planetary Mantles; Convection; Mars Volcanoes; Planetary Geology

20030111479 Arizona Univ., Tucson, AZ, USA
Preliminary Results on the Post-Impact Hydrothermal Alteration in the Yaxcopoil-1 Hole, Chicxulub Impact Structure, Mexico
Zurcher, Lukas; Kring, David A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NSF EAR-01-26055; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The results presented here are part of an investigation into the evolution of hydrothermal events associated with the Chicxulub impactites in Yucatan, Mexico. The study focuses on alteration products in core samples recovered from the Yaxcopoil-1 drill hole, which is located some 60 kilometers from the center of the impact structure. This research contributes to the growing knowledge-base of post-impact hydrothermal systems and their importance as potential life-originating environments. Macroscopic and petrographic descriptions, as well as preliminary electron microprobe and RAMAN spectrometry analyses, thus far, indicate a systematic spatial and temporal distribution of hydrothermal products in the Yaxcopoil-1 core.
Derived from text
Hydrothermal Systems; Cretaceous-Tertiary Boundary; Mexico; Boreholes; Petrography; Hypervelocity Impact

20030111480 New Mexico Univ., Albuquerque, NM, USA
Gamma Rays in a Spectrum from the Mars Odyssey Gamma-Ray Spectrometer
Reedy, R. C.; Evans, L. G.; Brueckner, J.; Kim, K. J.; Boynton, W. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The gamma-ray spectrum from a long sum over the middle latitudes of Mars measured by the Mars Odyssey Gamma Ray Spectrometer was analyzed. About 250 peaks and features were observed, including many seen during the cruise to Mars. The sources of about 85% of these gamma rays were identified. Most were background lines from the Ge detector or from Ti, Mg, and Zn near the detector.
Author
Gamma Ray Astronomy; Gamma Ray Spectra; Mars (Planet)

20030111481 Geological Survey, Flagstaff, AZ, USA
Mars Transverse Mercator (MTM) Map Series Updated with Planetocentric Grid
Rosiek, M. R.; Howington-Kraus, E.; Hare, T. M.; Redding, B. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Transverse Mercator (MTM) Map Series has been used to publish geologic and controlled photomosaic maps of Mars since 1984. Traditionally maps were published using planetographic coordinates with positive west longitude. In recent years planetocentric coordinates with positive east longitude have become more widely used for some Mars planetary data. The MTM map series has been updated to use planetocentric coordinates with positive east longitude as the primary grid with a secondary grid showing the planetographic coordinates with positive west longitude.
Derived from text
Mercator Projection; Mars Surface; Planetary Mapping; Planetocentric Coordinates

20030111482 Colorado Univ., Boulder, CO, USA
Surface Versus Internal Loading of the Tharsis Rise, Mars
Lowry, A. R.; Zhong, S.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Tharsis rise is the dominant feature in the Martian geoid (or areoid) and is second only to the crustal dichotomy among topographic features. Two competing models of Tharsis have been proposed, both deriving from the observation that Tharsis has been volcanically active throughout its 4Ga history. The first model holds that the Tharsis rise formed primarily

by volcanic construction and shallow magmatic intrusion and associated flexural isostatic response. The second model interprets the observed features as the dynamic response to an upwelling mantle plume beneath Tharsis. Most loading investigations have modeled Tharsis in a forward sense, either as a surface load atop a thin elastic shell or as a mantle plume in a viscous sphere with a high viscosity lid. A recent investigation modeled both surface and internal loading of a viscoelastic sphere to find that elastic flexural effects on the geoid, neglected in viscous flow models, are significant. Here we introduce a method for inverting load structure from geoid and topography of a viscoelastic planetary body. The method is applied to 1800+ coefficients of the Mars fields up to degree and order 60. By retaining all of the information content (i.e., amplitudes of each individual coefficient), we examine the loading effects localized to the Tharsis province as well as the influence of assumed parameters of Martian density structure and lithospheric thickness.
Author
Planetary Crusts; Mars Surface; Planetary Geology; Mars Volcanoes; Loads (Forces)

20030111483 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Observations of Periodic Comet 2P/Encke: Physical Properties of the Nucleus and First Visual-Wavelength Detection of Its Dust Trail
Lowry, Stephen C.; Weissman, Paul R.; Sykes, Mark V.; Reach, William T.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are conducting an observational program designed to determine the overall distributions of size, shape, rotation period, and surface characteristics of cometary nuclei. Here, we present results from a study of the Jupiter- family comet 2P/Encke based on observations from Steward Observatory's 2.3m Bok Telescope at Kitt Peak. This comet has been observed extensively in the past and was one of the primary flyby targets of the recently failed CONTOUR mission.
Author
Encke Comet; Comet Nuclei; Light (Visible Radiation); Cosmic Dust

20030111484 NASA Johnson Space Center, Houston, TX, USA
Diffusion of Siderophile Elements in Fe Metal: Application to Zoned Metal Grains in Chondrites
Righter, K.; Campbell, A. J.; Humajun, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-9435; NAG5-9800; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The distribution of highly siderophile elements (HSE) in planetary materials is controlled mainly by metal. Diffusion processes can control the distribution or re-distribution of these elements within metals, yet there is little systematic or appropriate diffusion data that can be used to interpret HSE concentrations in such metals. Because our understanding of isotope chronometry, redox processes, kamacite/taenite-based cooling rates, and metal grain zoning would be enhanced with diffusion data, we have measured diffusion coefficients for Ni, Co, Ga, Ge, Ru, Pd, Ir and Au in Fe metal from 1200 to 1400 C and 1 bar and 10 kbar. These new data on refractory and volatile siderophile elements are used to evaluate the role of diffusional processes in controlling zoning patterns in metal-rich chondrites.
Derived from text
Meteoritic Composition; Siderophile Elements; Metals; Diffusion Coefficient

20030111485 Universita degli Studi G. D'Annunzio, Chieti, Italy
New Evidences of an Impact Origin for Temimichat Crater, Mauritania
Rossi, A. P.; Baliva, A.; Piluso, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Temimichat crater is located in northern Mauritania (24 deg 15 min N, 9 deg 39 min). The bedrock is made up of crystalline basement rocks, with no sedimentary cover. The structure has been listed together with other Mauritanian craters or crater-like features. According to Pomerol, basaltic rocks have been found in the area. It is currently considered a probable impact crater, but no definitive evidence of an impact origin has been found so far. Gravity data indicate that the structure is shallower than what is expected for a simple crater of that size. The crater, for its remote location, has not been deeply investigated during last decades.
Derived from text
Craters; Gravitation; Basalt; Crystallinity; Impact Damage

20030111486 Toronto Univ., Ontario, Canada

Age Variations Among Ordinary Chondrites: U-Pb Chronology of Chondrules

Rotenberg, E.; Amelin, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Silicates from ordinary chondrites have been successfully dated using the U-Pb system. Preliminary studies focused on silicate mineral fractions and pyroxene-rich chondrule fragments and individual chondrules. Here we report the results from U-Pb analyses of whole chondrules and chondrule fragments from a wider range of ordinary chondrites of various chemical classes and metamorphic types. Unlike chondritic phosphates, which are secondary minerals, chondrules are primary components of chondrites. Dating them may allow us to reach back to their formation. It is as yet unclear whether the chondrule ages reflect primary formation ages, or resetting during an early stage of thermal metamorphism. It is also unclear whether chondrules from any ordinary chondrite can be dated using U-Pb method with necessary precision and accuracy. We discuss the potential of chondritic silicates as cosmochronometers as they relate to our knowledge of the early history of the solar system.

Author

Chronology; Chondrites; Silicates; Radioactive Age Determination; Chondrule

20030111487 California Univ., Los Angeles, CA, USA

Post-Shock Annealing and Post-Annealing Shock: Implications for the Thermal and Shock Histories of Ordinary-Chondrite Parent Bodies

Rubin, Alan E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A common view of the thermal and shock histories of ordinary-chondrite (OC) parent bodies is that, for the most part, thermal and shock metamorphism were distinguishable and successive events; e.g., the decay of Al-26 heated chondritic planetesimals and subsequent impacts produced various shock effects. Although collisions have long been acknowledged as capable of producing significant heating (including melting) of target rocks, shock events are generally not thought responsible for whole-rock annealing. Because olivine is readily affected by shock processes, OC with olivine grains exhibiting sharp optical extinction have been considered by many workers to have never been significantly shocked. However, shock-induced damage of the olivine crystal lattice can be annealed out at relatively low temperatures; thus, annealing can make a chondrite appear less shocked than it was at an earlier point in its history. I call this hypothetical earlier point the rock's maximum prior shock level. I examined the shock features of 75 type-5 and -6 OC of shock-stages S1 and S2 to test this idea. No more than a few of these chondrites are likely to be paired.

Derived from text

Chondrites; Mechanical Shock; Annealing; Meteorite Parent Bodies

20030111489 Massachusetts Inst. of Tech., Cambridge, MA, USA

Probing Europa's Interior with Natural Sound Sources

Makris, N. C.; Lee, S.; Zanolin, M.; Pappalardo, R. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

Our goal is to use both acoustic echosounding and tomographic techniques to determine Europa's interior structure. Echosounding reveals the depth and composition of terrestrial seafloor and subbottom layers by analysis of the arrival time and amplitude of acoustic reflections from these interfaces. Tomography reveals the temperature structure of terrestrial oceans by the way sound waves are perturbed along forward propagation paths. We plan to exploit natural cracking events on Europa s surfaces as sound sources of opportunity. Recent work shows that cycloidal cracks on the surface of Europa likely form on a daily basis due to stresses induced by Europa's eccentric orbit which has a period of roughly 3.5 days. We estimate that the acoustic waves radiated from these cracks will be in the 0.1-100 Hz range with typical wavelengths exceeding 1 km. In contrast to icepenetrating radar, such long wavelength disturbances suffer minimal attenuation in impure ice and water, and are relatively insensitive to anomalies such as ice fractures. Meteor impacts typically occur at a monthly rate and also have potential use as sound sources.

Author

Europa; Seismology; Echo Sounding; Tomography

20030111490 Boston Univ., Boston, MA, USA

Cold-based Glaciers in the Western Dry Valleys of Antarctica: Terrestrial Landforms and Martian Analogs

Marchant, David R.; Head, James W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Basal-ice and surface-ice temperatures are key parameters governing the style of glacial erosion and deposition. Temperate glaciers contain basal ice at the pressure-melting point (wet-based) and commonly exhibit extensive areas of surface melting. Such conditions foster basal plucking and abrasion, as well as deposition of thick matrix-supported drift sheets, moraines, and glacio-fluvial outwash. Polar glaciers include those in which the basal ice remains below the pressure-melting point (cold-based) and, in extreme cases like those in the western Dry Valleys region of Antarctica, lack surface melting zones. These conditions inhibit significant glacial erosion and deposition. An intermediate classification of subpolar glaciers includes those with wet-based interiors and cold-based margins. Results from our field-based research in Antarctica show that ancient landscapes are preserved beneath cold-based glacier ice. These results, along with new insights from quantitative measurements of glacial abrasion, have prompted us to re-evaluate some Martian landforms in terms of glacial processes. As background, we here summarize the formation of drop moraines, sublimation tills, and rock glacier deposits associated with cold-based glaciers in the Dry Valleys of Antarctica, and then outline the case for similar glacial landforms along the western flanks of the Tharsis Montes.
Author
Antarctic Regions; Mars Surface; Planetary Geology; Glaciers; Analogs; Valleys

20030111492 California Univ., Berkeley, CA, USA
Estimating the Vertical Distribution of Near-Surface Ice Using the Comptonized Continuum from the Neutron-Capture Gamma-Ray Line
Smith, D. M.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Boynton et al. [Science, v.297, p.81, 2002] have studied the global distribution and depth profile of water ice on Mars with the Mars Odyssey gamma and neutron spectrometers via three parameters: the fluxes of the 2.223 MeV gammaray line from neutron capture on hydrogen, and thermal and epithermal neutrons. We will report on the first attempt to add another constraint on the depth profile by measuring the 2.223 MeV photons which Compton scatter in the overlying material before reaching the spacecraft. For a given form of the vertical distribution, the size of this continuum tail below the line constrains one parameter: for example, for a model with a dry dust layer over a deep layer with uniform ice content, the thickness of the dust layer is directly related to the flux in the tail. This technique was used by Vestrand et al. [Proc. 21st ICRC, v.5, p.160, 1990] to measure the depth at which neutron capture on hydrogen was occuring in the solar atmosphere during a large solar flare.
Author
Mars Surface; Ice

20030111493 Antarctic Inst. of Canada, Edmonton, Alberta, Canada
The Use of Robotic Excavation Techniques to Excavate Man Rated Subsurface Structures
Mardon, A. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

When manned missions resume to the Moon it will be necessary to have habitable structures on or under the Moon's surface and also have structures for the protection of industrial activities for the support of manned missions to the Moon. What the author proposes is that in the very near term future robotic tunneling mission are sent to the Moon to excavate small and large caverns for later use by manned missions. It has already been proposed that lunar lava tubes be used for first stage manned missions to the Moon. If within the next two years robotic missions were launched to the Moon with excavation capability then by the time manned missions back to the Moon commenced in ten to twenty years from now then their would be a substantial warren of tubes and larger caverns that could be then converted to man and also machine rated use.
Author
Lunar Exploration; Tunneling (Excavation); Lunar Excavation Equipment; Lunar Shelters; Lunar Bases

20030111494 Arizona Univ., Tucson, AZ, USA
The Phoenix Scout Mission
Smith, P. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Scout missions to Mars have been proposed in response to a NASA Announcement of Opportunity (AO); 20 full mission proposals were received in August 2002. All missions are required to launch in 2007 and meet a cost cap of $325M that encompasses all mission costs including the launch vehicle and a healthy reserve. Step 1 proposals have been judged in a

rigorous series of reviews primarily on the basis of their science goals and implementation; however, no missions deemed high risk by the technical review panel have been selected. In December 2002, four missions were selected to proceed into Step 2, a 6- month Phase A study to advance the technical design, management plan, and cost to a level of detail that ensures that the mission can meet all its science goals within the cost cap. Phoenix was one of four missions selected. A final decision in August 2003 will authorize a single mission to proceed.
Author
Mars Missions; Mars Environment; Ice

20030111495 Centre de Recherches Petrographiques et Geochimiques, Nancy, France
Low Pressure Adsorption of Ar, Kr and Xe on Kerogen: Implications for the Trapping of Noble Gases onto Meteoritic Matter
Marrocchi, Y.; Razafitianamaharavo, A.; Michot, L. J.; Marty, B.; Toplis, M. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Carbonaceous chondrites contain trapped noble gases that are present in different carriers. The most abundant carrier, known as 'planetary' - also referred to as 'Q' or 'P1' - is formed of carbonaceous material, the nature of which remains ill-defined. It appears to be mainly composed of aromatic moieties linked by short aliphatic chains for which the best terrestrial analog may be kerogen. Trapped noble gases in chondrites (Ar, Kr, Xe) share common characteristics. First, they are tightly bound (release temperature up to 1000 C) in the carbonaceous residue obtained after acidic attack (HF, HCl) of chondrites. Second, these gases are easily released upon oxidation (using HNO3) which suggests that they may be located near the external surfaces of the organic materials. Third, the noble gas elemental abundances patterns are strongly fractionated relative to Solar with marked depletions of the lighter noble gases relative to the heavy ones.
Derived from text
Low Pressure; Adsorption; Argon; Krypton; Xenon; Meteoritic Composition; Trapping; Rare Gases

20030111496 NASA Johnson Space Center, Houston, TX, USA
The Search for Water and Other Volatile-bearing Phases on Mars: Mauna Kea Volcano as an Analog
Ming, D. W.; Lauer, H. V., Jr.; Golden, D. C.; Morris, R. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past 5 years, we have conducted field studies on the summit cones of Mauna Kea Volcano in Hawaii. Basaltic materials on several of these summit cones have been significantly altered by hydrothermal activity, whereas other summit cones have not undergone extensive aqueous alteration. These summit cones provide an important environment to study analogs of Martian surface alteration materials and analog surface processes (i.e., hydrothermal alteration, palagonitization. In on-going research, we have characterized the thermal and evolved gas behaviors of volatile-bearing reference minerals at reduced pressures in support of TEGA. We have expanded those studies to characterize the thermal and evolved gas behaviors of Mauna Kea samples as an analog for Mars surface materials. These samples were chosen for two reasons. First, many have chemical and spectral properties similar to what we see from remote sensing data from the Martian surface. Second, these samples have a range of mineralogical and chemical properties, ranging from simple to very complex; hence it will be challenging to characterize their thermal and evolved gas behaviors and to provide a context for their geological evolution. However, these types of studies are absolutely critical to understanding relevant geologic processes on Mars during robotic missions to the surface.
Author
Planetary Geology; Analogs; Water; Volcanoes; Mars (Planet); Minerals; Mars Surface

20030111497 Instituto de Educacion Secundaria, Madrid, Spain
Design and Construction of an Adjustable Shooter for the Modelization of Impact Craters in the Classroom
Martin, Luis; Lopez, Concha; Castilla, Gabriel; AngeldePablo, Miguel; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The exploration of the Solar System has demonstrated that 'the impacts of solid bodies is the most fundamental of all processes that have taken place on the terrestrial planets'. By this reason have been publish various activity guides where are collected experiences related with impacts for different educational levels. The simple modelizations of craters that these

guides propose they were employed with success by investigating like Alfred Wegener at the beginning of the twenty century. These experiences have like result very simple craters (only cavity and eyect), where hardly have into account some few physical parameters. In order to improve these results have built a shooter appliance for modelization impacts in the classroom in a easy and sure way, that we employ for the development of the subject of Geology in the Obligatory Secondary Education of Spain.
Derived from text
Design Analysis; Fabrication; Impact; Craters

20030111500 Brown Univ., Providence, RI, USA
Observations and Modeling of the Adsorbed Water in Montmorillonite with Reflectance Spectroscopy
Milliken, R. E.; Mustard, J. F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Understanding the role of water in surface and atmospheric processes is a focus of future Mars missions. NASA's Mars Reconnaissance Orbiter and ESA's Mars Express will carry VIS-NIR spectrometers (CRISM and OMEGA, respectively) capable of retrieving spectral data at wavelengths of 0.4-4.0 m. Characteristic water and hydroxyl absorptions at 1.4, 1.9, 2.2, and 3 m provide the opportunity for these instruments to detect aqueous or hydrothermally altered surface materials. It is anticipated that seasonal variations in the amount of adsorbed H2O might be detected as well. Though Mars is known to have a strong 3 m absorption band due to water, the different forms of water (adsorbed, structural, bound) and the structure of the host mineral (clays, hydroxides, etc.) affect the shape and strength of the absorption, making a quantitative assessment of this water difficult. Previous work has focused on the strength of water absorptions as a function of particle size and inter-layer cations. Bishop et al. were able to show the different forms of water (adsorbed and bound) are observed in reflectance spectra of clays, but did not try to quantify the amount of water present. Yen et al. modeled the percentage of water in materials as a function of apparent absorbance. Their results showed a correlation between percent water and apparent absorbance, but the uncertainties in estimating the percent water were 2%. Given that the water content of the Martian soil is <2 wt. %, this method of apparent absorbance may not be sensitive enough to quantify small amounts (or changes in) adsorbed water. Here we model the loss of adsorbed water in reflectance spectra of montmorillonite (SWy-1) as a function of the scattering efficiency (QS) and absorption efficiency (QA) of water. This method is capable of detecting and modeling changes in reflectance spectra due to small changes (<0.1 wt. %) of adsorbed water.
Author
Montmorillonite; Adsorption; Water; Moisture Content; Mars (Planet)

20030111501 NASA Ames Research Center, Moffett Field, CA, USA
Analysis of Multispectral Galileo SSI Images of the Conamara Chaos Region, Europa
Spaun, N. A.; Phillips, C. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Multispectral imaging of Europa s surface by Galileo s Solid State Imaging (SSI) camera has revealed two major surface color units, which appear as white and red-brown regions in enhanced color images of the surface (see figure). The Galileo Near- Infrared Mapping Spectrometer (NIMS) experiment suggests that the whitish material is icy, almost pure water ice, while the spectral signatures of the reddish regions are dominated by a non-ice material. Two endmember models have been proposed for the composition of the non-ice material: magnesium sulfate hydrates [1] and sulfuric acid and its byproducts [2]. There is also debate concerning whether the origin of this non-ice material is exogenic or endogenic [3].Goals: The key questions this work addresses are: 1) Is the non-ice material exogenic or endogenic in origin? 2) Once emplaced, is this non-ice material primarily modified by exogenic or endogenic processes? 3) Is the non-ice material within ridges, bands, chaos, and lenticulae the same non-ice material across all such geological features? 4) Does the distribution of the non-ice material provide any evidence for or against any of the various models for feature formation? 5) To what extent do the effects of scattered light in SSI images change the spectral signatures of geological features?
Derived from text
Europa; Image Analysis

20030111502 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
Investigating the Spectral and Compositional Properties of the Martian Surface Using HRSC, OMEGA, PFS and SPICAM Onboard the ESA Mars Express Mission
Martin, P. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Within the past 40 years, advances in ground-based remote sensing and significant return of spectral and compositional data from the Martian surface have led to a rapidly increasing knowledge of the surface mineralogy of the planet. These results, combined with progress made in the fields of laboratory measurements and simulations, have permitted better-constrained interpretation of the surface materials, hence allowing for improved understanding and comparisons of the various evolution processes, whether these processes are relevant to weathering and alteration or to more climatic-related changes. It is expected from future missions to bring back a substantial amount of additional compositional data. In particular, the ESA Mars Express spacecraft, due for launch at the end of May 2003 and for arrival at Mars at the end of December 2003, will return outstanding, unprecedented stereo images, multi-/hyperspectral visible/near-infrared data sets, and UV-infrared spectra. These will be acquired and delivered by the HRSC, OMEGA, PFS and SPICAM instruments, with better spatial and/or spectral coverage than previous Mars missions. The purpose of the investigations to be done with the data from those experiments will be to process and analyze such data sets with the broad scientific objectives of: 1) providing additional essential information and clarifying the debate about the detection, presence, abundance, and mixing degrees of surface constituents such as oxides, hydrates, silicates, clays, frosts, carbonates, sulfates, and palagonitic-like materials; 2) decorrelating the respective contributions of the surface and atmosphere; 3) updating the models of evolution of the Martian surface, in relation with the geologic timescales.
Author
Mars Surface; Planetary Composition; Astronomical Spectroscopy; Instrument Packages; Mars Express; Spectrometers

20030111503 Gakushuin Univ., Tokyo, Japan
Kinetics of Partial Melting of Melilite Solid Solution in the Temperature Range Between Solidus and Liquidus
Nagasawa, Hiroshi; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Synthesized crystals of melilite solid solution (Ge~50 k~50) were heated at about 1415 C, within the temperature range between solidus and liquidus for 5min. to 50hours and quenched at room temperature. It is found that the crystal samples were partially melted and recrystallized into mosaic structure of small melilite crystals with solidus and liquidus compositions. The average size of the Ge-rich crystals in the samples increases with heating time duration. Kinetics of partial melting is discussed with respect to the phase diagram and the theory of crystal growth.
Author
Melting; Chondrites

20030111504 Lunar and Planetary Inst., Houston, TX, USA
Algorithmic Classification of Drainage Networks on Mars and its Relation to Martian Geological Units
Stepinski, T. F.; Vilalta, R.; Achari, M.; McGovern, P. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present an algorithmic classification of drainage networks on Mars. Altogether, 368 drainage networks were computationally extracted using MOLA topographical data from various martian locations covering 16 major geological units. The classification is quantitative and objective, as it is based on a numerical description of drainage networks. Applying a clustering algorithm to our dataset, we have found that the networks can be best divided into 9 clusters. These clusters are separated from each other, so they can be used for classification purposes. Our partition does not correlate with an existing division into geological units. A morphological interpretation for this emergent classification is still been developed. One particular cluster was studied in detail, and we have determined that it groups networks overlaying landscapes dominated by topographical basins.
Author
Algorithms; Drainage; Mars (Planet); Mars Surface; Planetary Geology; Topography; Classifications

20030111505 Brown Univ., Providence, RI, USA

First Look at the Thermophysical Properties of the Dissected Mantle

Mustard, J. F.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous studies have identified a latitude dependent surface layer that appears to be continuous poleward of 60 , absent equatorward of 30 , and discontinuous in the 30-60 N and S latitude bands [1, 2, 3]. Based on apparent physical properties observed in Mars Orbiter Camera (MOC) images and Mars Laser Altimeter (MOLA) data, and the distinct latitude dependence of these observations, the surface layer has been interpreted to be ice-rich where continuous, an interpretation supported by recent Mars Odyssey results [4, 5, 6]. The discontinuous zone is interpreted to be the a degraded equivalent of the continuous layer [2, 3], and as such represents the maximum extent of a recent excursion in the stability of near-surface ground ice towards the equator. Here I report on preliminary analysis of THEMIS brightness temperature data [7] of observations in the mid-latitude zones to assess if the degraded mantle has properties distinct from the underlying substrate.

Author

Mars Surface; Image Analysis

20030111506 NASA Johnson Space Center, Houston, TX, USA

Internal Rb-Sr Age and Initial Sr-87/Sr-86 of a Silicate Inclusion from the Campo Del Cielo Iron Meteorite

Liu, Y.; Nyquist, L.; Wiesmann, H.; Shih, C.; Schwandt, C.; Takeda, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The largest group of iron meteorites, IAB, is distinguished by the presence of diverse silicate inclusions. In principle, Rb-Sr and Sm-Nd radiometric dating of these silicate inclusions by internal isochron techniques can determine both the times of melting and parent/daughter ratios in the precursor materials via initial Sr-87/Sr-86 and Nd-143/Nd-144 ratios. The Sr-87/Sr-86 and Nd-143/Nd-144 ratios could distinguish chondritic precursors from already differentiated silicates. We reported Rb-Sr and Sm-Nd internal ischron ages of 4.52+/-0.03 Ga and 4.50+/-0.04 Ga, respectively, for plagioclase-diopside-rich material in the Caddo County IAB iron meteorite. These results are essentially identical to literature values of its Ar-Ar age of 4.520+/-0.005 Ga and its Sm-Nd age of 4.53+/-0.02 Ga. The purpose of this study is to evaluate the formation and evolution of silicate inclusions in IAB iron meteorites by determination of their initial Sr-87/Sr-86 ratios combined with higher-resolution chronology and mineralogical and geochemical studies.

Derived from text

Chondrites; Iron Meteorites; Time Measurement; Feldspars; Melting; Chronology

20030111507 Carnegie Institution of Washington, Washington, DC, USA

D-rich Water in Interplanetary Dust Particles

Mukhopadhyay, S.; Nittler, L. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hydrogen isotopic compositions in interplanetary dust particles (IDPs), in the form of D enrichments, provide unequivocal evidence for the survival of presolar organic matter (e.g., [1-4]). D/H enrichments of up to 50,000o/oo have been reported from IDPs and such extreme values are presumably produced by ion-molecule reactions at 10-50 K in molecular clouds [1]. Although the phase(s) carrying the D enrichments remain unclear, it is generally accepted that the D excesses are associated with organic matter [1-5], while the phyllosilicates (the other host of phase for H in IDPs) do not seem to be anomalous in their H isotopic composition [4]. However, D enrichments in phyllosilicates have been reported from the Semarkona and Renazzo meteorites [6]. The primary goal of this work is to investigate H isotopic heterogeneity in IDPs and understand the chemistry and mineralogy of the phases carrying the D excesses. The current work extends the previous work done on characterizing H isotopic variability in IDPs [e.g., 1-5] and here we report the first clear evidence for a D-rich phase in IDPs that is not associated with organic matter.

Author

Interplanetary Dust; Mineralogy; Isotope Ratios

20030111508

Currently Flowing Water on Mars

Motazedian, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Newly-formed dark slope streaks on Mars appear to indicate currently flowing water [1]. Dark streaks on crater and valley walls begin upslope at point sources aligned along a common rock layer. They widen downslope and anastamose where interrupted by positive relief in the topography. These dark streaks have no topographical relief and passively overlay existing surface features, except where they bifurcate around dunes and knobs and crater rims. Images of the same places taken months apart show that new streaks have formed with time intervals of months. The dark streaks are among the youngest Martian surface features, as they are never overlain or cut by other features such as craters and eolian dunes. These dark streaks are especially common around Olympus Mons. It is possible that geothermal activity driven by volcanic heat melts subsurface ice, releasing a brine that dissolves surrounding minerals. This brine has a low freezing temperature, allowing it to flow at the Martian surface. The dissolved minerals precipitate from solution, leaving behind dark streaks of rock varnish. The dark streaks appear where the water table is intersected, as in craters and valleys.

Author

Mars Surface; Water Flow; Image Analysis

20030111509 Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse, Orsay, France

Cosmic Irradiation of Carbonaceous Material in Space and Prebiotic Chemistry

Maurette, M.; Balanzat, E.; Duprat, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Estimates of the radiation doses received by Hydrous-Carbonaceous Chondrites (HCCs) and micrometeorites (MMs) from Galactic Cosmic Rays (GCRs) and Solar Energetic Particles (SEPs) suggest that the composition of organic materials remaining in meteorites from the early Solar System has been altered over time. This paper estimates the amount of organic material, including kerogen and more volatile compounds, which was delivered to the prebiotic Earth during the Late Heavy Bombardment (LHBomb).

CASI

Meteoroid Showers; Kerogen; Volatile Organic Compounds; Micrometeorites; Extraterrestrial Radiation; Radiation Effects

20030111510 NASA Johnson Space Center, Houston, TX, USA

Palagonitic Mars from Rock Rinds to Dust: Evidence from Visible, Near-IR, and Thermal Emission Spectra of Poorly Crystalline Materials

Morris, R. V.; Graff, T. G.; Mertzman, S. A.; Lane, M. D.; Christensen, P. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Visible and near-IR (VNIR) spectral data for Martian bright regions are characterized by a general shape consisting of a ferric absorption edge extending from about 400 to 750 nm and relatively constant reflectivity extending from about 750 nm to beyond 2000 nm . Among terrestrial geologic materials, the best spectral analogues are certain palagonic tephras from Mauna Kea Volcano (Hawaii). By definition, palagonite is a yellow or orange isotropic mineraloid formed by hydration and devitrification of basaltic glass. The ferric pigment in palagonite is nanometer-sized ferric oxide particles (np-Ox) dispersed throughout the hydrated basaltic glass matrix. The hydration state of the np-Ox particles is not known, and the best Martian spectral analogues contain allophane-like materials and not crystalline phyllosilicates. We show here that laboratory VNIR and TES spectra of palagonitic alteration rinds developed on basaltic rocks are spectral endmembers that provide a consistent explanation for both VNIR and TES data of Martian dark regions.

Derived from text

Glass; Mars Surface; Planetary Geology; Planetary Composition

20030111511 Maryland Univ., College Park, MD, USA

Lithium Isotopic Composition of Chondritic Meteorites

McDonough, W. F.; Teng, F.-Z.; Tomascak, P. B.; Ash, R. D.; Grossman, J. N.; Rudnick, R. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Li isotope studies can provide insights into low temperature alteration processes involving aqueous fluids, given the potential solubility of lithium. In this respect, Li isotope studies of meteorites may help to elucidate fluid processes on meteorite parent bodies. The Li isotopic composition of solar system materials, however, remains poorly understood, with data available for only a few chondrules and CAI, selected phases from SNC meteorites, and one bulk chondrite (Orgueil). These data show a wide range in delta(7)Li values with no obvious systematic variation. Chondrules possess up to 100 (expressed at the 2 sigma level) variation in delta(7)Li values, whereas CAI have up to 200 variation. In addition, CAI are lighter, on average, than chondrules (-20% and +10%, respectively). Chaussidon et al. suggested that the lower delta(7)Li values of CAI materials may reflect the addition of spallogenic Li. Earth materials show approx. 60 total variation in delta(7)Li, with much of this variation attributed to water-rock reactions at low temperatures. Based on studies of rocks and fluids from the Earth only low temperature (<700 K) processes are recognized as having any significant effect in fractionating the Li isotopic compositions. Chan et al. established that the delta(7)Li of fresh, mantle-derived basalts increases from values of about +4 to values as high as +14%, as the amount of low temperature alteration and clay formation increases. Recently, Zack et al. demonstrated that metamorphic dehydration at slightly higher temperatures will shift the Li isotopic compositions of rocks to light values, as low as -12%. Given these observations, we have carefully selected a suite of chondritic meteorites that reflect a broad range of petrological types and degrees of aqueous alteration in order to characterize their Li isotopic variation and to understand this variation in a petrological context. We selected only samples that are falls, not finds, to avoid any uncertainties that might accompany Earth-based aqueous processing. By characterizing the Li isotopic composition of chondritic meteorites we place into context the wide variation of (7)Li/(6)Li values observed in chondrules and CAI. In addition, these data will provide insights into (1) fluid-rock interactions on meteorite parent bodies, and (2) the relative effects of dehydration versus thermal metamorphism on chondritic parent bodies.
Author
Chondrites; Meteoritic Composition; Lithium Isotopes; Isotope Ratios

20030111512 Museum of Natural History, London, UK
Iron Isotope Composition of Allende and Chainpur Chondrules: Effects of Equilibration and Thermal History
Mullane, E.; Russell, S. S.; Gounelle, M.; Mason, T. F. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have studied the petrography and Fe-isotope composition of seven chondrules, four from the Allende (CV3) carbonaceous chondrite and three from the Chainpur (LL3.4) ordinary chondrite. Three textural-chemical chondrule types are represented within this sample set: (1) BO, (2) RP and (3) PO/POP. These textural differences allow us to examine the Fe-isotope composition in material with different thermal histories. Fe-isotope measurements may help to constrain the chondrule forming process and determine the nature of chondrule precursor material. Fe is the most volatile major element found within chondrules, and thus the Fe-isotope composition may reflect evaporative loss of iron, if evaporation occurred by a Rayleigh fractionation process.
Author
Chondrule; Meteoritic Composition; Petrography

20030111513 Chicago Univ., Chicago, IL, USA
Formation of the Melilite Mantle of the Type B1 CAIs: Experimental Simulations
Mendybaev, R. A.; Richter, F. M.; Davis, A. M.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Type B Ca-Al-rich inclusions (CAIs) in carbonaceous chondrites represent the oldest materials known to have formed in the solar system, most likely by condensation from a gas of solar composition followed by reheating to approx. 1400 C and slow cooling at <50 C/hr. This reheating resulted in the igneous textures of Type B CAIs, the fractional loss of the moderately volatile elements Mg and Si, and the heavy isotope enrichment of the residual Mg and Si. Texturally, Type B CAIs are classified into those characterized by a relatively uniform distribution of melilite (Type B2), and those mineralogically zoned with a relatively thick outer melilite mantle (Type B1). The coarse-grained igneous texture of the B2s has been reproduced experimentally by cooling partially molten (spinel + melt) droplets of a Type B-like composition from about 1400 C at rates of 1 to 50 C/hr. To the best of our knowledge, zoned textures similar to that of the B1s have not been reproduced by experiment. Richter et al. suggested that the presence of melilite mantles in B1s and their absence in B2s is caused by differences in the evaporation rates of Mg and Si relative to their diffusion rates in the melt. If the evaporation rate is slow compared to the diffusion rate, the droplets would remain chemically homogeneous and there would be no distinction as to

where melilite crystallizes, thus making textures like that of the B2s. If however, evaporation is fast compared to diffusion, the outer parts of the molten droplets would be more depleted in Mg and Si, which as we will show, will favor melilite crystallizing there, thus making B1 textures. Here we discuss the results of a new series of evaporation and crystallization experiments of Type B CAI-like compositions, which depending on the conditions can produce textures very much like those of Type B2 and B1 CAIs.
Author
Carbonaceous Chondrites; Calcium; Aluminum; Inclusions; Igneous Rocks; Tests; Experimentation; Evaporation; Crystallization

20030111514 Brown Univ., Providence, RI, USA
Characterizing Polar Layered Deposits at the Martian North Pole: Current Results and Techniques
Milkovich, S. M.; Head, J. W., III; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Within the northern residual polar cap of Mars are dark lanes or troughs; on the walls of these exposures are layered deposits. These deposits consist of extensive lateral layers of ice and dust and are found throughout the polar cap. They were first identified in Mariner 9 images and later studied in detail with the Viking orbiters. In these images, the layers appear to consist of alternating sequences of light and dark layers approx. 5 to 25 m thick. Recent data taken by the Mars Orbiter Camera (MOC) onboard the Mars Global Surveyor (MGS) reveal that the layers are thinner and more numerous than Viking images suggested. Layers are seen with thicknesses at the limit of resolution (approx. 2 m) and it is possible that smaller scale layers may also exist. An understanding of the formation processes of the polar layered terrain will provide insights into the processes of trough formation, lateral propagation, erosion, and deposition. It will also allow us to interpret the simple vertical record of climate change encoded in the layered deposits. Ultimately, we will gain a foundation upon which we can build a better model for the interactions of the various volatile deposits on Mars, including the current polar surface as well as the latitude-dependent layer of subsurface ice currently being mapped by Mars Odyssey. In order to begin this foundation of knowledge we first must characterize sections of layers and quantitatively compare the layer sequences in one trough with another. In this way, constraints may be placed on trough formation mechanisms.
Author
Mineral Deposits; Mars Surface; Strata; Terrain; Planetary Geology

20030111515 Arizona State Univ., Tempe, AZ, USA
The Effect of Impact Shock on Water and H Isotopes in Amphibole
Minitti, M. E.; Leshin, L. A.; Guan, Y.; Luo, S.; Ahrens, T. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The amount of water in and distribution of water between the various martian water reservoirs (atmospheric, hydrospheric, interior) are outstanding questions in martian science. Kaersutitic (Ti-rich) amphibole and apatite, the few water-bearing minerals present in the martian meteorites, have been studied to gain insight into all three martian water reservoirs. The igneous nature of the kaersutites and apatites connects the phases to the interior, or magmatic, water reservoir. Their residence time in the crust provides opportunity for the phases to interact with the atmospheric and hydrospheric reservoirs. The combined influence of the reservoirs is imprinted in the low water contents and high, variable H isotopic com-positions of the kaersutites and apatites. Variations of up to deltaD = 900% exist within individual and between different grains. Water content and H isotope measurements of one of the Martian apatites were made in an attempt to separate the signatures of the magmatic and atmospheric/hydrospheric (assumed to be in communication) reservoirs. Results of the study led to a constraint on the H isotopic composition of the magmatic water reservoir and to the important conclusion that the hydrospheric reservoir is 2-3 times larger than previously determined. Such a study illustrates the power and importance of understanding the water contents and H isotopic signatures of martian water-bearing minerals. The water content and H isotopic composition of geologic materials, however, can be influenced via shock experienced in the impact process, the process which liberated the martian meteorites. Impact-induced loss of water and enrichment of H isotopic composition at shock pressures comparable to those experienced by the kaersutite-bearing martian meteorites (20-35 GPa) was demonstrated. If water contents and H isotopic compositions of martian water-bearing minerals were influenced by shock, such an effect could influence conclusions about the amounts of water present in and interactions between martian water reservoirs. In order to investigate the ability of shock to influence water, and in turn the validity of arguments based on martian kaersutite water

contents and H isotopic compositions, we have conducted a series of shock experiments on terrestrial amphibole samples. Author

Amphiboles; Shock Tests; Water; Hydrogen Isotopes

20030111516 NASA Johnson Space Center, Houston, TX, USA

Hydrothermal Alteration on Basaltic Mauna Kea Volcano as a Template for Identification of Hydrothermal Alteration on Basaltic Mars

Morris, R. V.; Graff, T. G.; Ming, D. W.; Mertzman, S. A.; Bell, J. F., III; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Certain samples of palagonitic tephra from Mauna Kea Volcano (Hawaii) are spectral analogues for bright martian surface materials at visible and near-IR wavelengths because both are characterized by a ferric absorption edge extending from about 400 to 750 nm and relatively constant reflectivity extending from about 750 nm to beyond 2000 nm. Palagonite is a yellow or orange isotropic mineraloid formed by hydration and devitrification of basaltic glass. For Mars-analogue palagonite, the pigment is nanometersized ferric oxide particles (np-Ox) dispersed throughout an allophane-like hydrated basaltic glass matrix. Crystalline phyllosilicates are not generally detected, and the hydration state of the is not known. The poorly crystalline nature of glass alteration products implies relatively low temperature formation pathways. We report here x-ray diffraction, major element, Mossbauer, and VNIR data for 9 basaltic tephras. Thermal emission spectra are reported in a separate abstract. Our multidisciplinary approach both tightly constrains mineralogical interpretations and maximizes overlap with datasets available for the martian surface available now and in the future.

Derived from text

Basalt; Mars Surface; Geochemistry

20030111517 NASA Johnson Space Center, Houston, TX, USA

Oxygen Fugacity of the Martian Mantle From Pyroxene/Melt Partitioning of REE

Musselwhite, D. S.; Jones, J. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study is part of an ongoing effort to calibrate the pyroxene/melt REE oxybarometer for conditions relevant to the martian meteorites. Redox variations have been reported among the shergottites. Wadhwa used the Eu and Gd augite/melt partitioning experiments of McKay, designed for the LEW86010 angrite, to infer a range of fo2 for the shergottites. Others inferred fo2 using equilibria between Fe-Ti oxides. There is fairly good agreement between the Fe-Ti oxide determinations and the estimates from Eu anomalies in terms of which meteorites are more or less oxidized. The Eu anomaly technique and the Fe-Ti oxide technique both essentially show the same trend, with Shergotty and Zagami being the most oxidized and QUE94201 and DaG 476 being the most reduced. Thus, the variation in fo2 appears to be both real and substantive. However, although the redox trends indicated by the two techniques are similar, there is as much as two log unit offset between the results of three researchers. One explanation for this offset is that the Eu calibration used for the shergottites was actually designed for the LEW86010 angrite, a silica-undersaturated basalt whose pyroxene (diopside) compositions are rather extreme. To correct this, experiments have been conducted on the redox relationship of Eu partitioning relative to Sm and Gd for pyroxene/melt compositions more relevant to Martian meteorites. We report here preliminary results for experiments on pigeonite/melt partitioning as a function of fO2.

Author

Shergottites; Planetary Mantles; SNC Meteorites

20030111518 Argonne National Lab., IL, USA

Isotopic Composition of Molybdenum and Barium in Single Presolar Silicon Carbide Grains of Type A+B

Savina, M. R.; Tripa, C. E.; Pellin, M. J.; Davis, A. M.; Clayton, R. N.; Lewis, R. S.; Amari, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

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Presolar SiC grains fall into several groups based on C, N, and Si isotopic compositions. Approximately 93% are defined as mainstream, having 10 less than C-12/C-13 less than 100 and N-14/N-15 ranging from 50 to 20,000. A number of studies have shown that the most likely sources of mainstream grains are low mass asymptotic giant branch stars. Models of nucleosynthesis in AGB stars reproduce the s-process enhancements seen in the heavy elements in mainstream SiC grains.

Among the less common grains, A+B grains, which comprise approximately 3-4% of presolar SiC, are perhaps the least well understood. Recent studies by Amari et al. show that A+B grains can be divided into at least 4 groups based on their trace element concentration patterns. Of 20 grains studied, 7 showed trace element patterns consistent with condensation from a gas of solar system composition, while the rest had varying degrees of process enhancements. Our previous measurements on 3 A+B grains showed Mo of solar isotopic composition, but Zr with a strong enhancement in 96Zr, which is an r-process isotope but can be made in an sprocess if the neutron density is high enough to bridge the unstable Zr-95 (T(sub 1/2)= 64 d). The observation of Mo with solar system isotopic composition in the same grains is puzzling however. Meyer et al. have recently shown that a neutron burst mechanism can produce a high Zr-96/Zr-94 without enhancing Mo-100, however this model leads to enhancements in Mo-95 and Mo-97 not observed in A+B grains. We report here results of Mo measurements on 7 additional A+B grains, and Ba measurements on 2 A+B grains, and compare these to the previous studies.
Derived from text
Barium; Silicon Carbides; Granular Materials; Molybdenum Isotopes; Isotopic Labeling; Solar System; Composition (Property)

20030111519 Museum fuer Naturkunde, Berlin, Germany
Properties, Classification, and Genetic Interpretation of the Allochthonous Impact Formations of the ICDP Chicxulub Drill Core YAX-1
Stoeffler, D.; Hecht, L.; Kenkmann, T.; Schmitt, R. T.; Wittmann, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): DFG-STO-101/38; DFG-KE-732/8; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The ICDP drilling YAX-1 (Yaxcopoil-1), located some 60 km south of the Chicxulub impact center, penetrated to a depth of 1510 m. Below 795 m of Tertiary post-impact sediments 100 m of allochthonous impact breccias occur which consist of impact melt particles mixed with lithic and mineral clasts derived from the complete excavated target section: Panafrican crystalline basement to Cretaceous carbonate and sulfate rocks. These breccias fulfill the definition of suevite: Polymict clastic matrix breccia with cogenetic melt particle. We report here first results of an analysis of the 100 m thick section of allochthonous impact breccias. Results of related studies are given in companion abstracts.
Derived from text
Breccia; Cretaceous-Tertiary Boundary; Classifications; Genetics; Lunar Craters; Chemical Properties; Petrography; Drilling

20030111520 NASA Johnson Space Center, Houston, TX, USA
In Situ Heating Behavior by Infrared Microspectroscopy of Organic Components in Tagish Lake Meteorite
Nakamura, K.; Nakashima, S.; Shiota, D.; Zolensky, M. E.; L. P. Keller; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Tagish Lake meteorite is a new type of water- and carbon-rich carbonaceous chondrite. Its total carbon content is approx. 5 wt% and the organic carbon content reaches approx.1.3 wt%. We reported from the Tagish Lake sample#TL3B6 the first in situ observation of the hollow organic globules. TL3B6 is generally enriched in the organic globules that consist of aliphatic and oxygenated functionality similar to the material produced by the laboratory simulation of UV photolysis of interstellar ice analogs suggesting that the organic globules in Tagish Lake may be extremely primitive organic material that formed before or during the formation of the solar system. Here we report the micro-sampling FTIR analysis of the TL3B6 and the in situ step heating experiments: which can allow us to place 1) significant constraints on the organic functionality in Tagish Lake; 2) the thermal stability of the organics; and 3) thermal history of the meteorite and its parent body. For comparison, the membranous films formed from hydrothermal reaction of an OH-bearing amino acid (theronine: Thr) and silica mixture were examined.
Derived from text
Carbonaceous Chondrites; Chemical Composition; Heating; Microanalysis; Organic Materials

20030111521 Portland State Univ., OR, USA
Relict Forsterite and Igneous Olivine Grains in Chainpur (LL3.5) Chondrules: Major- and Trace-Element Evidence for Vapor-Fractionation and Igneous Partitioning
Ruzicka, A.; Floss, C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is generally accepted that in addition to igneous olivine grains, chondrules contain relict olivine grains that did not crystallize in situ. Chondrule melts cooled relatively fast, which aided in the preservation of relict grains. One type of relict olivine grain, found both inside chondrules and as isolated olivine grains outside chondrules, and found both in ordinary and carbonaceous chondrites, is highly forsteritic (mainly Fo98-100), cathodoluminescing, and is often enriched in Al, Ca, Ti, V, Sc, and in an O-16 component. Jones and coworkers and Alexander argued for a predominantly igneous origin for such relict forsterite grains, whereas condensation (gas to solid or gas to liquid) was advocated by Steele and Weinbruch et al. We used SIMS to obtain major- and trace-element abundances for 23 elements in forsteritic and cathodoluminescing ('type R1') relict olivine grains and in normal igneous (type I) olivine grains in three chondrules in the Chainpur chondrite. The analyzed elements have widely varying 50% condensation temperatures and olivine/melt partition coefficients. Altogether, we obtained three analyses of type R1 relict grains, three analyses of type I igneous grains, and five analyses of overgrowths (less forsteritic rim areas) on the relict grains. These preliminary data can be used to evaluate condensation and igneous models for the relict grains, and to shed light on the nature of chondrule precursors and the chondrule-forming process.
Derived from text
Chondrule; Forsterite; Fractionation; Trace Elements; Vapors; Igneous Rocks; Granular Materials

20030111522 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Enhancement of Water Ice Content in the Local Area Northeast of Arcadia Planitia: Evidence from Neutron Data from HEND (Mars Odyssey) and Elevation from MOLA (MGS)
Sanin, A. B.; Mitrofanov, I. G.; Kozyrev, A. S.; Litvak, M. L.; Tretyakov, V.; Smith, D. E.; Zuber, M. T.; Boynton, W.; Saunders, R. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first year of neutron mapping measurements from the Mars Odyssey spacecraft revealed enormous hydrogen-rich regions in the southern and northern hemispheres of the Martian crust that imply significant amounts of near surface water ice. The hydrogen-rich areas of the southern and northern regions appear generally comparable in spatial extent and water ice content. This observation is interesting in light of topography measured by the Mars Orbiter Laser Altimeter (MOLA) on the Mars Global Surveyor (MGS) spacecraft, which shows a significant difference in elevation between northern lowlands and southern highlands that could imply a difference in seasonal CO2 condensation. In this study we correlate the high energy neutron flux observed by HEND (Mars Odyssey) and surface elevation measured by MOLA in order to interpret the seasonal change in epithermal neutron flux in terms near-surface water ice content.
Derived from text
2001 Mars Odyssey; Laser Altimeters; Mars Global Surveyor; Neutrons; Planetary Mapping; Moisture Content; Ice; Elevation

20030111523 NASA Ames Research Center, Moffett Field, CA, USA
The Mars Underground Mole (MUM): A Subsurface Penetration Device with Infrared Reflectance and Raman Spectroscopic Sensing Capability
Stoker, C. R.; Richter, L.; Smith, W. H.; Lemke, L. G.; Hammer, P.; Dalton, J. B.; Glass, B.; Zent, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
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Searching for evidence of life on Mars will probably require access to the subsurface. The Martian surface is bathed in ultraviolet radiation which decomposes organic compounds, destroying possible evidence for life. Also, experiments performed by the Viking Landers imply the presence of several strongly oxidizing compounds at the Martian surface that may also play a role in destroying organic compounds near the surface. While liquid water is unstable on the Martian surface, and ice is unstable at the surface at low latitudes, recent results from the Mars Odyssey Gamma Ray Spectrometer experiment indicate that water ice is widely distributed near the surface under a thin cover of dry soil. Organic compounds created by an ancient Martian biosphere might be preserved in such ice-rich layers. Furthermore, accessing the subsurface provides a way to identify unique stratigraphy such as small-scale layering associated with lacustrine sediments. Subsurface access might also provide new insights into the Mars climate record that may be preserved in the Polar Layered Deposits. Recognizing the importance of accessing the subsurface of Mars to the future scientific exploration of the planet, the Mars Surveyor 2007 Science Definition Team called for drilling beneath the surface soils. Subsurface measurements are also cited as high priority in by MEPAG. Recognizing the importance of accessing the Martian subsurface to search for life, the European Space Agency has incorporated a small automated burrowing device called a subsurface penetrometer or Mole onto the Beagle 2 lander

planned for 2003 launch. This device, called the Planetary Underground Tool (PLUTO), is a pointed slender cylinder 2 cm wide and 28 cm long equipped with a small sampling device at the pointed end that collects samples and brings them to the surface for analysis. Drawing on the PLUTO design, we are developing a larger Mole carrying sensors for identifying mineralogy, organic compounds, and water.
Derived from text
Infrared Spectroscopy; Mars Surface; Raman Spectroscopy; Detection; Penetration; Drilling

20030111525 AVL-AST doo, Zagreb, Croatia
Topography Profile Diagrams of Mars: A Step Toward the Formal Proof of Martian Ocean Recession, Timing and Probability
Salamuniccar, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

After the initial proposal of Contact 1 and 2, previously published papers about ocean on Mars can basically be divided in two groups. The first one was based on shorelines theory, however, shorelines were unfortunately not found in required amount. Papers from the second group, discussing basically whether Contact 1 or 2 is better approach, proposed as indicators for ocean on Mars: spiral beaches, sedimentation, hydraulic and thermal arguments, impact craters, fluvial valleys, tsunami generation and propagation, erosion features that might be ancient coastal terraces, etc. Recently, mathematical approach was proposed providing a way to compute how deep Martian ocean was during each period of the planet history, including the probability that ocean did exist once. It is interesting to find out that according to those proposed computations, both Contacts are good approximations, each one for some particular period of the planet history. This also explains why shorelines were not found in supposed amount, ocean that is constantly drying up can not leave some significant shorelines at a particular level. However, while the proposed approach, based on mathematical theory of stochastic processes, is generally applicable to some classes of planets, it still needs to be formally proved that Mars is such planet too. One of the first steps in this way is representation of Martian topography and related values, in the form of Topography Profile Diagrams (TPDs).
Author
Mars (Planet); Extraterrestrial Oceans; Diagrams; Topography

20030111526 University of Western Ontario, London, Ontario, Canada
Exploration Strategies and Landing Sites at the Lunar South Pole
Stooke, P. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous landing site studies for the lunar south pole have emphasized sites with maximum duration of sunlight for solar powered lander operation. Using this plus two other site selection criteria, access to South Pole/Aitken basin ejecta and convenient rover access to perpetually shaded regions with possible volatile materials, I identify several candidate landing sites for future missions.
Derived from text
Landing Sites; Site Selection; Lunar Surface; Lunar Exploration; Polar Regions

20030111527 Texas Univ., Austin, TX, USA
Search for Far-Side Deep Moonquakes
Nakamura, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
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A truly unexpected finding of the Apollo missions, 1969-1972, was a discovery of deep moonquakes. Analysis of the data from the seismic network, which operated for eight years from 1969 through 1977, identified more than 100 discrete source regions at depths approximately half way to the center of the moon. Their distribution, however, was not uniform, as all but one of the source regions found were on the front hemisphere of the moon. Thus, a question remains whether the observed one-sided distribution of deep moonquake sources represents their true distribution or instead occurs because all seismic stations are on the near side of the moon. If it is the former, it means that the interior of the moon is truly asymmetric, structurally and dynamically; if it is the latter, it means that we simply did not identify most moonquakes on the far side and

that their identification will be a great help in investigating the deep interior of the moon, including existence of a possible metallic core.
Derived from text
Moonquakes; Asymmetry

20030111528 National Museum of Natural History, Paris, France
The Age of Tenoumer Crater, Mauritania, Revisited
Storzer, D.; Selo, M.; Latouche, L.; Fabre, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On occasion of two field trips through the Mauritanian Western Sahara, one of us (J.F.) crossed twice the Tenoumer area and extensively collected target- and impact melt-rocks. The Tenoumer crater is a moderately large (diameter about 1.9 km) almost perfectly circular explosion crater located at 22 55.N/10 24.W. The crater is filled with unconsolidated fresh-water sediments. The structure is developed in the Precambrian basement of the up to 3.5 Ga old gneisses and granites of the Reguibat rise which in turn is overlain by a thin veneer of silcretes and calcretes, the post Pleistocene 'hamada'. The crater was first described and interpreted as the result of an explosion of post 'hamada' age. Due to the rare occurrence of fused igneous materials outside the crater, 'basalt', 'rhyodacite', a volcanic origin was favored. Together with Temimichat-Ghallaman and Aouelloul, two other Mauritanian craters, Tenoumer is almost perfectly aligned along an about N 40 E trending line. For this reason it was speculated that all three structures might have resulted from a triplet impact cratering event. Although a possible origin by meteorite impact was already proposed, clear and diagnostic evidence for the origin of Tenoumer crater by meteorite impact was given. Up to eight different sets of planar features were described in quartz grains from strongly shocked granitic basement rock inclusions trapped by the melt samples. K-Ar age determinations on melt rocks established an average value of 2.5 plus or minus 0.5 Ma for the most reasonable age of the Tenoumer crater, whereas specimens of unshocked basement granites and gneisses, yielded K-Ar ages of about 2 Ga. K-Ar dating has been successfully applied to tektites and impact glasses in the past. However, it was also realized at that time that the presence of undetectable inherited radiogenic Ar might considerably increase K-Ar ages. On example of impact glasses from the craters: Aouelloul, Darwin, and Wabar, which were aliquots of the same samples for the K-Ar analyses, it was demonstrated by fission track dating that this age increase was especially marked in the case of young craters on old country rocks. This effect is the more pronounced the younger the events and the older the targets are. Since the K-Ar age of the Tenoumer crater has never been reconsidered during the last 33 years, and as new and precisely documented material was available for fission track dating, we felt motivated to reinvestigate the timing of this impact event. As impact- glass in a quality required for fission track dating is not available, apatite represents the only datable phase among the impact melt-rocks of Tenoumer. Although the apatites were part of the Precambrian country rocks, the residual temperature of the melt rocks after the impact was sufficiently high in order to reset completely the apatite fission track clock (e.g. 380 C prevailing for 1 hour). Former age results for the Rochechouart crater (France) and the Ries crater (Germany), demonstrated clearly the applicability of apatites, trapped in impact melts, to the dating of impact structures. In this paper, we present a detailed account of the age obtained from fission track analysis of apatites trapped in Tenoumer impact-melt rocks.
Derived from text
Geochronology; Mauritania; Mars Craters; Sedimentary Rocks; Precambrian Period

20030111529 Naval Research Lab., Washington, DC, USA
Transmission Electron Microscopy of Non-Etched Presolar Silicon Carbide
Stroud, Rhonda M.; Nittler, Larry R.; Alexander, Conel M. O'D.; Bernatowicz, Thomas J.; Messenger, Scott R.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-4328; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our solar system formed from nuclei produced in earlier generations of stars. Mixing in the proto-solar nebula isotopically homogenized most of this material, but some grains, called presolar grains, retain their original isotopic composition. The isotopic properties of presolar SiC grains indicate that most of the grains formed in the outflows of carbon-rich Asymptotic Giant Branch (AGB) stars. The microstructure of these presolar grains reflects the conditions of the dust formation and subsequent alteration. Early microstructural studies of SiC grains obtained by acid dissolution from meteorites show that most isotopically anomalous SiC grains have the face-centered cubic b- SiC structure. However, Daulton et al. have shown that a small fraction of sub-micron presolar SiC grains are of the hexagonal 2H polytype (a-SiC). Although the harsh chemical

treatments of these grains does not alter their crystal structure, significant alteration of the surface morphology of the grains due to the acid treatments has been observed. In addition, the acid treatments may preferentially remove cracked or fissured grains, and possible sub-grains, such as graphite. By studying SiC grains isolated by physical separation and found in situ, we attempt to obtain a more complete analysis of presolar SiC microstructures, including the surface morphology, in order to address the formation and processing history of the grains. In our prior work, we reported on one in situ SiC grain (hereafter CBIS1). Here we present results from two additional grains, one in situ, and one prepared as a physical separate.
Derived from text
Silicon Carbides; Transmission Electron Microscopy; Microstructure; Granular Materials; Solar Nebula

20030111530 Academy of Sciences (USSR), Moscow, USSR
Trace Element Chemistry of Lunar Highland Meteorites from Oman
Nazarov, Mikhail A.; Demidova, Svetlana I.; Taylor, Lawrence A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): RFBR-02-05-64981; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During the last few years, numerous lunar meteorites have been discovered in the Dhofar region of Oman. All of them are lunar highland breccias, except for Dhofar 287A, which is a mare basalt. In this paper, we present the first trace-element chemistry of these new lunar highland meteorites: Dhofar 280, 301-310. Mineralogy and petrology of these meteorites have been reported in other works.
Derived from text
Breccia; Meteoritic Composition; Trace Elements; Meteorites; Lunar Composition

20030111531 Naturhistorisches Museum, Vienna, Austria
Major, Minor and Trace Elements in Some Glasses from the NWA 1664 Howardite
Kurat, G.; Varela, M. E.; Zinner, E.; Maruoka, T.; Brandstatter, F.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): P-13975-GEO; P-14022/91; P-07-08176; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The new howardite NWA 1664, 6.31 kg, is a polymict breccia consisting mainly of mineral fragments and lithic clasts (diogenitic and eucritic) embedded in a fine-grained clastic matrix. This rock has abundant glass fragments (up to 2 cm), glass spherules (up to 1 cm) and chondrule-like objects. Most of the glass fragments are devitrified to variable degrees, some have vitrophyric textures and some are fully hyaline. Here we present the results of a major and trace element analyses of these glass fragments. Our preliminary results allow us to speculate that the howardite glasses and those present in angrites (D'Orbigny) and eucrites (Cachari) share similar formational processes and have similar origins.
Author
Meteoritic Composition; Trace Elements; Breccia; Glass; Achondrites

20030111532 Arizona Univ., Tucson, AZ, USA
Semi-Three Dimensional Computer Simulations of Large-scale Cataclysmic Flooding: A Model and Parameter Sensitivities
Miyamoto, H.; Baker, V. R.; Komatsu, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many cataclysmic megafloods in the geological history of Earth has been recognized. They are linked with late Pleistocene glaciation, and therefore research on these floods might provide insights on climatic changes of Earth. Megafloods appear also to have occurred on Mars, at scales so large that the outflows may have been responsible for the formation of a transient north polar ocean on the planet. Relevant to these problems, the understanding of discharge rates and durations of megafloods will be quite important. A variety of quantitative methods have been applied. However, these computations were confined to a single reach at one time. Therefore, it was difficult to reconstruct the continuous flow relationships among multiple reaches, which is necessary to estimate a discharge rate for the whole system of a megaflood. To solve this problem, we are developing and testing a new semi-three dimensional flood simulation code. The new code is capable of calculating time-slices of flow distribution over topography and depth, and also flow characteristics such as velocity and discharge rate. The combination of topographic data and fluid physics in semi-three dimensions provides important advantages over

theoretical analyses or two-dimensional simulations, as follows: (1) complicated water paths, including bifurcations and reconvergences of flows can be naturally reproduced; (2) relationships of individual continuous flow paths can be reconstructed; and (3) calculated areal coverages and water depths can be directly compared with geological and geomorphological observations.
Derived from text
Three Dimensional Models; Floods; Cataclysmic Variables; Computerized Simulation; Climate Change; Continuum Flow; Fluid Dynamics; Flow Characteristics

20030111533 Hawaii Univ., Honolulu, HI, USA
A Source for the Martian Crustal Magnetic Field
Scott, Edward R. D.; Fuller, Michael D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The magnitude of the martian magnetic crustal field requires intensities of magnetization of large volumes of the martian crust to be stronger than any comparable volumes on Earth. The Martian magnetic field at 4.0 Gyr was about one order smaller than the present geomagnetic field, and because the generating volume for the martian dynamo is considerably smaller than that for the geodynamo, it seems unlikely that the martian dynamo would ever have been much stronger than the geodynamo. In the absence of evidence for such a strong field on Mars, there is a need for a special model to account for the intensity of magnetization of the source rocks of the Martian anomalies. One potentially relevant feature of early Mars is the presence of water that reacts with atmospheric carbon dioxide to form acidic solutions. These fluids can dissolve igneous rocks in the crust and precipitate iron-rich carbonates, as observed in the older martian meteorites. Here we suggest that thermal decomposition of such iron-rich carbonates due to magmatic intrusions could give rise to plentiful single-domain magnetite and generate a potent source for the martian crustal field.
Derived from text
Magnetization; Mars (Planet); Planetary Crusts; Planetary Geology; Planetary Magnetic Fields; Mars Surface

20030111534 Tokyo Univ., Japan
Reflectance Spectra for Olivine Heated with Sudden Oxygen-Fugacity Change
Miyamoto, M.; Ueda, Y.; Mikouchi, T.; Monkawa, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Because bombardments on asteroidal surfaces by meteorites may locally increase surface temperature and change oxygen fugacity by selective evaporation of surface material, we have studied changes of diffuse reflectance spectra in the UV-Visible-Near infrared wavelength region (200-2500 nm) for powder samples of some meteorites heated at 800 - 1200 C under different oxygen fugacities. The brief summary of the results is as follows. The spectral contrast fairly decreases and the spectra often show strong reddening after heating, especially when the meteorite sample was heated at a different oxygen-fugacity condition from the intrinsic oxygen-fugacity of the meteorite.
Derived from text
Olivine; Reflectance; Stellar Spectra; Surface Temperature; Asteroids; Diffuse Radiation; Oxygen

20030111535 Notre Dame Univ., IN, USA
The Composition of KREEP: A Detailed Study of KREEP Basalt 15386
Neal, C. R.; Kramer, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Apollo 15 basalt 15386 contains elevated incompatible trace element abundances and has been described as a pristine (volcanic) basalt with KREEP rare-earth element (REE) abundances and patterns. Basalt 15386 is considered to be a fragment of a lava flow, rather than an impact melt, based upon the relatively low siderophile element abundances reported by Warren and Wasson and Warren et al. of 0.061 ppb Ir and 1.8 ppb In. 15386 is older and more feldspathic and alkaline than other Apollo 15 basalts; it has a Rb-Sr age of 3.94 +/- 0.1 Ga [I(Sr) = 0.70038 +/- 3] and a Sm-Nd age of 3.85 +/- 0.08 Ga [I(Nd) = 0.50762 +/- 9]. Alumina and K2O contents are about 15 wt% and about 0.7 wt%, respectively, compared to an average of 9.0+/- 1.2 wt% Al2O3 and 0.04 +/- 0.01 wt% K2O for both the olivine- and quartz-normative Apollo 15 basalts. O Kelley et al. reported that 15386 had a surface exposure age of at least two million years. The purpose of this study was to analyze

15386 by Inductively Coupled Plasma -- Mass Spectrometry (ICP-MS) for 40 trace elements, including many not previously quantified in this sample.
Derived from text
Basalt; Kreep; Rare Earth Elements; Trace Elements; Lunar Rocks; Lunar Composition; Chemical Analysis

20030111536 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Cosmogenic Records in 18 Ordinary Chondrites from the Dar Al Gani Region, Libya, 1, Noble Gases
Schultz, L.; Franke, L.; Welten, K. C.; Nishiizumi, K.; Jull, A. J. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-4992; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the last decade thousands of meteorites have been recovered from hot deserts in the Sahara and Oman. One of the main meteorite concentration surfaces in the Sahara is the Dar al Gani plateau in Libya, which covers a total area of ~8000 km2. More than 1000 meteorites have been reported from this area. The geological setting, meteorite pairings and the meteorite density of the Dar al Gani (DaG) field are described in more detail in [1]. In this work we report concentrations of the noble gas isotopes of He, Ne, Ar as well as 84Kr and 132Xe in 18 DaG meteorites. In a separate paper we will report the cosmogenic radionuclides [2]. We discuss the thermal history and cosmic-ray exposure (CRE) history of these meteorites, and evaluate the effects of the hot desert environment on the noble gas record.
Author
Chondrites; Isotope Ratios

20030111538 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Nitrogen and Heavy Noble Gases in Sands That Hosted Sayh Al Uhaymir 008 in the Oman Desert
Schwenzer, S. P.; Mohapatra, R. K.; Hermann, S.; Ott, U.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Martian meteorite Sayh al Uhaymir (SaU) has been found in the desert of Oman. Up to now six stones, which are thought to be paired, have been discovered. Terrestrial ages are estimated to be less than 10(exp 5) a. Besides the petrological investigations, noble gas studies point to the Martian origin of the meteorite. As these specimens spent a significant time in the desert, their indigenous elemental and isotopic compositions have been found to be affected by desert weathering. In order to understand the effects of terrestrial contamination on SaU in its nitrogen and noble gases, we have carried out a detailed study of various sample extracts (e.g., bulk, caliche and glass). These studies provide indications for the existence of an Elementally Fractionated Air (EFA) component in this meteorite which may explain the low-temperature component observed in Martian meteorites from hot deserts. Adsorption of terrestrial nitrogen and heavy noble gases: Adsorption of terrestrial gases cannot be avoided during terrestrial residence and sample preparation. Preheating at 150C for several hours is usually adopted to remove such contamination. But signatures of terrestrial contamination induced by desert weathering have been shown to persist beyond such preheating and often to temperatures as high as 1000C. It has been shown that by using a carefully devised stepped heating experiment, it nevertheless is possible to isolate such terrestrial contamination from the indigenous signatures. Take-up of heavy noble gases due to weathering and sample preparation procedures has been noticed in other types of meteorites as well. Incorporation of elementally fractionated Kr and Xe by chondrites due to weathering has been reported. Futhermore, others observed an increase of Kr and Xe during crushing and grinding of lunar samples with Xe uptake up to one order of magnitude greater than Kr uptake. Still, processes responsible for the adsorption of heavy noble gases are poorly understood. Therefore we carried out studies on non-meteoritic material to investigate the elemental ratios of Kr and Xe in these samples. In an earlier study we investigated a caliche sample. In the present study we have focused on a sample of the soil that hosted the meteorite in the Oman desert to further understand the nature of desert weathering of SaU.
Derived from text
Chemical Composition; Nitrogen; Petrology; Rare Gases; SNC Meteorites; Deserts

20030111539 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Experimental Study of the Angle of Repose of Surrogate Martian Dust
Moeller, L. E.; Tuller, M.; Baker, L.; Marshall, J.; Castiglione, P.; Kuhlman, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Accumulation of wind-blown dust particles on solar cells and instruments will be a great challenge in the exploration of Mars, significantly reducing their lifetime, durability, and power output. For future Mars Lander missions it is crucial to gain information about the ideal angle at which solar panels can be positioned to minimize dust deposition and thus, maximize the power output and lifetime of the solar cells. The major determinant for the optimal panel angle is the angle of repose of the dust particles that is dependent on a variety of physical and chemical properties of the particles, the panel surface, and the environmental conditions on the Mars surface. To gain a basic understanding of the physical and chemical processes that govern dust deposition and to get feedback for the design of an experiment suitable for one of the future Mars Lander missions we simulate atmospheric conditions expected on the Mars surface in a controlled chamber, and observe the angle of repose of Mars dust surrogates. Dust deposition and angle of repose were observed on different sized spheres. To cover a range of potential materials we will use spheres made of 7075 aluminum (10 mm, and 15 mm), alumina oxide ceramic (10 mm), and Teflon(trademark) (10 mm) and wafers of gallium arsenide, silicon.
Derived from text
Mars Environment; Environmental Tests; Dust; Mars Atmosphere; Mars Surface

20030111540 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
AGE (Argon Geochronology Experiment): An Instrument for Geochronology on the Surface of Mars
Swindle, T. D.; Bode, R.; Boynton, W. V.; Kring, D. A.; Williams, M.; Chutjian, A.; Darrach, M. R.; Cremers, D. A.; Wiens, R. C.; Baldwin, S. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As our knowledge of the planet Mars continues to grow, one parameter that remains elusive is the absolute chronology of the planet s geological history. Although crater counts have provided a robust relative chronology, impactor fluxes are poorly enough known that there are places on Mars where the absolute age is uncertain by a factor of two or more. To resolve these uncertainties, it will be necessary to either analyze well-documented samples returned to the Earth from the Martian surface or to perform in situ measurements with sufficient precision. Sample return is still at least a decade away, and even then it might be from a biologically interesting area that might be geologically complex. Hence an in situ measurement, within an uncertainty of 20% or better, could greatly improve our knowledge of the history of Mars. With funding from the Planetary Instrument Definition and Development Program (PIDDP), we have been working on an instrument to perform potassium-argon (K-Ar) and cosmic-ray exposure (CRE) dating in situ on the surface of Mars. For either of these techniques, it is necessary to measure the abundance of one or more major or minor elements (K in the case of KAr; all majors and minors in the case of CRE) and the abundance and isotopes composition of a noble gas (Ar in the case of K-Ar; He, Ne and Ar for CRE dating). The technology for either of these types of measurements exists, but has never before been integrated for a spacecraft. We refer to the instrument as AGE, the Argon Geochronology Experiment (although we will measure the noble gases He and Ne as well for CRE ages). We report here on the basic components that go into such an instrument, both those that use existing technology and those that had to be developed to create the integrated package.
Derived from text
Argon; Geochronology; Mars Surface; Mars (Planet); In Situ Measurement

20030111541 Tokyo Univ., Japan
Shock Formation of Kaersutite in Martian Meteorites: An Experimental Study
Monkawa, A.; Mikouchi, T.; Sekine, T.; Koizumi, E.; Miyamoto, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Magmatic inclusions in Martian meteorites contain some hydrous minerals such as kaersutites. The characteristic of Martian kaersutites is their water-poor and Ti-rich (approx. 10 wt%) compositions. The presence of kaersutite gives evidence that Martian parent magma contained water. In fact, several attempts have been performed to estimate the water content in Martian magmas and mantle. Thus, it is important to reveal the crystallization process of kaersutite for understanding the Martian magma water content. However, no one has been successful in explaining crystallization process of Martian kaersutites because of difficulty in explaining crystallization of Ti-rich kaersutite. Johnson et al. studied a partially crystallized magmatic inclusion in Chassigny and suggested that low TiO2 content in synthetic kaersutite was due to ilmenite crystallization prior to kaersutite in the experiments. We suggested that Ti-rich kaersutites in Martian meteorites is a shock origin rather than a primary phase crystallized at depth. In order to explore this hypothesis, we have performed shock

experiments on analogous mixture of magmatic inclusions in Martian meteorites.
Derived from text
Meteoritic Composition; Ilmenite; Magma; Planetary Mantles; Titanium Oxides

20030111542 Arizona Univ., Tucson, AZ, USA
Production Rates of Noble Gases in the Near-Surface Layers of Europa by Energetic Charged Particles and the Potential for Determining Exposure Ages
Swindle, T. D.; Reedy, R. C.; Masarik, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The surface of Europa is expected to be extremely active, undergoing tectonic and/or tidal geological activity and sputtering/ deposition, as well as impact cratering. Determination of the actual age of the surface at one or more places would greatly simplify trying to sort out what processes are occurring, and at what rate. If there is K present, as the spectral and compositional modeling discussed predict, it should be possible, in principle, to determine K-Ar crystallization ages. Whether or not there is K present, a consideration of the environment suggests we can determine an energetic particle exposure age if we can make in situ measurements of the abundances of major elements and of noble gas isotopes. This requires instrumentation that is within reach of current technology. In this paper, we calculate production rates for noble-gas isotopes in a simplified Europan surface, to quantify the amount of light noble gases produced by exposure to energetic particles.
Derived from text
Charged Particles; Europa; Exposure; Rare Gases; Planetary Surfaces

20030111543 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Nitrogen, Argon and Xenon in Happy Canyon E Chondrite
Mohapatra, R. K.; Herrmann, S.; Ott, U.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An interesting aspect of enstatite chondrites (EC) lies in their oxygen isotopic compositions that are identical to those of the Earth-Moon system. Thus it has been suggested that Earth could have accreted mostly from EC. Similarly, based on an assessment of nitrogen and oxygen isotopes in martian meteorites about 75 % contribution from EC type materials to the accretion of Mars has been proposed recently. The suggestion that EC type materials could have played a key role in the accretion of earth-like planets is also consistent with the bulk chemical compositions of these planets. Earlier nitrogen studies have shown that EC have a number of isotopic components in them, which are poorly understood, and so are the hosts of these components. In this context, it is useful to study nitrogen combined with another tracer. Carbon has been used, but another approach could be one using noble gases, which have been shown to be useful tracers for solar system studies. However, simultaneous nitrogen and noble gas data on EC are scarce so far. Here we report on the analysis of a 0.68 mg sample of Happy Canyon (EL6) simultaneously for its nitrogen and noble gas isotopic compositions, as part of an ongoing study of EC.
Derived from text
Enstatite; Argon; Nitrogen; Xenon; Composition (Property); Oxygen Isotopes; Chemical Composition

20030111544 Museum fuer Naturkunde, Berlin, Germany
Platinum Group Elements Analysis of Impactites from the ICDP Chicxulub Drill Core Yax-1: Are There Traces of the Impactor?
Tagle, R.; Erzinger, J.; Hecht, L.; Stoeffler, D.; Schmitt, R. T.; Claeys, P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): DFG-STO-101/38; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The nature of the Chicxulub impactor is still not fully understood. Attempts to identify the traces of the impactor from chemical analyses of impactites within the crater are extremely controversial. Ir analyses of samples from the Chicxulub-1 and Yucatan-6 drill cores lead to different results. Nuggets of platinum group elements (PGE) and Ir concentration of more than 1000pg/g were reported. Analyses of samples from the same core made by other authors did not show any Ir enrichment. Os isotopes studies of one impact melt sample from the Chicxulub-1 core indicate a probable presence of an extraterrestrial component. Results from K/T sites show an unequivocal picture. K/T sites all over the world are enriched in PGE. These enrichments are interpreted as resulting from the impacting bolide. The PGE ratios in those sites are mostly highly disturbed

because of post depositional fractionation. Based on Cr-isotope studies of two K/T sites a carbonaceous chondrite was proposed as source for the PGE anomaly. This theory is supported by a fragment of a small meteorite found in the K/T layer at the DSDP Hole 567. This piece of meteorite was interpreted as a fragment of the Chicxulub impactor and shows a texture that resembles a carbonaceous chondrite. The aim of our study is to characterize the Chicxulub impactor by means of analyzing PGE and siderophile elements of impact melt rocks. The samples were taken from the ICDP Yax-1 drill core as well as from Yucatan 6 drill core. The Yax-1-samples represent various types of melt-rich suevite-type polymict breccias as defined in a companion paper.
Derived from text
Platinum; Cretaceous-Tertiary Boundary; Impactors; Drilling; Meteorites; Chemical Analysis

20030111545 Texas Univ., Austin, TX, USA
IMPACT: Texas and the World. An Interactive CDROM for Educational Outreach
Molineux, A.; Gunter, M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Accession of the tektite collection of the late Virgil Barnes into the collections of the Texas Memorial Museum provided an opportunity to develop an interactive CDROM covering topics relating to tektites, impact sites and meteorites. The project was designed to attract middle and high school students and expose them to the wealth of extra-terrestrial connection. Where possible specimen images are original and include Quicktime(QT) and QTVR presentation. Other movies in the public domain have been incorporated to vitalize the subject matter. The basic multimedia program used is Director and the product is in the form of four distinct movies with a recommended sequence for viewing. The format is one of questioning, stimulating thought on the part of the user. Back up materials include a large glossary which can be addressed as you read, or can be held as an open file beside the movie. Emphasis is on Texas resources, impact sites, meteorites and tektites, with worldwide coverage where relevant to avoid the parochial treatment of the topic. Scientists from all branches of meteoritical sciences were involved and provided current stimulating vignettes for the user.
Derived from text
Education; Multimedia; Tektites; Collection; Dictionaries; Meteorites

20030111546 Museum fuer Naturkunde, Berlin, Germany
A Non-Magmatic Iron Meteorite as Impactor for the Rochechouart Crater
Tagle, R.; Stoeffler, D.; Claeys, P.; Erzinger, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Rochechouart impact crater in the French Massif Central, has a diameter of 20 - 25 km and an age of 250 my. The cater is deeply eroded, down to the crater floor. Impact melt outcrops can be found in different parts of the crater. The type of impactor that produced Rochechouart crater is still not clear. The first proposal of an IIA iron asteroid was based on the abundance of some platinum group element (PGE) and siderophile elements in the melt and target rocks of the Rochechouart structure. Later, metal veins were reported from the rocks at the bottom crater and interpreted as condensates from the impacting asteroid. From the Ni/Cr ratios of these veins the authors proposed a chondrite body as impactor. On the basis of Cr isotope an ordinary chondrite as impactor was finally proposed. The goal of the present work was to determine the type of impactor that produced this crater, based on complete analysis of all PGE and Au as well as Ni, Co and Cr.
Derived from text
Impactors; Iron Meteorites; Lunar Craters; Mineralogy

20030111547 Muenster Univ., Germany
TEM Investigation of a 'Mysterite' Inclusion from the Krymka LL-Chondrite: Preliminary Results
Weber, I.; Semenenko, V. P.; Stephan, T.; Jessberger, E. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In only two meteorites, Krymka and Supuhee, a very rare, fine-grained mysterious material has been discovered so far. Laul et al. detected in these two ordinary chondrites an enrichment in Ag, Tl, and Bi. They concluded that this enrichment has its origin in a late condensate introduced during a brecciation event. Since a petrographic carrier of the volatiles could not be specified, they named this fine-grained areas mysterite . Higuchi et al. studied by radiochemical neutron activation four mysterite fragments from the H6 chondrite Supuhee, whereas Grossman et al. investigated with electron microprobe a

mysterite-bearing inclusion from the Krymka LL3.1 chondrite. Although they used very different analytical techniques, both groups concluded that mysterite belongs to an unknown kind of carbonaceous material condensed in a special nebular region. Another carbonaceous clast (K1) from Krymka with similar mineralogy was studied by Semenenko et al. The presence of organic compounds, microcrystals of graphite and an anomalous enrichment in Ag are distinctive features of this clast. It was supposed that the graphite was formed from the organic compounds as a result of metamorphism. Due to this features mysterite was interpreted as the most likely material with a cometary origin. In our study we carried out an additional detailed investigation of the Krymka carbonaceous clast K1 by using reflected light microscopy, scanning electron microscopy, secondary ion mass spectrometry, and transmission electron microscopy (TEM). The aims of the study were to investigate structural features and nature of graphite and the other minerals. Here we present preliminary results of TEM analyses, which we made on a thin section prepared by focussed ion beam (FIB) technique.
Derived from text
Chondrites; Metamorphism (Geology); Inclusions; Mineralogy; Meteorites; Meteoritic Composition

20030111548 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
The First 2-50 Micron Infrared Spectrum of an Interplanetary Dust Particle (IDP)
Molster, F. J.; Demyk, A.; d'Hendecourt, L.; Bradley, J. P.; Bonal, L.; Borg, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

IDPs (<50 microns diameter) from comets and asteroids are collected in the stratosphere. Some of them are among the most chemically and isotopically primitive meteoritic materials available for laboratory investigation. Studies of IDPs provide insight about grain dynamics in the early Solar System and presolar interstellar and circumstellar environments. Processes like grain condensation, chemical and physical evolution, and grain density distribution in the proto-planetary disk can be investigated through studies of IDPs. It is now also possible to directly compare the properties of IDPs with those of dust around other young stars using infrared (IR) spectral properties. Most of the vibrational band structures associated with astronomical dust are in the IR wavelength range. The direct comparison of laboratory and astronomical dust data defines the new discipline of 'astromineralogy'
Derived from text
Asteroids; Interplanetary Dust; Meteorites; Chemical Evolution; Protoplanetary Disks

20030111549 Universidad Complutense, Madrid, Spain
Mars 3D: A Virtual Fieldtrip by the Red Planet in the Classroom
Montoya, I.; Nieto, A. B.; dePablo, M. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars, one the most famous planets of our Solar System, it can be used as tool to draw attention of the pupils (and of the public) toward a great variety of topics related to the Natural Sciences, and that they are contained in the curriculum of the Obligatory Secondary Education in Spain, as can be the subjects of technology, Astronomy, Geology, Biology,... There are many material and published books with activities on Planetary Sciences to develop in the classrooms, that show the interest by that science. Furthermore, there was developed numerous activities of this kind, with the aid of informatic tools, to elaborate topographic maps, to create photographs mosaic on-line of the various planets and satellites surfaces, and others activities about Mars with planetary data. In this abstract we show how create 3D Digital Elevation Models and anaglyphs of the surface of Mars in a easy way. The objective of this activity is show, through a virtual fieldtrip with a computer, the most important features and regions of the planet Mars: highlands, lowlands, dicotomy, polar regions, craters, channels, volcanoes and canyons; and of its surface: rocks, sediments, landscapes... We development that two didactic activities with students between 10 to 18 years old of the secondary education, and with a general public in different contexts: some local simposiums of astronomers, an international congress of didactic and geology, some expositions in different universities... It shows that it's possible to approach the planetary geology to the public by a fun and easy way. The teacher could employ the idea that we show here with their pupils with differents modifications depending of the subjets were it could be employ: informatic, geology,... and the edge of the pupils.
Derived from text
Mars (Planet); Education; Digital Elevation Models; Three Dimensional Models; Virtual Reality; Mars Surface

20030111550 Hokkaido Univ., Sapporo, Japan

Response of Residual CO2 Ice Cap to Climate Changes on Mars

Takayama, K.; Yokohata, T.; Odaka, M.; Kuramoto, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Partitioning of CO2 on Mars plays an important role in controlling the state of martian climate. On Mars CO2 is exchangeable among the atmosphere, polar-caps and regolith. The existence of plural reservoirs may allow multiple climate states even when the boundary conditions are fixed. For example, when the total amount of CO2 is given, the climate could be either warm or cold dependent on whether CO2 exists mainly in the atmosphere or in the ice caps or regolith. Abundant geological evidence including the outflow-channels and polar deposits strongly suggests that the martian climate has been changing through its history. Such climate changes would be realized by the variation of CO2 partitioning, which may be triggered by changes of boundary conditions such as the solar flux, obliquity and total CO2 mass on Mars. In the past studies , residual CO2 ice cap has been treated as a reservoir with infinite capacity or constant thickness without considering the formation processes. This has inhibited the quantitative treatment of the CO2 partitioning and the application to topographical study. In this study, we construct a new climate model which can calculate the ice cap topography consistently. We apply this model to the partitioning of CO2 on Mars, and discuss the past climate change and evolution of polar topography.
Derived from text

Carbon Dioxide; Climate Change; Ice; Polar Caps; Mars Surface; Mathematical Models; Topography

20030111551 Geological Survey, Flagstaff, AZ, USA

Volatile-driven, Deformational and Resurfacing Origin for the Vastitas Borealis Formation on Mars

Tanaka, K. L.; Skinner, J. A., Jr.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Vastitas Borealis Formation (VBF) makes up one of the largest map units on Mars, covering 17.6 x 10(exp 6) sq km, or about 12% of the surface. The VBF was mapped initially on the basis of its distinctive morphologic and albedo characteristics and its occurrence in the northern plains below the martian highland/lowland boundary (HLB) and boundary plains. However, the origin of the VBF has proved to be controversial, owing to its many perplexing features. Volcanic, tectonic, glacial, periglacial, and sedimentary related processes have been ascribed to various landforms encompassed by the unit. Mapping of putative shoreline features also followed in part the VBF contact. Recently, Mars Orbiter Camera (MOC) narrow-angle (NA) images and Mars Orbiter Laser Altimeter (MOLA) topographic data have been used to study the unit. Perhaps receiving the most attention has been the marine sediment origin, because the VBF margin occurs mostly within a rather limited elevation range. Alternatively, we have suggested that the VBF resulted from volatile-driven reworking of earlier rocks. Here, we examine distinct types of surface morphology within and surrounding the VBF and how they may bear on understanding of the origin of the VBF. These descriptions are generalizations, and cursory examination of the Mars Odyssey THEMIS images released in January 2003 reveals many complexities and variations in the expression of the VBF landforms.
Author

Mars Surface; Planetary Geology; Volatile Organic Compounds

20030111553 City Univ. of New York, Brooklyn, NY, USA

Amoeboid Olivine Aggregates in CR Chondrites

Weisberg, M. K.; Connolly, H. C., Jr.; Ebel, D. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Amoeboid Olivine Aggregates (AOAs) are irregular-shaped, fine-grained aggregates of olivine and refractory minerals and are important components of C chondrites. The AOAs in CV chondrites have been interpreted to be primary nebular condensates and therefore, can provide constraints on models for nebular condensation. AOAs are intermediate in composition, and may be a link, between the older, refractory calcium-aluminum-rich inclusions (CAIs) and the younger, moderately volatile ferromagnesian chondrules, and can provide information on the astrophysical settings of CAI and chondrule formation. Additionally, AOAs may be among the precursor solid materials that accreted and were melted to form chondrules. In the highly primitive CR chondrites, AOAs are rare but intriguing components. Some of the AOAs in CRs contain FeNi metal and Mn-enriched forsterite, in which Fe and Mn are decoupled with Fe/Mn ratios less than one. Similar Mn-enriched olivine has been described in interplanetary dust particles (IDPs) and chondrite matrices. Herein we present the preliminary results of our re-examination of the AOAs in the CR chondrites, which include detailed petrologic analyses and a SEM-cathodoluminescence study. Our goals are to complete a comprehensive petrologic study of the AOAs in CR

chondrites, understand their petrogenesis and their relationship to other chondritic components in the CRs and to AOAs and chondritic components in other chondrite groups.
Derived from text
Carbonaceous Chondrites; Olivine; Calcium; Aluminum; Inclusions; Aggregates; Petrogenesis

20030111554 California Univ., Berkeley, CA, USA
Cosmogenic Records in 18 Ordinary Chondrites from the Dar Al Gani Region, Libya, 2, Radionclides
Welten, K. C.; Nishiizumi, K.; Finkel, R. C.; Hillegonds, D. J.; Jull, A. J. T.; Schultz, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): W-7405-eng-48; NAG5-4992; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the past decade more than 1000 meteorites have been recovered from the Dar al Gani (DaG) plateau in the Libyan part of the Sahara. The geological setting, meteorite pairings and density are described. So far, only a few terrestrial ages are known for DaG meteorites, e.g. 60+/- 20 kyr for the DaG 476 shergottite shower and 80+/- 20 kyr for the lunar meteorite DaG 262. However, from other desert areas, such as Oman, it is known that achondrites may survive much longer than chondritic meteorites, so the ages of these two achondrites may not be representative of the majority of the DaG meteorite collection, of which more than 90% are ordinary chondrites. In this work we report concentrations of the cosmogenic radionuclides, 14C (half-life = 5,730 yr), 41Ca (1.04x10 superscript 5 yr), Cl-36 (3.01x10 superscript 5 yr), Al-26 (7.05x10 superscript 5 yr) and 10Be (1.5x10 superscript 6 yr) to determine the terrestrial ages of DaG meteorites and constrain their pre-atmospheric size and exposure history.
Author
Chondrites; Isotope Ratios

20030111555 Hawaii Univ., Honolulu, HI, USA
Evolution of the Martian Crust: Evidence from Preliminary Potassium and Thorium Measurements by Mars Odyssey Gamma-Ray Spectrometer
Taylor, G. Jeffrey; Boynton, W.; Hamara, D.; Kerry, K.; Janes, D.; Keller, J.; Feldman, W.; Prettyman, T.; Reedy, R.; Brueck, J., et al.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Potassium and thorium are useful elements for determining the inventory of moderately volatile elements in planetary interiors and for deciphering the evolution of the crust and mantles of the planets. We report preliminary measurements by the Gamma-Ray Spectrometer (GRS) on Mars Odyssey of the K and Th concentrations on the Martian surface between 45 degrees south and 45 degrees north longitude, divided into 15x15 degree pixels. The data were corrected by procedures outlined in Boynton et al. In addition, we normalized the K concentration to the composition of the Mars Pathfinder landing site, and we used the same normalization factor for Th. Results are shown in this paper. We use these data to make preliminary tests of three concepts: (1) The idea that the Martian crust contains geochemically-enriched and depleted regions, reflecting distinctive reservoirs in the mantle. (2) The concept that Mars is richer in moderately volatile elements such as K, Mn, and P compared to Earth. (3) The effect of surface alteration processes and the composition of the pervasive dust on Mars. Although preliminary, our data show the great promise of having a global data set of geochemically-diagnostic elements.
Derived from text
Planetary Evolution; Mars Surface; Planetary Crusts; 2001 Mars Odyssey; Gamma Ray Spectrometers; Potassium; Thorium

20030111556 Clinton High School, Clinton, NY, USA
Crustal Plateau Collapse on Venus: Evidence from the Pasom-mana Region
Tewjsbury, C. M.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past several years, a number of workers have offered compelling evidence that Venusian crustal plateaus were created by mantle upwelling. Recent geophysical modeling has further suggested that, on Venus, an initially uncompensated crustal plateau created by upwelling should decay into a torroidal shape in three dimensions and a ring shape in map view. Such a decayed plateau should appear on the surface of Venus as a ring of complexly-deformed terrain (tessera), perhaps flooded or partially flooded by younger lavas. A number of workers have noted the resemblance between arcuate patches of

tessera in the plains and the rims of crustal plateaus. No one, however, has previously systematically studied isolated rings and patches of tessera to determine whether they might, in fact, be the remnants of collapsed plateaus. The existence of such areas would provide crucial evidence for resolving controversies over the origin and evolution of crustal plateaus on Venus. The Pasom-mana Tessera region on Venus (centered on 30S, 37E) consists of a topographically high ring approximately 1000 kilometers across rising 1-3 kilometers above both a low center and the surrounding plains. This study aims to determine whether this ring defines the rim of collapsed and previously unrecognized crustal plateau and whether the detailed geologic history of the area is consistent with early plateau formation and subsequent collapse and burial.
Derived from text
Venus Surface; Planetary Crusts; Plateaus; Planetary Evolution; Topography; Paleontology

20030111557 Louisiana Univ., Monroe, LA, USA
Determining Water Levels in Maumee and Vedra Valles Using Equilibrium Sediment Transport Theory
Thibodeaux, C. J.; Washington, P. A.; DeHon, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ever since the first recognition of channels on Mars, attempts to estimate the flow characteristics of channel systems and their sediment transport consequences have been a holy grail of martian hydrological and sedimentological studies. Previous attempts were severely hampered by the lack of sufficiently precise data to perform the necessary calculations. The MOLA data set provides greatly increase accuracy and therefore allows improved estimates of discharge and related parameters. Maumee and Vedra Valles consist of a collection of anastomosing channels that head on the eastern edge of Lunae Planum, extend across Xanthe Terra uplands,and debouch onto the lower Chryse Planita surface. Flow through the system began as large-scale overland flooding which became channelized. Tributary channels became abandoned as the trunk channel in each of the systems capture the bulk of the discharge. Maumee and Vedra were abandoned as the trans-Xanthe portion of Maja captured the remaining discharge. Volumes and duration for the discharge through Maumee and Vedra channels were previously estimated using Viking orbiter data and a wide-range of possible water depths. That model for the Maja outflow system was based primarily on the use of a modified Chezy equation to calculate the rate of discharge through a series of deepening spillways with a deceasing head at the source. In this paper we refine water level estimates by application of the Manning equation and Stream-Sediment Equilibrium Theory to much improved topographical data provided by MOLA.
Derived from text
Mars Surface; Sediment Transport; Transport Theory; Water Depth; Planetary Geology; Equilibrium

20030111559 NASA Johnson Space Center, Houston, TX, USA
An Extraction and Curation Technique for Particles Captured in Aerogel Collectors
Westphal, A. J.; Snead, C.; Dominquez, G.; Bradley, J. P.; Zolensky, M. E.; Flynn, G.; Brownlee, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 2006, the STARDUST mission will return samples of cometary, interplanetary and interstellar dust captured in aerogel collectors. The curation strategy (or strategies) for STARDUST remain to be defined. Here we present a technique for curation of particles captured in aerogel which will simultaneously preserve the entire particle track, and could allow for the elemental in situ analysis of both the particle residue at the terminus of the track and any particle residues located along the track. This builds on work that we have previously reported elsewhere.
Derived from text
Aerogels; Stardust Mission; Extraction; Interplanetary Dust; Dust Collectors

20030111560 Arizona State Univ., Tempe, AZ, USA
Mars: Dust Devil Tracks in Hellas Basin and Argyre Planitia
Whelley, P. L.; Balme, M. R.; Greeley, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Dust devils on Mars could be an important mechanism for delivery of dust into the Martian atmosphere. Suspended dust in the Martian atmosphere is observed to be approximately 1-2 m in diameter and calculations of fall-out rate imply an ongoing supply of this fine dust to the atmosphere. Laboratory wind tunnel experiments, however, suggest that entrainment of fine dust into the atmosphere requires surface wind speeds exceeding those measured on Mars. Recent experiments using a laboratory

scale vortex generator at low-pressure suggest that vortex action (i.e. a dust devil) is more efficient at lifting fine dust than boundary layer winds. Coupled with the many observations of dust devils on Mars, these experiments suggest that dust devils are an important contributor to the global dust budget and hence to the global climate. Characterizing the temporal and spatial distribution of dust devil activity on Mars is therefore essential for generating accurate climate models. However, the transient nature of dust devils, the limited spatial coverage of the high resolution images required to actually resolve them, and restricted viewing times of the Mars Orbiter Camera (MOC) makes their detection serendipitous. Several studies have attempted to measure the frequency of active dust devils using both Wide Angle and Narrow Angle (NA) MOC images but, for the reasons given above, they can only sample a small fraction of dust devil activity. However, the passage of dust devils over the surface can leave a surface track that remains visible on the surface for orders of magnitude longer than the dust devil that produced them. Here we investigate the distribution of these dust devil tracks in two study areas: Argyre Planitia (20 deg. to 50 deg. W; -50 deg. to -30 deg. S) and Hellas Basin (250 deg. to 320 deg. W; -50 deg. to -15 deg. S).
Derived from text
Mars Surface; Interplanetary Dust; Structural Basins; Climatology; Mars Photographs

20030111562 Los Alamos National Lab., NM, USA
The Applicability of Laser-induced Breakdown Spectroscopy (LIBS) to Mars Exploration
Wiens, R. C.; Maurice, S.; Cremers, D. A.; Chevrel, S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Measurements of elemental composition of Mars rocks and soils have been limited to a very few missions, most notably Viking and Mars Pathfinder, and to the martian meteorites. While the Mars Exploration Rover (MER) missions to be launched later this year represent a significant step forward, many of the key questions of today will remain for future missions to be answered. A new technique for remote elemental composition measurements from rovers or landers is being developed in the US and France: Laser-induced breakdown spectroscopy (LIBS). Here we lay out some of the key science questions yet to be answered and explore the potential for LIBS to answer these questions.
Derived from text
Laser-Induced Breakdown Spectroscopy; Mars Exploration; Planetary Geology; Geochemistry

20030111563 Hawaii Univ., Honolulu, HI, USA
Constraints on the Depth and Variability of the Lunar Regolith
Wilcox, B. B.; Robinson, M. S.; Lucey, P. G.; Thomas, P. C.; Hawke, B. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The lunar regolith is produced by impacts of all sizes which break surface materials into finer particles. The depth of the regolith is directly related to the number of impacts per unit area over time. Accurate knowledge of regolith depth can help elucidate properties such as impactor flux, and three dimensional mixing of individual lava flows, and can help us better understand the portion of the Moon most accessible to human exploration. There is a common notion that the regolith depth in mare regions is on the order of 5 m. We find that the depth of the mare regolith is highly variable and is commonly greater than 25 m.
Derived from text
Lunar Rocks; Regolith; Variability; Depth; Lunar Surface

20030111564 Aberdeen Univ., UK
Model Crystals to Test Techniques in Astrobiological Exploration of Evaporites on Mars
Wilkins, A. D.; Parnell, J.; Wright, A. J.; Artz, R. R. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The search for life on Mars involves many potential strategies for the analysis in situ of surface samples or the analysis of returned samples in a controlled environment, in particular analyses seek evidence of tangible life and/or biomolecules. It is important to develop mineralogical standards suitable for testing the techniques that will be used for these analyses. Evaporites have been previously suggested as potential hosts to microbial life on Mars. In particular much interest has recently been focused upon evaporite deposits that are associated with impact crater lakes. For example, the feature on Mars known as White Rock is believed to be a potential evaporite deposit contained within an impact crater site as it appears as a significant

albedo feature within orbital camera images. Within Martian evaporite basins the mineralogy may include epsomite (hydrated magnesium sulphate), gypsum (hydrated calcium sulphate) and halite (sodium chloride). Halite and epsomite are therefore of particular relevance to astrobiology. They both occur in Martian meteorites and are thought to be a significant component of Martian soils. It is important to investigate the astrobiological potential of such evaporite minerals and we have undertaken an experimental study of halite and epsomite. These minerals are ideal candidates for laboratory experiments as they have a high solubility and can be readily precipitated. The study was particularly concerned with the entrapment of organic materials within fluid inclusions.
Derived from text
Crystals; Exobiology; Mars Surface; Mars Exploration; Mineral Deposits

20030111565 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Lunar Rotation and the Lunar Interior
Williams, J. G.; Boggs, D. H.; Ratcliff, J. T.; Dickey, J. O.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Variations in rotation and orientation of the Moon are sensitive to solid-body tidal dissipation, dissipation due to relative motion at the fluid-core/ solid-mantle boundary, and tidal Love number k2. There is weaker sensitivity to flattening of the core-mantle boundary (CMB) and fluid core moment of inertia. Accurate Lunar Laser Ranging (LLR) measurements of the distance from observatories on the Earth to four retroreflector arrays on the Moon are sensitive to lunar rotation and orientation variations and tidal displacements. Past solutions using the LLR data have given results for dissipation due to solid-body tides and fluid core plus Love number. Past detection of CMB flattening has been marginal but is improving, while direct detection of the core moment has not yet been achieved. Three decades of Lunar Laser Ranging (LLR) data are analyzed using a weighted least-squares approach. The lunar solution parameters include dissipation at the fluid-core/solid-mantle boundary, tidal dissipation, dissipation-related coefficients for rotation and orientation terms, potential Love number k2, a correction to the constant term in the tilt of the equator to the ecliptic which is meant to approximate the influence of core-mantle boundary flattening, and displacement Love numbers h2 and l2. Several solutions, with different combinations of solution parameters and constraints, are considered.
Author
Lunar Rotation; Laser Ranging

20030111566 Smithsonian Institution, Washington, DC, USA
Large Aeolian Ripples: Extrapolations from Earth to Mars
Wilson, S. A.; Zimbelman, J. R.; Williams, S. H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The shapes produced on terrestrial surfaces that are continually subject to aeolian processes range in size from tiny ripples to giant draa. The physical mechanism of the formation of ripples, the smallest of aeolian bedforms, is intimately related to saltation and reptation processes. Sand and granule ripples are typically tens of reptation path lengths wide and do not alter the flow of wind that passes over them. Dunes are greater than tens of saltation path lengths wide, large enough to affect the local wind regime, and typically exhibit avalanchegenerated slip faces on their lee side. On Earth, the differences between aeolian ripples and dunes are quite apparent and distinct. On Mars, however, the thin atmosphere leads to greatly increased saltation path lengths for sand-sized particles, which may cause the physical dimensions of large ripples and small dunes to overlap despite their unique formation mechanism. Since bedforms intermediate between ripples and dunes are rare in terrestrial aeolian environments, the largest terrestrial granule-covered ripples are used as analogues for ripple-like bedforms on Mars as imaged by the Mars Orbiter Camera (MOC). Comparing the physical characteristics of granule ripples on Earth to ripple-like bedforms on Mars is useful to further the understanding of large ripple formation on both planets.
Author
Mars Surface; Landforms

20030111567 NASA Johnson Space Center, Houston, TX, USA
Lunar Regolith Albedos Using Monte Carlos
Wilson, T. L.; Andersen, V.; Pinsky, L. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The analysis of planetary regoliths for their backscatter albedos produced by cosmic rays (CRs) is important for space exploration and its potential contributions to science investigations in fundamental physics and astrophysics. Albedos affect all such experiments and the personnel that operate them. Groups have analyzed the production rates of various particles and elemental species by planetary surfaces when bombarded with Galactic CR fluxes, both theoretically and by means of various transport codes, some of which have emphasized neutrons. Here we report on the preliminary results of our current Monte Carlo investigation into the production of charged particles, neutrons, and neutrinos by the lunar surface using FLUKA. In contrast to previous work, the effects of charm are now included.
Author
Lunar Surface; Regolith; Albedo

20030111568 Eidgenoessische Technische Hochschule, Zurich, Switzerland
High Precision Ag Isotopic Measurements of Low Pd/Ag Meteorites
Woodland, S. J.; Rehkaemper, M.; Lee, D.-C.; Halliday, A. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The now extinct radionuclide Pd-107 decays to Ag-107 with a half life of 6.5 Myr. Highly volatile element depleted (i.e. high Pd/Ag) Group IVA iron meteorites show good correlations between excess Ag-107 and Pd/Ag. This strongly indicates the presence of live Pd-107 at the start of the solar system. Pd is both more refractory and more siderophile than Ag. Hence condensation/evaporation processes in the nebula, as well as planetary core formation, may have caused the requisite early Pd/Ag fractionation necessary for the system to be useful as a chronometer. Isochrons determined for iron meteorites generally yield initial Pd-107/Pd-108 in the range 1.5 - 2.5 x 10(exp -5), and this was confirmed recently by Carlson and Hauri who measured an initial Pd-107/Pd-108 of (2.39 +/- 0.26) x 10(exp -5) for the Group IA iron meteorite Canyon Diablo. Primitive chondritic meteorites have received only limited study with regard to Pd-Ag systematics. Improved analytical precision (+/- 1.3 epsilon, 2 sigma) obtained through the use of multi-collector inductively coupled plasma mass spectrometry (MC-ICPMS) permitted analysis of the carbonaceous chondrite Allende (CV3). The results of their study indicated that Allende is enriched in Ag-107 by between +4 and +6.5 epsilon relative to the NIST Ag standard.
Author
Carbonaceous Chondrites; Isotope Ratios

20030111569 Pittsburgh Univ., Pittsburgh, PA, USA
Spaceborne Thermal Infrared Data Analysis of Meteor Crater, Arizona: Analog for THEMIS Data of a Small Impact Crater in Syrtis Major
Wright, S. P.; Ramsey, M. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Thermal Infrared (TIR) data from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) have been used to map the Meteor Crater ejecta lithologies. This has many applications to current TIR data being returned from Mars by the Thermal Emission Imaging System (THEMIS) instrument. Terrestrial multispectral images can be used as proxies for constraining TIR data of Mars. A fresh, small (approximately 1 km diameter), simple impact crater in Syrti s Major Planitia has been mapped using a similar methodology to that employed at Meteor Crater. Image end member spectra are shown and potential future investigations are listed.
Author
Meteorite Craters; Ejecta

20030111570 Arizona State Univ., Tempe, AZ, USA
TEM Observations of Amorphized Silicate-Perovskite, Akimotoite and Ca-rich Majorite in a Shock-induced Melt Vein in the Tenham L6 Chondrite
Xie, Zhi-Dong; Sharp, Thomas G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tenham is a famous highly shocked L6 chondrite. Previous studies revealed a series of high-pressure minerals in the melt vein, including ringwoodite, majorite, wadsleyite, magnesiow stite, akimotoite, silicate-perovskite, and hollandite-structured plagioclase. These high-pressure minerals have been studied intensively in static high pressure experiments. The presence of

glassy plagioclase and polycrystalline ringwoodite in Tenham indicates a shock stage of S6 (P greater than 45-55 GPa) based on shock classification of ordinary chondrites. However, shock pressure also can be inferred from crystallization pressure of the melt at approximately 25 GPa, based on the phase equilibrium data. The duration of the melt-vein solidification can be estimated based on simple thermal models. The goal of this study is to characterize the mineral assemblages in the melt veins of Tenham, using TEM, to constrain crystallization and to see how the crystallization pressures are related to the shock pressure inferred from the calibration of Stoffler et al.
Derived from text
Chondrites; Perovskites; Silicates; Veins (Petrology); Calcium; Shock

20030111571 Sandia National Labs., Carlsbad, NM, USA
Evaporation Loss of Light Elements as a Function of Cooling Rate: Logarithmic Law
Xiong, Yong-Liang; Hewins, Roger H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowledge about the evaporation loss of light elements is important to our understanding of chondrule formation processes. The evaporative loss of light elements (such as B and Li) as a function of cooling rate is of special interest because recent investigations of the distribution of Li, Be and B in meteoritic chondrules have revealed that Li varies by 25 times, and B and Be varies by about 10 times. Therefore, if we can extrapolate and interpolate with confidence the evaporation loss of B and Li (and other light elements such as K, Na) at a wide range of cooling rates of interest based upon limited experimental data, we would be able to assess the full range of scenarios relating to chondrule formation processes. Here, we propose that evaporation loss of light elements as a function of cooling rate should obey the logarithmic law.
Derived from text
Cooling; Light Elements; Logarithms; Evaporation

20030111573 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Polar Heat Flow on Io
Veeder, G. J.; Matson, D. L.; Johnson, T. V.; Davies, A. G.; Blaney, D. L.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recently, Galileo spacecraft data have revealed Io's polar regions to be much warmer than previously expected. This unexpected development came from Photo-Polarimeter Radiometer (PPR) data which show that the minimum night temperatures are in the range of 90-95 K virtually everywhere on Io. The minimum night temperatures show no dependence upon latitude and, when away from the sunset terminator, they show no dependence upon time of night. This is indeed bizarre behavior for surface units which generally had been assumed to be passive with respect to Io's pervasive volcanism. Night temperatures of 90-95 K at high, polar latitudes are particularly hard to explain. Even assuming infinite thermal inertia, at these latitudes there is insufficient sunlight to support these warm night temperatures. Thus, through the process of elimination of other possibilities, we come to the conclusion that these surfaces are volcanically heated. Taking previously passive units and turning them into new sources of heat flow is a radical departure from previous thermophysical model paradigms. However, the geological interpretation is straight forward. We are simply seeing the effect of old, cool lava flows which cover most of the surface of Io but yet have some heat to radiate. Under these new constraints, we have taken on the challenge of formulating a physical model which quantitatively reproduces all of the observations of Io's thermal emission. In the following we introduce a new parametric model which suffices to identify a previously unrecognized polar component of Io's heat flow.
Derived from text
Heat Transmission; Io; Polar Regions; Volcanology

20030111575 Community Coll. of Rhode Island, Lincoln, RI, USA
Preliminary Analysis of Pit Craters on Alba Patera, Mars Using MOC Data
Venturini, K. E.; Jager, K. M.; Savasta, K. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chains of pit craters, also known as catenae, are found on Mars, many of them visible within graben on the eastern flanks of Alba Patera. Alba is a large, low relief shield volcano whose edifice is asymmetrical but has an average diameter of 1200 km and is located on the northern flanks of the Tharsis Plateau. Tanaka (1990) determined that the majority of pits on Alba

are located within the final stage of faulting on Alba, a stage that does not follow the same trend as the previous graben around the flanks. Two main theories have been developed to explain how these pit chains formed. The first theory suggests that pits formed from underlying tension cracks extending the depth of the lithosphere. The ground above these cracks collapsed, forming 2-10 km wide pits. These pits are not thought to be formed by volcanic processes because there is no evidence of volcanic deposits. The second theory concerning pit chain formation involves the emplacement of shallow dikes in the Martian crust, producing surface graben. These graben with pits are likely a result of the emplacement of dikes originating near the Tharsis Montes. This second theory explains both the larger and smaller pits on Alba. The smaller pits formed when there was a surface collapse of rock layers into a void space, which was created by leaking volatiles from a subsurface dike when it stalled. The larger pits formed from collapsed surface material falling into the space provided by an explosive eruption of magma from a dike that approached the surface. Although volcanism is involved in the formation of the large pits, the flows are not seen because of the extreme dispersal of the erupted material. In this paper we analyze pits on Alba Patera using Mars Orbiter Camera (MOC) images with resolutions of 1.60-6.53 m/pixel. Those images allow more refined values of the area and sizes of the pits. Mars Orbiter Laser Altimeter (MOLA) data were also used to determine pit depth and slopes. Pits studied in this paper are compared to pits studied by Scott and Wilson (2002) on Alba Patera.
Derived from text
Mars Craters; Mars Volcanoes; Planetary Geology; Mars Photographs; Pits (Excavations)

20030111576 Washington Univ., Saint Louis, MO, USA
Survey for Life-related Species During a Planetary Surface Exploration; System Type I - UV Stimulated Fluorescent Sensor
Wang, Alian; Haskin, L. A.; Gillis, J. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-12114; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The widely accepted minimum requirements for life on Earth include the presence of water and accessible sources of carbon. We assume that the same criteria must hold for putative life on past or present Mars. The evidence for CO2 and H2O at or near the Martian surface, carbon in Martian meteorites, aqueous alteration, and probable hydrothermal activity suggest that conditions conducive to the origin and evolution of life on Mars may have existed for long periods of time and may still obtain at present. Surface exploration on Mars that enables the direct detection of water in minerals and of organic carbon (including not just organic and biogenic materials but their degradation products such as kerogen-like hydrocarbons and graphitized carbon) that might be products or residues of biologic activity, is crucial. The search for evidence of life, past or present, will nevertheless be difficult. The lack of direct evidence for organic carbon and the low amounts of water found in the soils at the Viking sites demonstrated the difficulties. Recent results of GRS experiment of Odyssey mission indicated the existence of abundant water ice beneath the Mars surface. Mineralogical evidence for the presence of carbonate, sulfates, or clay minerals, products of weathering and aqueous deposition, have not been identified unambiguously on Mars. Rocks such as shales and, more particularly, limestones, which we associate with moist and benign environments on Earth, are evidently not abundant. Presumably, then, neither were the photosynthetic organisms that might have produced them. In addition, the harsh present environment on Mars (e.g., dryness, low temperatures, large temperature cycles, high level of UV light on the surface, frequent dust storms, etc.) can both destroy carbon- and water-bearing materials and hide them. Therefore, directly detecting life-related materials on Mars was likened to seeking and examining proverbial needles in haystacks. We argue that survey type instruments, that can frequently and quickly check a relatively large amount of material at many locations during a mission, are essential.
Derived from text
Fluorescence; Mars Surface; Detection; Ultraviolet Radiation; Mars Exploration; Biological Evolution; Planetary Surfaces

20030111577 Washington Univ., Saint Louis, MO, USA
Fe-Ti-Cr-Oxides in Martian Meteorite EETA79001 Studied by Point-counting Procedure Using Raman Spectroscopy
Wang, Alian; Kuebler, Karla E.; Jolliff, Bradley L.; Haskin, Larry A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-12114; NAG5-10703; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fe-Ti-Cr-Oxide minerals contain much information about rock petrogenesis and alteration. Among the most important in the petrology of common intrusive and extrusive rocks are those of the FeO-TiO2-Cr2O3 compositional system chromite, ulv spinel-magnetite, and ilmenite-hematite. These minerals retain memories of oxygen fugacity. Their exsolution into companion

mineral pairs give constraints on formation temperature and cooling rate. Laser Raman spectroscopy is anticipated to be a powerful technique for characterization of materials on the surface of Mars. A Mars Microbeam Raman Spectrometer (MMRS) is under development. It combines a micro sized laser beam and an automatic point-counting mechanism, and so can detect minor minerals or weak Raman-scattering phases such as Fe- Ti-Cr-oxides in mixtures (rocks & soils), and provide information on grain size and mineral mode. Most Fe-Ti-Cr-oxides produce weaker Raman signals than those from oxyanionic minerals, e.g. carbonates, sulfates, phosphates, and silicates, partly because most of them are intrinsically weaker Raman scatters, and partly because their dark colors limit the penetration depth of the excitation laser beam (visible wavelength) and of the Raman radiation produced. The purpose of this study is to show how well the Fe-Ti-Cr-oxides can be characterized by on-surface planetary exploration using Raman spectroscopy. We studied the basic Raman features of common examples of these minerals using well-characterized individual mineral grains. The knowledge gained was then used to study the Fe-Ti-Cr-oxides in Martian meteorite EETA79001, especially effects of compositional and structural variations on their Raman features.
Derived from text
Raman Spectroscopy; Petrogenesis; Chromium Oxides; Iron Oxides; Titanium Oxides; Mars Surface; SNC Meteorites

20030111578 New Mexico Univ., Albuquerque, NM, USA
Evidence for an 800 km Diameter Impact Structure in Meridiani Planum and Associated Channels and Basins: A Connection with the Origin of the Hematite Deposits?
Newsom, H. E.; Barber, C. A.; Schelble, R. T.; Hare, T. M.; Feldman, W. C.; Sutherland, V.; Gordon, H.; Thorsos, I. E.; Livingston, A.; Lewis, K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-8804; NAG5-11496; NAG5-10143; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Topographic evidence for the existence of an early 800 km diameter multi-ringed impact structure, and evidence for fluvial and lacustrine environments in Meridiani Planum suggests a connection with the origin of the hematite deposits present in the region.
Derived from text
Hematite; Mars Surface; Meteorite Craters; Mars Craters

20030111579 Academy of Sciences (USSR), Moscow, USSR
Accretion and Differentiation of Terrestrial Protoplanetary Bodies and Hf-W Chronometry
Vityazev, A. V.; Pechernikova, G. V.; Bashkirov, A. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The extinct 182Hf-182 W isotope system has been widely applied to date core formation in planetary bodies. New Hf-W data for C and H chondrite meteorites lead to very rapid accretion and early core formation of asteroids and terrestrial planets: 3 - 4 Ma for the Vesta, < 30 Ma and < 15 Ma for the Earth and Mars cores formation respectively. According to analytical calculations and computer simulation last stages accretion process of terrestrial planets the value of 100 Ma is preferable. We suggest here other interpretation of new chondritic ratio 182W/184W and the Solar system initial 182Hf/180Hf : these data tell us about initial differentiation in large terrestrial planetesimals and protoplanets at the stage of large impacts before the end of accretion of terrestrial planets. In this scenario Earth's core and Moon were formed later but before late bombardment stage.
Author
Protoplanets; Terrestrial Planets; Planetary Evolution

20030111580 Tokyo Univ., Japan
A Numerical Simulation of Impacts into Granular Materials by Distinct Element Method
Wada, K.; Senshu, H.; Yamamoto, S.; Matsui, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hydrocode simulations have been performed to reveal the nature of the cratering processes. In the hydrocode simulations, materials are treated as continuum. This is not appropriate for the analysis of motion of ejecta due to impacts into granular materials. A numerical simulation method called Distinct Element Method (DEM) has been developed in the field of powder

technology to reveal the behavior of granular materials. Since materials are treated as distinct elastic particles in this simulation, this method has a potential benefit to simulate the cratering process on granular materials and the behavior of ejecta. Therefore, using DEM we conducted a numerical simulation of impact into granular material. We can derive the velocity distribution of ejecta. Then, we compare the numerical results with the scaling laws obtained from impact experiments. Using these comparisons we try to evaluate whether or not DEM simulation can be used to model processes of ejecta ejection due to impacts into granular materials.
Derived from text
Granular Materials; Simulation; Mathematical Models; Numerical Analysis; Impact Velocity

20030111581 California Univ., Los Angeles, CA, USA
High Cooling Rates of Type-II Chondrules: Limited Overgrowths on Phenocrysts Following the Final Melting Event
Wasson, John T.; Rubin, Alan E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations
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In a study of type-II chondrules in Y81020 Wasson and Rubin (2003) described three kinds of evidence indicating that only minor (4-10 m) olivine growth occurred following the final melting event: 1) Nearly all (>90%) type-II chondrules in CO3.0 chondrites contain low-FeO relict grains; overgrowths on these relicts are narrow, in the range of 2-12 m. 2) Most type-II chondrules contain small (10-20 m) FeO-rich olivine grains with decurved surfaces and acute angles between faces indicating that the grains are fragments from an earlier generation of chondrules; the limited overgrowth thicknesses following the last melting event are too thin to disguise the shard-like nature of these small grains. 3) Most type-II chondrules contain many small (<20 m) euhedral or subhedral phenocrysts with central compositions that are much more ferroan than the centers of the large phenocrysts; their small sizes document the small amount of growth that occurred following the final melting event.We have additional data on chondrules in Y81020 and Semarkona, and we have reinterpreted observations of Jones (1990). The striking feature of this chondrule is the large number of tiny fragments. The chondrule precursor initially consisted of crushed olivine.
Derived from text
Chondrule; Meteoritic Composition

20030111582 Louisiana State Univ., Baton Rouge, LA, USA
Fresh Melt Inclusions in 3.3 Ga Komatiitic Olivines from the Barberton Greenstone Belt, South Africa
Thompson, M. E.; Kareem, K. M.; Xie, X.; Byerly, G. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Studies of komatiitic lavas continue to play a significant role in refining our understanding of early planetary tectonism, and thermal and compositional structure of the crust-mantle. Komatiites further represent a major lithologic component of the primitive landscapes which fostered early life on Earth, and may have played a significant part in modification of early atmospheric and hydrospheric compositions. The antiquity of nearly all komatiitic sequences typically result in diagenetic, metamorphic and tectonic modification which often include severe hydration and other chemical and mineralogical changes, and make petrologic interpretations of original igneous processes difficult. In this report we present data on several unusually fresh komatiitic flows, including compositions of fresh olivines and melt inclusions, as well as preliminary modeling of fractionation processes.
Derived from text
Olivine; Tectonics; Lava; Metamorphism (Geology); Atmospheric Composition; Fractionation

20030111583 Pomona Coll., Claremont, CA, USA
Geologic Map Interpretations of the Surface of the Nemesis Tessera (V14) Quadrangle, Venus
Waldron, A. C.; Blondes, M. S.; Katzenstein, W. P.; Grosfils, E. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The global and regional history of the surface of Venus can be interpreted by analysis of radar data and interpretation of individual mapped units. However, choice of mapping methods can lead to different interpretations of units. Areas containing volcanic plains and flows within the Nemesis Tessera quadrangle provide one example of areas in which different mapping

strategies lead to different results. Plains make up approximately 80% of the surface of Venus and normally consist of large basaltic units and smaller lava flows. Shield fields are identified by small-scale, individual, digitate lava flows of ranging surface textures, originating from numerous vents. The most common issues that arise when interpreting plains and shield field-related units are related to the textural contrast necessary to define a distinct border between units, and the use of features, such as compressional ridges and shield volcanoes, to separate units and interpret the origin of specific volcanic flows. It is also important to consider the difference between primary, tectonic and erosional features in any given map.
Author
Venus Surface; Topography

20030111585 Smithsonian Institution, Washington, DC, USA
Boundary Element Modeling of the Rahe Dorsum Thrust Fault on Asteroid 433 Eros
Watters, T. R.; Robinson, M. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Rahe Dorsum is one of the most striking features on the surface of Eros. It generally has tens of meters of relief and extends for about 18 km Fig. 1) making it a global-scale feature [1, 2]. Rahe Dorsum appears to be a series of segments that are generally asymmetric in crosssection [1, 2]. Rahe Dorsum strongly resembles landforms called lobate scarps found on Mercury, Mars, and the Moon.
Author
Asteroids; Geological Faults

20030111586 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Classification of Mars Pathfinder Rock Surfaces Using Quantitative Morphologic Indices
Yingst, R. A.; Haldemann, A. F. C.; Lemmon, M. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have examined the morphology of rocks in two regions of the MPF landing site in terms of location, size and dimensions, sphericity sphericity and elongation, and have correlated this information with spectral data extracted from associated rock surfaces, with the goal of improving the likelihood of discerning between rock and rock surface types. We use four highly diverse Imager for Mars Pathfinder (IMP) images centered on Mini-Matterhorn and the Rock Garden because they are suited to demonstrate the wide morphologic variation of rocks at the site. A sampling of rocks was chosen at these locations that represented a range of shapes, textures and spectral signatures. In this initial analysis we focused upon the largest rocks that are situated in such a way as to allow easy viewing of most of the faces.
Derived from text
Morphology; Mars Surface; Mars Surface Samples; Rocks; Classifications

20030111587 NASA Ames Research Center, Moffett Field, CA, USA
Cratering Rates in the Outer Solar System
Zahnle, K.; Schenk, P.; Dones, L.; Levison, H.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We use several independent constraints on the number of ecliptic comets (aka JFCs) to determine impact cratering rates from Jupiter to Pluto. Long period comets and asteroids are currently unimportant on most worlds at most sizes. The size-number distribution of comets smaller than 20 km is inferred from size-number distributions of impact craters on Europa, Ganymede, and Triton; while the size- number distribution of comets bigger than 50 km is equated to the size-number distribution of Kuiper Belt Objects. The gap is bridged by interpolation. It is notable that small craters on Jupiter's moons indicate a pronounced paucity of small impactors, while small craters on Triton imply a collisional population rich in small bodies. However it is unclear whether the craters on Triton are of heliocentric or planetocentric origin. We therefore consider two cases for Saturn and beyond: a Case A in which the size-number distribution is like that inferred at Jupiter, and a Case B in which small objects obey a more nearly collisional distribution. Known craters on Saturnian and Uranian satellites are consistent with either Case, although surface ages are much younger in Case B, especially at Saturn and Uranus. At Neptune and especially at Saturn our cratering rates are much higher than rates estimated by Shoemaker and colleagues, presumably

because Shoemaker's estimates mostly predate discovery of the Kuiper Belt. We also estimate collisional disruption rates of moons and compare these to estimates in the literature .
Author
Cratering; Solar System

20030111588 NASA Johnson Space Center, Houston, TX, USA
Results from the Martian Radiation Environment Experiment MARIE
Zeitlin, C.; Cleghorn, T.; Cucinotta, F.; Saganti, P.; Andersen, V.; Lee, K.; Pinsky, L.; Atwell, W.; Turner, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the three science instruments aboard the 2001 Mars Odyssey spacecraft is the Martian Radiation Environment Experiment, MARIE. MARIE consists of a stack of silicon detectors, augmented by a Cerenkov detector. MARIE is designed to measure a portion of the particle spectrum of the Galactic Cosmic Rays (GCR), as well as the high fluxes of low-energy protons (energies less than about 100 MeV) that are intermittently produced by active regions on the sun in Solar Particle Events (SPE). MARIE is providing the first detailed information about the radiation environment near Mars.measurements. MARIE has been operating successfully for nearly a year. Solar particle events of considerable interest have been observed, and data have been obtained that will yield GCR spectra from a novel observation point in the solar system.
Derived from text
Mars Environment; 2001 Mars Odyssey; Spacecraft Instruments; Galactic Cosmic Rays; Extraterrestrial Radiation

20030111590 Lawrence Livermore National Lab., Livermore, CA, USA
Geochemistry and Impact History at the Apollo 16 Landing Site
Zellner, N. E. B.; Spudis, P. D.; Delano, J. W.; Whittet, D. C. B.; Swindle, T. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
Contract(s)/Grant(s): NAG5-7598; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar impact glasses possess the unmodified refractory element ratios of the original fused target materials at the sites of impacts. These target materials are usually regolith. 866 glasses from the Apollo 16 landing site have been analyzed by electron microprobe in this study. These glasses show significant variation and hint at the existence of highland basalt (HB) regolith compositions atypical of the usual HB compositions historically found at the Apollo 16 site. Additionally, a large number of mare glasses have been identified. Clementine color image data have been used to construct iron, titanium, and aluminum maps for comparison with the sample database. These maps suggest that the Apollo 16 landing site is largely composed of anorthositic material and that mare compositions are not found close by. Nine of these impact glasses have been dated by the Ar-40/Ar-39 technique and may be used to constrain the impact history at the Apollo 16 landing site. These results illustrate how lunar impact glasses together with orbital data can provide geochemical constraints on the local and regional geology of the Moon.
Derived from text
Geochemistry; Landing Sites; Apollo 16 Flight; Planetary Geology; Hypervelocity Impact; Glass

20030111591 Universidad Nacional Autonoma de Mexico, Mexico City, Mexico
On the Nature of Chicxulub Impactor
Urrutia-Fucugauchi, J.; Vera-Sanchez, P.; Soler-Arechalde, A. M.; Morton-Bermea, O.; Reyes-Salas, M.; Lozano-Santamaria, R.; Linares-Lopez, C.; Robolledo-Vieyra, M.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

The approximately 200 kilometer diameter Chicxulub crater in the Yucatan carbonate platform in Mexico is currently considered the K/T impact site, responsible for the K/T global ejecta layer. In this work we report results of the studies of the impact breccia sequence cored in the UNAM-5, UNAM-6, UNAM-7 and Yaxcopoil-1 boreholes. UNAM drilling program involved continuous coring of the Tertiary carbonate sequence and the impact lithologies. Yaxcopoil-1 borehole was drilled a year ago as part of the Chicxulub scientific drilling project, in the southern sector of the crater. The Chicxulub deep drilling is part of the International Continental Drilling Program. Coring started at 400 m and was continuous to the final depth of about 1.5 kilometers. We concentrate on the initial studies of the breccia sequence where apparent fragments of meteorite are present and descriptions of the fragments. These findings provide a unique opportunity to investigate on the nature of the Chicxulub impactor, from the study of the impact-related material directly recovered inside the carter. Identification of

impactors forming large terrestrial craters is a difficult problem, mainly because, in contrast to small impacts in which fragments can be preserved, no physical evidence survives the high-energy events. Investigations can be based on analyses of the crater melt rocks and/or melt-rich ejecta. Chemical data on Ni, Cr, Co and PGE contents and interelement ratios have been successfully used in large crater studies. However, fractionation during melting in large impacts, vaporization, condensation, etc can modify chemical composition. Further, subsequent processes of hydrothermal alteration, metamorphism, diagenesis or weathering may alter or erase the chemical signature. Survival of parts of the impacting body in large impacts is restricted by the high temperature/pressures attained and vaporization of impactor. This has been considered the case for the Cretaceous/Tertiary large impact, with siderophile material present into the fine-grained global ejecta layer.
Derived from text
Cretaceous-Tertiary Boundary; Metamorphism (Geology); Craters; Hypervelocity Impact; Impactors

20030111592 NASA Ames Research Center, Moffett Field, CA, USA
H2O-Silicate Microphysics in Ascending Volcanic Plumes on Mars
Zent, A. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We begin this study with a simple investigation of the role of the particle size frequency distribution on adsorptive scavenging in the ascending cloud. We define a parcel of silicates and H2O, and allow that parcel to cool, monitoring the total H2O remaining in the vapor phase. In this case, we have defined 10(exp 7) kg of silicates in the test volume, with a log-normal size-frequency distribution, a mean grain size of 10(exp -5) m, and a minimum of 10(exp -6) square meters per particle. This is based on observations of terrestrial ash particles that reveal enormous internal surface area. We assume 10(exp 5) kg of H2O (approximately equal to 1 wt%). The results of this study show significant dependence of the H2O sequestered in the adsorbed phase.
Derived from text
Mars Volcanoes; Planetary Geology; Plumes; Silicates; Water; Mars Surface

20030111593 Nevada Univ., Reno, NV, USA
Continuity of Interior Deposits in Western Candor Chasma, Valles Marineris, Mars: Wiped Out by Faulting or Erosion?
Utley, J. A.; Schultz, R. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present our first results from study of the interior deposits of western Candor Chasma. Using high-resolution DEMs, we mapped four major units to separate intact wall rock, landslide materials, other floor materials, and the interior deposits. We then evaluated a possible northwest-trending fault to determine if the continuity of the interior deposits is disrupted primarily by faulting or, most likely, by erosional processes. We plan to identify the stratigraphy and response to deformation (including faults and folds) in order to (a) establish plausible material properties and (b) reconstruct the emplacement and subsequent history of the interior deposits in western Candor Chasma.
Derived from text
Erosion; Mars Surface; Geological Faults; Stratigraphy; Mineral Deposits

20030111594 Michigan Univ., Ann Arbor, MI, USA
Volatiles on Mars
Zhang, You-Xue; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Compared to Earth's atmosphere, Mars has a thin CO2-rich atmosphere with a surface pressure of about 700 Pa. When normalized to planetary mass (mass of Mars is 10.7% of that of Earth), the abundance of volatiles on Mars is about 0.07% to 6% of that on Earth (when CO2 in terrestrial carbonates is included). Is the depletion of volatiles on Mars a primary feature (because less volatiles accreted on Mars than on Earth), or a secondary feature (due to lower degree of degassing or due to gas escape to outer space)? In this contribution, a simple model for volatile budgets of Mars, and implications for water on Mars are outlined.
Derived from text
Mars Surface; Volatility; Mars Atmosphere; Planetary Geology

20030111595 Los Alamos National Lab., NM, USA

Remote Sensing of Water in the Valles Marineris Using Mars Odyssey Neutron Data

Moore, K. R.; Tokar, R. L.; Elphic, R. C.; Lawrence, D. J.; Barraclough, B. L.; Funsten, H. O.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

All three major regions of the Valles Marineris exhibit features that suggest the presence of groundwater at some point in Martian history. The Noctis Labyrinthus in Western Valles Marineris contains valleys that appear to have been enlarged by sapping that is possibly due to groundwater. The Ius, Ophir, and Hebes Chasmata in Central Valles Marineris exhibit landslides with deposit flows extending much further than those associated with dry terrestrial landslides. One possible explanation is the presence of water in the slide material. The chaotic terrain in Eastern Valles Marineris and the outflow channels that empty into Chryse Basin are again evidence for the presence of water. The neutron spectrometer (NS) in the gamma ray spectrometer (GRS) on Mars Odyssey is capable of sensing the presence of hydrogen to a depth of approximately 100 g-sq cm (density-depth product) by the depression of epithermal neutrons emiited from the Martian surface. This study examines the GRS epithermal neutron data recorded over the Valles Marineris for signatures of hydrogen (assumed to represent water).
Author

Mars (Planet); Valleys; Mars Surface; Water; Remote Sensing

20030111596 NASA Johnson Space Center, Houston, TX, USA

Crystal Size Distributions from Porphyritic Olivine Chondrules: Insights into Formation Conditions

Zieg, M. J.; Lofgren, G. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578
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Most chondrules preserve, in their texture, a record of their precursor material and the nature and intensity of the nebular events in which they were formed. We have used crystal size distributions (CSDs) together with crystallization experiments to explore the textures of natural chondrules and their relationships to natural formation conditions. Many careful experimental studies have demonstrated fundamental relationships between the texture of a chondrule and its precursor material, melting intensity, and cooling rate. However, until recently most studies have focused on distinctions between textural types (e.g., barred, radial, porphyritic). Previous work has shown that CSDs provide precise, reproducible characterizations of chondrule-scale textures, and can be used together with crystallization experiments to estimate chondrule formation conditions. Here, we expand this study to investigate the link between texture and formation conditions for a range of natural porphyritic olivine (PO) chondrules.
Derived from text

Chondrule; Olivine; Crystallization; Size Distribution; Igneous Rocks

20030111597 Rice Univ., Houston, TX, USA

Discrete Element Simulations of Volcanic Spreading: Implications for the Structure of Olympus Mons

Morgan, J. K.; McGovern, P. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Large basaltic volcanoes, such as Olympus Mons on Mars, and the Hawaiian volcanoes on Earth, are thought to be subject to large scale slope failure and flank collapse, which scatter landslide and avalanche debris (a.k.a., aureole deposits) about the base of the edifice. Volcano growth may also be accompanied by gravitational relaxation of the edifice, referred to as volcanic spreading. This deformation is accommodated by outward flank displacement along a low-angle decollement near the base of the edifice, and thrust faults that surface at the distal edge of the volcano. Volcanic spreading is well documented in Hawaii, and accounts for extensive anticlinal ridges and frontal scarps that border the submarine toes of the flanks. A prominent scarp at the distal edge of Olympus Mons, may have a similar origin as the terrestrial flanking benches, a hypothesis that can be tested by dynamic modeling of volcano deformation. Here, we carry out numerical simulations using the Discrete Element Method to explore the consequences of landsliding and volcanic spreading. The resulting models compare favorably to morphologic features noted on Olympus Mons, suggesting the importance of volcanic spreading in this setting.
Author

Planetary Geology; Mars Volcanoes; Discretization (Mathematics); Simulation; Avalanches

20030111598 National Air and Space Museum, Washington, DC, USA

Geologic Mapping Applications Using THEMIS Data for the Medusae Fossae Formation, Mars

Zimbelman, J. R.; Bender, K. C.; Harris, J. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-11743; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Medusae Fossae Formation (MFF) is a regionally extensive deposit located along the equator of Mars between roughly 130 and 240 E longitude, the origin of which has stimulated a host of published hypotheses. A volcanic or aeolian origin appear most consistent with Viking and MGS data, but other hypotheses remain viable and new data, as from the Mars Odyssey spacecraft, is likely to stimulate additional hypotheses of origin. NASA is supporting geologic mapping of portions of the MFF deposits, but it is now quite clear that this on-going mapping will need considerable revision as data from the Thermal Emission Imaging System (THEMIS) on Mars Odyssey become available. The daytime IR THEMIS images hold particularly strong potential for providing a new base on which geologic mapping can be carried out, as illustrated by the examples discussed.

Derived from text

Planetary Geology; Planetary Mapping; Themis Project; Mars Surface; Mineral Deposits; Imaging Techniques

20030111599 Academy of Sciences (USSR), Moscow, USSR

The Mass of Double Protostar with Protoplanetary Systems in Norma

Val'tts, E.; Lyubchenko, S. Yu.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

A search for extraterrestrial planets is a difficult task, because their thermal emission would be strongly masked by the emission from hot dust in the surrounding matter. It seems that, at present, there is no other means of the detecting very distant planetary bodies except of their molecular maser emission forming in the atmosphere of the protoplanet. Among the most widespread masers are class II methanol masers emitting in the 5(sub 1)-6(sub 0)A(sup +) transition at 6.7 GHz, which are found in star-forming regions. High-resolution images of such masers demonstrate a structure which could be interpreted by the circumstellar disk with Keplerian motion of the maser spots as protoplanets around central massive object. The problem is to obtain the mass of this object and to evaluate the mass of these protoplanets. We present a new way to obtain the velocity of the central protostar and to calculate its mass. The analysis has been carried out for a double protostar in the Norma constellation which is accompanied by two protoplanetary systems emitting in methanol. Masses of protostars are in the interval of 10-40 solar mass and protoplanets have a mass approximately equal to the mass of the Earth.

Derived from text

Protoplanets; Protostars; Stellar Mass; Planetary Atmospheres

20030111600 Moscow State Univ., Russia

Systematic Compositional Variations of Silicates and Metallic Phases as Evidence of Liquid Immiscibility in Chondritic Melts

Zinovieva, N. G.; Mitreikina, O. B.; Granovsky, L. B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Petrological and experimental study of ordinary chondrites demonstrates that their chondrules and matrices compose a single complex, whose genesis was controlled by the evolution of physicochemical parameters in the parent bodies. The texture of ordinary chondrites was shaped by liquid immiscibility in the fluid melts, a process that caused their exsolution into silicate chondrules and a Fe- and Ni-rich matrix, which are in phase equilibrium with each other. The development of iron silicate magmatic liquid immiscibility, which underlies our petrologic model for the genesis of chondrites, receives support in experimental studies of magmatism under strongly reduced conditions, and the introduction of a Ni Fe phase into the experiments makes it possible to obtain phase correlations (postulated in the form of the Prior rule) typical of ordinary chondrites.

Derived from text

Chondrites; Meteoritic Composition

20030111601 Max-Planck-Inst. fuer Chemie, Mainz, Germany

Bulk Chemistry of the Neuschwanstein (EL6) Chondrite: First Results

Zipfel, J.; Spettel, B.; Schoenbeck, T.; Palme, H.; Bischoff, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On April 6, 2002 a meteorite fell near the castle of Neuschwanstein, Southern Germany. After careful evaluation of photographs taken by the European Fireball Network a single stone of 1.75 kg was recovered at the predicted fall site (position: 10 deg. 48.5 min. E, 47 deg. 31.5 min N) in July 2002 in a location in the Northern Alps that was still covered by snow at the time of the fall. Based on its mineralogy and petrography this meteorite is classified as an enstatite chondrite of petrographic type 6 which is little weathered (W0/1). Petrography and mineral chemistry is published in a companion abstract by Bischoff and Zipfel. Since enstatite chondrites contain phases (e.g., oldhamite) that are readily weathered each new fall bears the opportunity to recover pristine material. Their bulk compositions are essential for defining characteristics of chemical groups. Here we report first results of the bulk chemical composition of Neuschwanstein. It is shown that Neuschwanstein is a typical member of the EL subgroup.

Derived from text

Chemical Composition; Chondrites; Germany; Meteoritic Composition

20030111602 Academy of Sciences (USSR), Moscow, USSR

Mineralogy and Petrology of Laser Irradiated Artificial Carbonaceous Chondrite: Implication to the Martian Moons and Some Asteroids

Shingareva, T. V.; Basilevsky, A. T.; Fisenko, A. V.; Semjonova, L. F.; Roshchina, I. A.; Guseva, E. V.; Korotaeva, N. N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations

Contract(s)/Grant(s): RFBR-02-05-65156; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This work is devoted to the effects of micrometeorite impact melting of carbonaceous and ordinary chondrite materials that is relevant to space weathering of regolith on some asteroids and Martian moons. Following we melted by laser pulses the artificial analog of CM chondrite and ordinary chondrite Tsarev (sample 2) and studied the experiment products under SEM and microprobe. The companion work considers VIS-IR spectra of the experiment products. The micrometeorite impacts were simulated by irradiation of powdered (mostly to <30 micron) samples under (2-3) x 10-4mm Hg vacuum by the ND-YAG multiple-pulse laser (lambda = 1.06 micron) with impulse frequency 30-40 KHz. Pulse duration was 0.5-1 microsec, laser power approximately 1.2 KW and laser beam was approximately 100 micron wide).

Derived from text

Carbonaceous Chondrites; Mars (Planet); Melting; Meteorite Collisions; Petrology; Mars Satellites

20030111603 NASA Johnson Space Center, Houston, TX, USA

Iron-Nickel Sulfide Compositional Ranges in CM Chondrites: No Simple Plan

Zolensky, Michael; Le, Loan; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Iron-nickel sulfides are found in most or all solar system environments, and are probably the only minerals found in all extraterrestrial materials on hand. Despite this ubiquity, they have only just begun the attention they deserve. The most common Fe-Ni sulfides in chondrites are troilite (FeS), pyrrhotite (Fe(1-x)S) and pentlandite (Fe,Ni)9S8. Troilite is believed to have resulted from sulfidation of metal (Fe-Ni) grains in an H2S-containing environment. Pyrrhotite is produced when friable troilite grains, which are exfoliated from the metal nucleus, are submitted to continued sulfidation. Some asteroids are known to have experienced aqueous alteration, forming products including new generations of sulfides (pyrrhotite and pentlandite). Pentlandite in particular is known to form during such alteration. However, experimental work by Lauretta has indicated that pentlandite may also have been formed during the initial sulfidation process, due to the faster diffusion rate of nickel into the forming sulfide, as compared to iron. Finally, there is considerable evidence for a family of phases intermediate between pyrrhotite and pentlandite, following the trend of the high temperature monosulfide solid solution, something not encountered in terrestrial rocks. Each sulfide has its own particular stability conditions, which have been determined for most phases. The long-term objective of our research is to characterize sulfides in chondritic materials in order to better establish the conditions under which they formed, and the subsequent processes they experienced. Ultimately, it will be possible to infer whether the sulfides in the chondrites were formed in the solar nebula or on asteroids, and if formed on the asteroids, deduce

how much alteration has occurred there. Here we explore the relationships between the finest grain size portions of carbonaceous chondrites, these being matrix and chondrule rims; fine-grained materials are the most sensitive to their environment. This abstract is one of a series reporting results for chondrites, earlier work reported results for a much more limited set of CMs, as well as for CVs and CIs.
Derived from text
Carbonaceous Chondrites; Iron; Nickel; Hydrogen Sulfide; Chemical Composition

20030111604 Arizona State Univ., Tempe, AZ, USA
Martian Volcanic Gases: Are They Terrestrial-like?
Zolotov, M. Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Volcanism was a major geological process in the geologic history of Mars. Associated volcanic degassing should have affected the composition of the atmosphere, contributed to the greenhouse effect, and influenced the chemistry and mineralogy of crustal materials through condensation of volcanic aerosols and chemical weathering. Despite the importance of volcanic degassing, the chemical composition of martian volcanic emanations is weakly constrained. The presence of H2O, CO2, oxidized sulfur, and Cl compounds in the atmosphere and surface materials implies that typical martian volcanic gases contain water, carbon oxides, and S-, Cl-bearing species. Even with tentative detection of magmatic H2O and CO2 in tiny fluid-gas inclusions in pyroxene in the ALH84001 meteorite and the presence of a magmatic amphibole in several martian rocks, martian meteorites generally reveal volatile-depleted magmatic environments. Although terrestrial volcanic gases are often used as analogs in martian climatic and geochemical models, several factors could affect bulk composition, speciation, and the amount of martian volcanic gases compared to their terrestrial counterparts. Here I briefly review those factors and then evaluate the effects of pressure, temperature, oxidation state, and the C1/S ratio on speciation of modeled martian volcanic gases.
Derived from text
Gases; Mars Volcanoes; Planetary Geology; Mars Atmosphere

20030111605 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Solar System Observing with the Space Infrared Telescope Facility (SIRTF)
Cleve, J. Van; Meadows, V. S.; Stansberry, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

SIRTF is NASA's Space Infrared Telescope Facility. Currently planned for launch on 15 Apr 2003, it is the final element in NASA's Great Observatories Program. SIRTF has an 85 cm diameter f/12 lightweight beryllium telescope, cooled to lekss than 5.5K. It is diffraction-limited at 6.5 microns, and has wavelengthcoverage from 3-180 microns. Its estimated lifetime (limited by cryogen) is 2.5 years at minimum, with a goal of 5+ years. SIRTF has three instruments, IRAC, IRS, and MIPS. IRAC (InfraRed Array Camera) provides simultaneous images at wavelengths of 3.6, 4.5, 5.8, and 8.0 microns. IRS (InfraRed Spectrograph) has 4 modules providing low-resolution (R=60-120) spectra from 5.3 to 40 microns, high-resolution (R=600) spectra from 10 to 37 microns, and an autonomous target acquisition system (PeakUp) which includes small-field imaging at 15 microns. MIPS (Multiband Imaging Photometer for SIRTF)} does imaging photometry at 24, 70, and 160 m and low-resolution (R=15-25) spectroscopy (SED) between 55 and 96 microns. The SIRTF Guaranteed Time Observers (GTOs) are planning to observe Outer Solar System satellites and planets, extinct comets and low-albedo asteroids, Centaurs and Kuiper Belt Objects, cometary dust trails, and a few active short-period comets. The GTO programs are listed in detail in the SIRTF Reserved Observations Catalog (ROC). We would like to emphasize that there remain many interesting subjects for the General Observers (GO). Proposal success for the planetary observer community in the first SIRTF GO proposal cycle (GO-1) determines expectations for future GO calls and Solar System use of SIRTF, so we would like promote a strong set of planetary GO-1 proposals. Towards that end, we present this poster, and we will convene a Solar System GO workshop 3.5 months after launch.
Derived from text
Solar System; Space Infrared Telescope Facility; NASA Space Programs; Observation; Spacecraft Instruments

20030111606 Los Alamos National Lab., NM, USA
On the Impact of Brines on Hydrothermal Circulation Below Martian Permafrost
Travis, B. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Water has played a role on Mars in each of its epochs, including the present: ice at the poles, vapor in the atmosphere, both in the near surface. If water is also present deeper in the subsurface, what form is it in - ice, liquid water, vapor? If liquid water exists, what is its condition - stagnant, or flowing? What kind of flow patterns can the modest internal heat generation of Mars (25 - 45 mW/sq m) support? Can it generate hydrothermal convection, and could this convection be related to the presence of near-surface liquid water on Mars as possibly evidenced, e.g., by crater-wall seeps? A previous numerical study of hydrothermal convection in the Martian subsurface indicates that background geothermal heat flux is sufficient to generate long-lasting hydrothermal flow and, further, could lead to substantial local thinning of the permafrost layer above warm upwelling convection plumes. That model assumes pure water properties. However, subsurface water on Mars is likely to be a brine rather than pure water. This study begins to address the impact of salts on subsurface hydrothermal circulation - how will brines change flow behavior compared to pure water?
Derived from text
Mars Surface; Water Flow; Permafrost

20030111607 Brown Univ., Providence, RI, USA
Fractionation of Eu from Other REE by Melt-Rock Reaction in the Lunar Mantle
Morgan, Z. T.; Liang, Y.; Hess, P. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As the lunar magma ocean (LMO) cooled it first crystallized Mg-rich olivine (ol) and orthopyroxene (opx). With continued cooling and crystallization the residual liquid in the LMO becomes enriched in FeO, TiO2 and other incompatible elements. Eventually the overlying melt will be denser than the underlying liquid interstitial to the cumulus crystals within the LMO. At some point the dense liquid will descend through the cumulate crystals modifying the compositions of the interstitial melt and cumulus minerals through dissolution-precipitation and diffusive change. These crystal-melt exchange reactions may have important implications for the formation of a REE enriched source region while preserving its primitive major element signature (possibly the Mg suite source region). One of the unique features of melt flow and melt-rock reaction in the lunar mantle is the strong fractionation of Eu from other REE. As will be shown below, this can happen even in the absence of plagioclase.
Author
Europium; Melts (Crystal Growth); Lunar Mantle; Lunar Composition; Lunar Rocks

20030111609 Academy of Sciences (USSR), Moscow, USSR
Major and Trace Element Chemistry and Ar-Ar Age of the NWA 011 Achondrite
Korotchantseva, E. V.; Ivanova, M. A.; Lorenz, C. A.; Bouikine, A. I.; Trieloff, M.; Nazarov, M. A.; Promprated, P.; Anand, M.; Taylor, L. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Northwest Africa (NWA) 011 was originally described as a non-cumulate eucrite with an anomalous Fe/Mn ratio [1]. However, it was demonstrated later [2] that this rock is different from eucrites in oxygen isotopic composition and represents a new type of basaltic meteorite. Furthermore, it has been suggested that the rock may have come from Mercury [3]. In this paper, we report new data on major- and trace-element compositions of this unique meteorite, in addition to the first results of 40Ar-39Ar dating. The mineralogy and petrology are reported in a companion paper [4]. These studies present new evidence showing that NWA 011 is significantly different from HED meteorites.
Author
Achondrites; Meteoritic Composition

20030111612 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Exploration Rover Landing Site Boulder Fields
Schroeder, R. D.; Golombek, M. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As an aid in constraining the rock size-frequency distributions at the Mars Exploration Rover (MER) landing sites, Mars Orbiter Camera (MOC) images of all potential MER landing sites were systematically searched for boulder fields. Low-Sun angle MOC images can be used to identify boulders larger than 1.5 m diameter, which can be used to determine the shape

of the rock size-frequency distributions. These distributions can be compared with the rock size-frequency distributions measured at the Viking and Mars Pathfinder landing sites to better quantify potentially hazardous rocks at the MER landing sites.
Author
Mars Exploration; Mars Landing Sites

20030111613 Arizona Univ., Tucson, AZ, USA
Numerical Simulations of Convection in Europa's Ice Shell: Implications for Surface Features
Showman, A. P.; Han, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Europa's icy surface displays numerous small (5-30 kmdiameter) pits, spots, and uplifts with topography of 100-300 m. Although several formation models exist for these features, the most popular is that they result from deformation of the lithosphere by convection in the underlying ice. However, it is unclear whether convection can produce topography of the appropriate-wavelength, height, and surface expression. Here we present numerical simulations of convection in Europa's ice shell including temperature-dependent viscosity and tidal heating. Ice shells 15 and 50 km thick are considered, consistent with several estimates of the shell thickness on Europa . The convection produces 100-200 m-deep pits with 10-20 km diameter consistent with some of the observed features when the lithospheric viscosity is 10(exp 3)-10(exp 5) times greater than that of the underlying ice, but greater or smaller viscosity contrasts lead to topography insufficient to explain the observed pits and uplifts. When compared with plausible lithospheric stiffnesses, the results suggest that Europa's widest pits and uplifts could result from convection; however, features with diameters < 5 km require other formation mechanisms. The convection induces stresses > 1 bar, which exceeds the inferred strength of Europa's crust and indicates the likelihood of surface disruption. Europa's dominant terrain types are the ridged plains, which consist of successive generations of overprinted ridge pairs, and the chaos terrains, which are comprised of hummocky material and disrupted crustal blocks. In addition, numerous small (< 30 km) landforms were imaged by Galileo, including pits, domes, platforms, irregular uplifts, irregular lobate features, and smooth, flat regions embaying topographic lows. Furthermore, several of the depressions and uplifts alter the topography of the existing surface without disruption. Pappalardo et al. and others suggested that Europa's ice shell undergoes solidstate convection vigorous enough to flex, and perhaps fracture, the lithosphere, producing the observed landforms. However, these ideas have until recently remained qualitative, and it is unclear whether convection can produce enough topography to explain the observed features. Here we present two-dimensional numerical simulations of solid-state convection in Europa's ice shell with the goal of determining implications for the surface features, especially the amplitude and wavelength of topography produced by the convection.
Derived from text
Convection; Europa; Ice; Two Dimensional Models; Planetary Surfaces

20030111614 State Univ. of New York, Stony Brook, NY, USA
Acid-Sulfate Weathering of Synthetic Martian Basalt: The Acid Fog Model Revisited
Tosca, N. J.; McLennan, S. M.; Lindsley, D. H.; Schoonen, M. A. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of several models that has been proposed to explain the present chemical and mineralogical nature of the Martian surface is referred to as the 'acid-fog' model. This model involves the recent (up to 1Ga), slow and continuous interaction of acidic volatiles, presumably of volcanic origin, with the exposed Martian basaltic crust. As a result of this interaction, mineral dissolution occurs and subsequent evaporation of the fluid results in formation of evaporite salts. Banin et al. have tested the acid-fog model experimentally by interacting terrestrial analog basalt with sulfuric, hydrochloric and nitric acid mixtures and found that upon fluid evaporation, the Ca and Al-sulfate salts gypsum and alunogen precipitated as secondary mineral phases with no other phases detected by X-ray diffraction. The study presented here revisits this model using more relevant Martian basaltic analogs synthesized in the laboratory. Results show that the chemical and mineralogical composition of the basaltic analog material is critical in determining fluid chemistry and the subsequent secondary products that are formed. Different chemical compositions of basaltic analogs are used in this study to provide a thorough evaluation of fluid-rock interaction as a function of host rock composition.
Derived from text
Mars Surface; Basalt; Hydrochloric Acid; Sulfates; Sulfuric Acid; Planetary Crusts

20030111616 Arizona Univ., Tucson, AZ, USA

Crack Azimuth Sequences on Europa: The Southern Leading Hemisphere

Sarid, A. R.; Greenberg, R.; Geissler, P.; Hoppa, G. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Galileo images of Europa's northern hemisphere taken at low resolution during the first orbit of Jupiter showed that regional-scale lineaments orientations followed a systematic progression (clockwise going forward in time) consistent with predicted trends in tidal stress over approx. 1/6 of a period of nonsynchronous rotation. The fit is even better if diurnal tides, as well as non-synchronous effects, are taken into account. Non-synchronous rotation, i.e. a gradual rotation relative to the direction of Jupiter, had been predicted, based on considerations of tidal torques caused by Europa's orbital eccentricity. The possibility that tectonic patterns might contain a record of non-synchronous rotation was noted by previous authors. We have now considered more completely the tectonic record in the southern leading hemisphere, systematically using cross-cutting lineaments to constrain the sequence. This approach has several advantages: it uses images of higher resolution; it is not dependent on the implicit assumptions that underlie a particular geological scenario; and it avoids the special conditions of a small locale. We map tectonic lineaments in this area, and identify their order of formation from cross-cutting relationships. We then determine the sequence of longitudes at which they must have formed to fit the model of tidal stress in nonsynchronous rotation, contributing constraints to the dynamical history of Europa.

Derived from text

Europa; Cracks; Tectonics; Gravitational Effects; Tides

20030111617 Arkansas-Oklahoma Center for Space and Planetary Sciences, USA

The Origin of Chondrites: Metal-Silicate Separation Experiments Under Microgravity Conditions, Experiment 2

Moore, S. R.; Franzen, M.; Benoit, P. H.; Sears, D. W. G.; Holley, A.; Myers, M.; Godsey, R.; Czlapinski, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chondrites are categorized into different groups by several properties, including the metal-to-silicate ratio. Various processes have been suggested to produce distinct metal/silicate ratios, some based on sorting in the early solar nebular and others occurring after accretion on the parent body. Huang et al. suggested that a weak gravitational field accompanied by degassing, could result in metal/silicate separation on parent bodies. We suggest that asteroids were volatile-rich, at least early in their histories. Spectroscopic evidence from asteroid surfaces indicates that one-third of all asteroids maybe rich in clays and hydrated minerals, similar to carbonaceous chondrites. Internal and/or external heating could have caused volatiles to evaporate and pass through a surface dust layer. Spacecraft images of asteroids show they have a thick regoliths. Housen, and Asphaug and Nolan proposed that even a 10 km diameter asteroid could potentially have a significant regolith. Grain size and grain density sorting could occur in the unconsolidated layer by the process known as fluidization. This process occurs when an upward stream of gas is passed through a bed of particles which are lifted against a gravitational force. Fluidization is commonly used commercially to sort particulates. This type of behavior is based upon the bed, as a whole, and differs from aerodynamic sorting. Two sets of reduced gravity experiments were conducted during parabolic flights aboard NASA's KC-135 aircraft. The first experiment employed 310 tubes of 2.5 cm diameter, containing mixtures of sand and metal grains. A gas source was used to fluidize the mixture at reduced gravity conditions and mixtures were analyzed after the flight. However, this experiment did not allow a description of the fluidization as a function of gravity. A second experiment was conducted on the KC-135 aircraft in the summer of 2001, consisting of two Plexiglas cylinders containing a metal/silicate mixture, and video cameras to record the experiment on tape. Here we summarize this experiment and discusses the implications for metalsilicate separation on asteroid bodies.

Author

Chondrites; Metals; Silicates; Meteoritic Composition; Microgravity

20030111619 Madrid Univ., Spain

Terrestrial Impact Craters: What Can We Learn About the Earth and Other Bodies of Our Solar System? Didactic Activities

Uceda, Esther R.; DePablo, Miguel A.; Castilla, Gabriel; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A wide variety of scientific branches attempting to better know other bodies of the Solar System, including our planet Earth, are unified in the Planetary Sciences. This multidisciplinary character is what makes it so attractive to the Secondary

Education students, allowing them to reach from the geology or the biology to the physics, the mathematics or the engineering. In the last years, numerous manuals with activities related with the Planetary Sciences for different-aged students have been published, and even they have been developed complete didactic units to apply within official curriculum of the Spanish Secondary Education. In this work we show that, using this multidisciplinarity, students can extract information of the terrestrial impact craters with the aid of some mathematic equations and some simple physical concepts.
Derived from text
Solar System; Planetary Geology; Earth (Planet); Hypervelocity Impact; Meteorite Craters

20030111621 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Rb-Sr and Sm-Nd Study of the D'Orbigny Angrite
Tonui, E. K.; Ngo, H.H.; Papanastassiou, D. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): RTOP 344-31-55-01; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

D'Orbigny, is a relatively a new angrite find. Angrites are achondrites that show unique mineralogy and typically ancient crystallization ages. D Orbigny has been described extensively by. We have initiated a study of D Orbigny. A Pb-Pb model age of 4559 Ga has been reported. The presence of Pu-244 fission Xe in D Orbigny has also been reported. We present Sm-Nd and Rb-Sr results and a Mn-53-Cr-53 study is in progress. We had expected to find a relatively well-behaved Sm-Nd system, and distinct evidence for the Sm-146-Nd-142 system. Emphasis in this study was placed on the precise measurement of initial Sr-87/Sr-86, since primitive initial Sr-87/Sr-86 may be characteristic of the angrite parent body. Sr isotope measurements were obtained in the recently completed laboratories at JPL, using the ThermoFinnigan Triton mass spectrometer. Due to lower amounts of Nd and Sm, Sm-Nd data were obtained on the Lunatic I spectrometer at Caltech, due to established high ionization techniques, on this instrument using light rare earth oxide ions.
Derived from text
Meteoritic Composition; Rare Earth Elements; Plutonium 244; Crystallization; Isotopes; Light Ions

20030111622 New Brunswick Univ., Fredericton, New Brunswick, Canada
Shocked Quartz as an Indicator of the Loading and Relaxation Conditions During and After Hypervelocity Impact: Microstructural Evidence from Crystalline Target Rocks of the Charlevoix Impact Structure, Canada
Trepmann, C. A.; Spray, J. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The loading and relaxation conditions (e.g., pulse duration, pressure, differential stress and temperature) during and after hypervelocity impact are dependent on the velocity, material and size of the projectile, as well as on the material properties of the target rocks, including macroscopic and microscopic structural features (e.g., foliation, grain size, etc.) and shock impedance variation between adjacent phases. The shock effects generated in the target rocks are sensitive to these conditions and can therefore provide important information on the cratering process. The late Devonian Charlevoix impact structure is located 105 km north of Quebec city (47 32 N; 70 18 W) along the north shore of the St. Lawrence River. The topographic expression of the ~55 km diameter complex structure with a prominent central peak is well defined. Shocked quartz from the crystalline target rocks has been studied by optical microscopy, U-stage and scanning electron microscopy, combined with electron backscattered diffraction (EBSD).
Author
Quartz; Hypervelocity Impact

20030111623 PELSYS doo, Zagreb, Croatia
Topography Profile Diagrams of Mars: Algorithms for Computing Altitude of Craters
Nezic, Z.; Salamuniccar, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recently, mathematical approach was proposed providing a way to compute how deep Martian ocean was during each period of the planet history, including the probability that ocean existed once. An important step toward the formal proof of Martian ocean recession, timing and probability is representation of Martian topography and related values, in the form of

topography profile diagrams. For this purpose, algorithms for computing crater altitude according to the topography, center coordinates and radius of impact crater r are of importance.
Derived from text
Algorithms; Mars (Planet); Mars Surface; Topography; Water Depth; Mars Craters; Oceans

20030111624 Academy of Sciences (USSR), Moscow, USSR
Impacts of 100-km-Diameter Asteroids Against the Earth
Trubetskaya, I. A.; Shuvalov, V. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): RFBR-01-05-64564-a; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impacts of asteroids and comets played an important role in the evolution of the early Earth. The Earth itself was formed due to collisional accretion, a collision of the proto-Earth with a Mars-sized impactor has been suggested as a cause for the formation of the Moon, a significant fraction of the Earth's prebiotic inventory of organic molecules probably had been delivered by asteroidal and cometary impacts during the period of heavy bombardment. The impacts of cosmic bodies with sizes up to 10 km are intensively studied in connection with the problems of global catastrophes and formation of terrestrial craters. Less investigated are the impacts of 100 to 1000 km in size projectiles. In this paper we consider impacts of 100-km diameter asteroids against the Earth. Impact velocity V equals 11 and 15 kilometers per second, trajectory angle (to horizon) equals 30 and 45 degrees. An impactor is considered to be a dunite sphere. The target consists of a 30 kilometers deep granite crust overlaying a dunite mantle. The Earth is considered to be surrounded by the modern atmosphere with density 1.29 kilograms per cubic meter. The purpose of this study is to determine ejecta velocity distribution, the distribution of deposits on the Earth's surface and the mass of escaped atmosphere.
Derived from text
Asteroids; Earth Surface; Hypervelocity Impact; Ejecta

20030111626 Arizona Univ., Tucson, AZ, USA
Modeling the Formation of Lobate Debris Aprons on Mars by Creep of Ice-rich Permafrost
Turtle, E. P.; Pathare, A. V.; Crown, D. A.; Hartmann, W. K.; Greenham, J. C.; Hartness, N.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A wide variety of mid- to high-latitude surface features on Mars has long been attributed to viscous creep and flow phenomena associated with near-surface ground ice. On the basis of Viking Orbiter images, Squyres identified two classes of creep-related landforms: (1) softened terrain, which results from in situ viscous deformation and is particularly evident in impact craters with degraded rims and flattened topographic profiles, and (2) debris aprons, which are produced by mass wasting along escarpments, e.g., lobate debris aprons, lineated valley fill, and concentric crater fill. Such features have been linked to kilometer-thick layers of permafrost (with upper boundaries less than 200 m deep) at higher latitudes, an interpretation that is consistent with recent GRS observations indicating a high water content in the very shallow Martian subsurface. We are using MOC and MOLA data to document the structural and topographic characteristics of softened landforms and debris aprons in the Hellas and Noachis regions. By comparing the observed landforms to the results of finite-element models of viscous creep relaxation which incorporate recent laboratory measurements of ice/rock mixtures, we can constrain the conditions necessary to allow such deformation on Mars.
Derived from text
Creep Properties; Debris; Ice; Mars Surface; Permafrost; Planetary Geology; Mathematical Models

20030111627 Tokyo Univ., Japan
Surface Material Analysis of the S-type Asteroids: Removing the Space Weathering Effect from Reflectance Spectrum
Ueda, Y.; Miyamoto, M.; Mikouchi, T.; Hiroi, T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-3871; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent years, many researchers have been observing a lot of asteroid reflectance spectra in the UV, visible to NIR at wavelength region. Reflectance spectroscopy of asteroid at this range should bring us a lot of information about its surface materials. Pyroxene and olivine have characteristic absorption bands in this wavelength range. Low-Ca pyroxene has two

absorption bands around 0.9 microns and 1.9 microns. The more Ca and Fe content, the longer both absorption band centers. On the other hand, reflectance spectrum of olivine has three complicated absorption bands around 1 m, and no absorption feature around 2 microns. In general, reflectance spectra of many asteroids that are considered to be silicate rich (i.e., S- and A type asteroids) show redder slope and more subdued absorption bands than those of terrestrial minerals and meteorites. These features are now believed to be caused by the space weathering effect, which is probably caused by micrometeorite bombardment and/or solar wind. This process causes nanophase reduced iron (npFe(sup 0)) particles near the surface of mineral grains, which leads the optical change. Therefore, the space weathering effect should be removed from asteroid reflectance spectra to compare with those of meteorite and terrestrial minerals. In this report, we will apply the expanded modified Gaussian model (MGM) to the reflectance spectra of S-type asteroids 7 Iris and 532 Herculina and compare them with those of meteorites.
Derived from text
Asteroids; Space Weathering; Spectral Reflectance; Mathematical Models; Surface Properties; Micrometeorites

20030111628 Maryland Univ., College Park, MD, USA
Osmium Isotope and Highly Siderophile Element Compositions of Lunar Orange and Green Glasses
Walker, R. J.; Horan, M. F.; Shearer, C. K.; Papike, J. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The absolute and relative abundances of the highly siderophile elements (HSE) present in planetary mantles are primarily controlled by: 1) silicate-metal partitioning during core-mantle differentiation, 2) the subsequent addition of HSE to mantles via continued planetary accretion. Consequently, constraints on the absolute and relative abundances of the HSE in the lunar mantle will provide unique insights to the formation and late accretionary history of not only the Moon, but also Earth. Determining the HSE content of the lunar mantle, however, has proven difficult, because no bona fide mantle rocks have been collected from the moon. The only materials presently available for constraining mantle abundances are lunar volcanic rocks. Lunar basalts typically have very low concentrations of HSE and highly fractionated HSE patterns. Because of our extremely limited understanding of mantle melt partitioning of the HSE, even for terrestrial systems, extrapolations to mantle compositions from basaltic compositions are difficult, except possibly for the less compatible HSE Pt and Pd. Primitive, presumably less fractionated materials, such as picritic glasses are potentially more diagnostic of the lunar interior. Here we report Os isotopic composition data and Re, Os, Ir, Ru, Pt and Pd concentration data for green glass (15426,164) and orange glass (74001,1217). As with previous studies utilizing neutron activation analysis, we are examining different size fractions of the spherules to assess the role of surface condensation in the generation of the HSE abundances.
Derived from text
Osmium Isotopes; Siderophile Elements; Lunar Mantle; Glass; Volcanology; Composition (Property)

20030111629 Minnesota Univ., Morris, MN, USA
Giant Impacts and Thermochemical Martian Mantle Convection: Implications for Tharsis
Reese, C. C.; Solomatov, V. S.; Baumgardner, J. R.; Stegman, D. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The initial thermal and compositional state of Mars was likely heterogeneous as a result of giant (Moon-sized) impacts during late stage planet formation which can locally shock heat the deep interior to supersolidus temperatures. The subsequent evolution of Mars is governed by the nature of mantle convection. Early thermochemical mantle heterogeneity is efficiently removed only if convection is sufficiently vigorous. If convection is sluggish, early heterogeneity persists throughout planetary history. The fact that Mars has only one large volcanic complex, Tharsis, is an important constraint on Martian evolution. Stagnant lid scaling relationships suggest that for subsolidus Martian mantle temperatures, thermal convection is sluggish and mantle heat transfer and homogenization inefficient. In this case, mantle heating during early evolution makes early plume formation and Tharsis development difficult. An alternative mechanism for Tharsis formation with the potential for early and longlived magma generation is an impact induced thermal anomaly preserved because of sluggish convection. These models, however, did not address compositional variations resulting from impact heating, mantle melting, and crust formation.
Author
Hypervelocity Impact; Thermochemistry; Mars (Planet); Planetary Mantles; Convection; Mars Volcanoes

20030111630 Academy of Sciences of the Ukraine, Kiev, Ukraine

Biostratigraphic Indications of End Cretaceous Age of the Boltysh Impact Crater (Ukrainian Shield)

Valter, Anton; Plotnikova, Ludmila; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Boltysh meteorite crater (diameter 23 km) on the Ukrainian shield was formed in Precambrian (approx. 2.1 Ga) granites and has a classical complex structure. The geological setting of it have been studied in many rocks which were summarized by V.L.Masaitis [1]. The annular trough around central uplift (average diameter approx. 4km) is filled with predominantly glassy impactites (tagamites) to 230 m thick. The crater lake sediments overlie impactites and are represented by laminated siltstones, sandstones, claystones. They have nearly 400 m thick in the central crater area. The data about the geological age of lower crater sediments were contradictory (K1-P2) as well as results of early K-Ar whole rock age determinations of tagamites (177-64Ma). In the first suggestion about possible formation of Boltyshka crater near or at the Cretaceous-Tertiary (KT) boundary was done. The age of the crater once more attracts attention due to results of fission track dating of its glassy impactites and later new Ar-Ar determination confirmed this age 65.17 +/- 0.64 Ma. The aim of this work is a specification of the Boltysh event age by biostratigraphic methods because it can not only be not less precise than isotopic ones but also because it gives direct information on geological position of this event to stratigraphic boundaries.

Author

Meteorite Craters; Cretaceous Period; Geochronology

20030111631 Washington Univ., Saint Louis, MO, USA

Bounded Variable Least Squares: Application of a Constrained Optimization Algorithm to the Analysis of TES Emissivity Spectra

Seelos, F. P., IV; Arvidson, R. E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objective of any linear spectral unmixing procedure is to determine the abundance at which the components represented in a predetermined end-member library are present in the observed target. This is done by modeling an observed spectrum as a linear combination of end-member spectra. Following the work of Ramsey and Christensen and Feely and Christensen linear unmixing has become a fundamental tool for analysis and interpretation of thermal infrared emissivity spectra. This technique was expanded upon by Smith et. al to include inferred Martian atmospheric end-member spectra for the purpose of analyzing Mars Global Surveyor Thermal Emission Spectrometer (TES) data. The simultaneous modeling of atmospheric and surface contributions to the observed TES spectrum in a single linear system has become the most accessible means by which the surface emissivity spectrum and inferred surface mineralogy can be isolated from a given TES spectral observation. In this work we examine the application of an advanced constrained optimization algorithm to the problem of linear spectral unmixing and evaluate its utility in the analysis of TES emissivity spectra.

Derived from text

Algorithms; Mars Surface; Spectrometers; Spectrum Analysis; Thermal Emission

20030111632 Virginia Univ., Arlington, VA, USA

Mars Thermal Evolution: Aided by Tidal Dissipation?

Singer, S. Fred; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Early models of accretion of Mars [1] suggested long time scales and led to assumed cold post-accretion initial temperatures [2]. But later accretion models [3] gave much shorter time scales and led to the general acceptance of a hot Mars heated by the kinetic energy of impacting planetesimals. Evidence from isotopic studies also seems to require early melting; in particular, Hf-W systematics indicated that accretion, large-scale melting, and core segregation would be accomplished within 20 Myr [4]. But doubts about the adequacy of accretion to produce melting persisted. Adopting the model of runaway accretion, Ghosh et al [5] therefore investigated the contribution from radioactive heating from short-lived Al-26 (half-life 0.7 Myr) as an important source of energy. This requires, however, that the accretion process take no more than 1 Myr. Such short time-scales conflict with many dynamic models of accretion; some of which arrived at values of 100 to 1700 Myr [1]. More recent studies [3] have reduced these numbers, but there is still exists a wide gap. But there is no good evidence that large amounts of Al-26 ever existed, or even if they did, that the accretion process was brief enough to incorporate sufficient Al-26 into Mars to add appreciable heat. For example, a recent finding of the absence of measurable Mg-26 in hibolite grains in the

Murchison meteorite [6] suggests a corresponding absence of radioactive Al-26, as does other evidence. We may therefore consider the thermal evolution of Mars as a problem yet to be settled.
Author
Planetary Geology; Mars (Planet)

20030111635 NASA Johnson Space Center, Houston, TX, USA
Age and Petrogenesis of Picritic Shergottite NWA1068: Sm-Nd and Rb-Sr Isotopic Studies
Shih, C.-Y.; Nyquist, L. E.; Wiesmann, H.; Barrat, J. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NWA 1068 is a 577g picritic shergottite found in the Moroccan Sahara in 2001. The meteorite resembles several other picritic shergottites, e.g. EETA79001B, DaG476, SaU005 and Dho019, in major-element chemistry and mineralogy, but it differs significantly from these meteorites in REE distribution pattern. It has a slightly LREE-depleted pattern commonly shared by some olivine-free basaltic shergottites, e.g. Shergotty, Zagami and Los Angeles, but not QUE94201. Detailed geochemical and mineral-petrological studies were given in. We performed Rb-Sr and Sm-Nd isotopic analyses on this rock to determine its crystallization age and to study the petrogenetic relationship between this meteorite and other basaltic and pricritic shergottites.
Derived from text
Shergottites; Petrogenesis; Isotopes; Meteoritic Composition

20030111636 International Research School of Planetary Sciences, Pescara, Italy
The Uppermost Crust of Mars and Flood Basalts
Ori, G. G.; Karna, A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The nature of the uppermost crust of Mars has been deeply discussed since the Viking mission. In recent years, the images of the camera of Mars Global Surveyor have shown that the upper part of the crust is extensively layered. These beds are remarkably exposed in the walls of Valles Marineris, but occur also extensively all over the planet. The interpretation is not simple due to the lack of direct observations and unequivocal mineralogical data. However, it is quite probable, that the represent basalt layers accumulated in a way similar to the terrestrial traps. The presence of these flood basalt type units underlying younger ridged-plain materials and veneers of aeolian and other water-laid deposits suggests that the purported impact mega-breccia (mega-regolith) will occur underneath or will be absent. We have carried an extensive analysis of the MOC images investigating the nature of the vertical cliffs forming the rims of craters, the walls of channels and fractures, and other depressions. The data have been located on a planetary map and correlated to the geological units. In this abstract we will investigate the nature of these layered units at the planetary scale. We will call these stratified formations thick-bedded unit (TBU) to distinguish them from the interior layered deposits and other thin-stratified deposits unrelated with crustal processes. The data set and the interpretation are preliminary and should be regarded as un-reviewed data and working hypothesis.
Derived from text
Basalt; Mars Surface; Mars (Planet); Planetary Geology; Planetary Crusts

20030111637 Army Cold Regions Research and Engineering Lab., Hanover, NH, USA
Terrestrial Glacial Processes: Analogs for Martian Polar Landform Development
Finnegan, D. C.; Lawson, D. E.; Zimbelman, J. R.; Rice, J. W.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We suggest that there is a genuine need for an integrated field-based workshop that will focus on bringing the Mars research community together with terrestrial glacial scientists to provide a better understanding of glacier dynamics and the physical processes that determine how glacial and glaciofluvial deposits and landforms develop, including those of large floods associated with glaciers and ice sheets. The long-term development and characteristics of the Martian landscape may be better understood by direct interaction and exchange of information by the terrestrial and planetary research communities.
Derived from text
Mars Surface; Landforms; Glaciers

20030111638 Arizona Univ., Tucson, AZ, USA

Role of the Manning Coefficient on Progressive Inundation by a Megaflood

Miyamoto, H.; Baker, V. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Estimations of peak discharge rates and durations of floods will play critical roles in discussions about megafloods and their relevance to the history of water on Earth and Mars. However, the movement of the floodwater is not easily modeled in an exact form because it strongly correlates to turbulent forces. In addition to that, actual floods progressively inundate complicated rough terrains, which introduces an additional complexity on the movement of the megaflood. For these reasons, empirical equations, especially the Manning equation developed in the fluvial hydrology field, are widely used to analyze megafloods. Nevertheless, the Manning resistant coefficient of a megaflood is not easily estimated by extrapolation from measured stream flows of much smaller floods. Here we discuss its theoretical background and its role in megaflood inundation processes by numerical calculations of our new flood simulation code.

Author

Computerized Simulation; Manning Theory; Water; Mars Surface; Floods; Planetary Geology

20030111639 NASA Ames Research Center, Moffett Field, CA, USA

Ariadnes-Gorgonum Knob Fields of North-Western Terra Sirenum, Mars

Moore, J. M.; Howard, A. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fields of knobs and small mesas outcrop principally in five adjacent basins in northwestern Terra Sirenum (~32-43 S, 166-192 W). Several of these knob fields (the largest) have names. East to west they are: Gorgonum Chaos, Atlantis Chaos, and Ariadnes Colles. These three largest knob fields are on order of 200 km across and are roughly equant but with very irregular boundaries in plan view . There are several smaller knob fields in smaller nearby basins; some as small as 20 km across. Knob material, where unmantled, is relatively brighter than its surroundings. The largest individual knobs are almost invariably mesas with typical plan dimensions of ~10 km and relief > 200 m. Knob profiles transition from mesas to rounded mounds with decreasing size. Individual knobs range in size down to ~100 m in plan view and relief < 10 m where seen on some MOC NA images.

Author

Mars Surface; Image Analysis; Landforms

20030111640 Geological Survey, Flagstaff, AZ, USA

How Should Planetary Map Units be Defined?

Skinner, J. A., Jr.; Tanaka, K. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Planetary geologic maps are inherently different from typical terrestrial geologic maps in the character of geologic units as well as in the hypothetical nature of most unit contact relationships. Geologic units separated by various contacts are meant to distinguish materials of distinctive lithology and/or formation age. In practice, map units are characterized by what are interpreted to be primary morphologies, textures, or other attributes, by ages relative to adjacent units, and/or by cross-cutting or buried structures or landforms.Based in part on recent mapping efforts in the martian northern plains and surrounding areas, we propose a revision in mapping approach that includes the separation of material units into two distinctive types based on certain criteria. These revisions should facilitate more meaningful stratigraphic divisions and improve objectivity of geologic maps. Furthermore, our approach will maintain the flexibility necessary for the incorporation of future datasets. Though our revisions are based on material relationships observed in the martian northern plains, they are equally applicable to other planetary surfaces.

Derived from text

Planetary Surfaces; Mapping

20030111641 Carnegie Institution of Washington, Washington, DC, USA

Hugoniots and Shock-melting Criteria for Solid and Porous H2O Ice

Stewart, Sarah T.; Ahrens, Thomas J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowledge of the dynamic response of planetary minerals such as H2O ice is required to model and interpret mutual collisions and impact craters. The Hugoniot of H2O ice describes the dynamic strength and possible shock-compressed states, which determine the mechanical and thermodynamic work done during an impact event. Previous studies of the shock properties of ice were centered at approx. 263 K for terrestrial applications. Because ices on most planetary surfaces exist at ambient temperatures much below 263 K, we conducted a detailed study of the shock response of solid ice Ih at 100 K and approx. 40 % porous ice at approx. 150 K to derive Hugoniots that are applicable to most of the solar system.
Author
Planetary Geology; Water; Ice; Dynamic Response; Mechanical Shock; Hugoniot Equation of State; Shock Tests

20030111642 Hawaii Univ., Honolulu, HI, USA
Performance of a Remote Raman System: Defining Remote Raman Efficiency
Stopar, J. D.; Lucey, P. G.; Sharma, S. K.; Hubble, H. W.; Misra, A. K.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Raman analysis is a concept that has been explored for many years. Wang et al. first hypothesized on the usefulness of in situ Raman analysis for planetary landers and later Jolliff et al. among others. However, the applicability of a remote Raman system on planetary landers has only been investigated in the last few years. A proof-of-concept study conducted by Lucey et al. showed that mineral spectra could be detected up to a distance of 10 meters. Initial tests of the system were conducted on earlier systems and equipment including preliminary calibration methods, however, the system is only now being refined through advancements in available equipment and analysis. Landers and rovers have become increasingly important to solar system exploration, and we are designing and analyzing a remote Raman system to assess its applicability on a planetary mission. First, in order to design a flight instrument, the quantitative Raman efficiency of natural surfaces must be understood. While some Raman cross-sections on a per molecule basis are available for compounds like benzene, the number is limited and the relationship to measured Raman efficiency of a rock surface is complex and has not been studied theoretically. The remote Raman efficiency is a dimensionless quantity that we define here as the ratio of the irradiance (W/cm) of the incident laser light to the Raman irradiance emitted from a surface. The irradiance of the surface is calculated from the measured absolute radiance of the Raman signal using an absolutely calibrated spectrometer and the spectral bandwidth of the spectrometer, and we assume isotropic scattering. We examined our rock and mineral spectra for characteristic Raman peaks. While the darker rocks did not produce enough Raman signal that could be isolated, three samples did produce spectra with significant peaks: quartz, dolomite marble, and anorthosite. Typical quartz spectra are shown. The calculated remote Raman efficiency for each sample s strongest spectral peak are as follows: quartz = 9.5 x 10(exp -8), dolomite marble = 3.5 x 10(exp -8), and anorthosite = 3.0 x 10(exp -9).
Derived from text
Raman Spectra; Minerals; Rocks; Remote Control; Space Missions

20030111643 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Io's Thermal Regions and Non-SO2 Spectral Features
Smythe, W. D.; Soderblom, L. A.; Lopes, R. M. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several absorptions have been identified in the Galileo NIMS spectra of Io that are not related to SO2. [1,2]. These absorptions have band centers at 2.97, 3.15, 3.85, and 3.91 microns. There are also broad absorptions in the regions 1-1.3 and 3- 3.4 microns. Patterning noise in wavelength registration, arising from the pushbroom imaging and grating motion of the NIMS instrument have previously inhibited reliable mapping of weak absorptions. Recent improvements in techniques to remove the coherent pattern noise from the NIMS dataset have been made by Soderblom. This greatly improves the signal to noise ratio and enables mapping of weak spectral signatures such as the 3.15 micron absorption on Io.
Author
Io; Spectral Signatures

20030111644 NASA Ames Research Center, Moffett Field, CA, USA

Mars Analog Research and Technology Experiment (MARTE): A Simulated Mars Drilling Mission to Search for Subsurface Life at the Rio Tinto, Spain

Stoker, Carol; Lemke, Larry; Mandell, Humboldt; McKay, David; George, Jeffrey; Gomez-Alvera, Javier; Amils, Ricardo; Stevens, Todd; Miller, David; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations

Contract(s)/Grant(s): 344-51-21-01; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The MARTE (Mars Astrobiology Research and Technology Experiment) project was selected by the new NASA ASTEP program, which supports field experiments having an equal emphasis on Astrobiology science and technology development relevant to future Astrobiology missions. MARTE will search for a hypothesized subsurface anaerobic chemoautotrophic biosphere in the region of the Tinto River in southwestern Spain while also demonstrating technology needed to search for a subsurface biosphere on Mars. The experiment is informed by the strategy for searching for life on Mars.

Derived from text

Mars (Planet); Analogs; Extraterrestrial Life; Research and Development; Drilling

20030111645 PELSYS doo, Zagreb, Croatia

Topography Profile Diagrams of Mars: Algorithms for Computing Altitude of Craters

Nezic, Z.; Salamuniccar, G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recently, mathematical approach was proposed providing a way to compute how deep Martian ocean was during each period of the planet history, including the probability that ocean existed once. An important step toward the formal proof of Martian ocean recession, timing and probability is representation of Martian topography and related values, in the form of topography profile diagrams. For this purpose, algorithms for computing crater altitude according to the topography, center coordinates and radius of impact crater r are of importance.

Derived from text

Algorithms; Mars Surface; Topography; Mars Craters; Altitude

20030111646 Arkansas-Oklahoma Center for Space and Planetary Sciences, USA

Martian Gullies and the Stability of Water in the Martian Environment

Thompson, J.; Sears, D. W. G.; Benoit, P. H.; Kareev, M. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The discovery of high concentrations of hydrogen at near surface levels of Mars polar regions by the Gamma Ray Spectrometer on the Mars Odyssey spacecraft has once again sparked the debate as to the existence of liquid water on the Martian surface. Surface features observed in the recent Mars Global Surveyor and Odyssey missions have given great insight into the possibility of liquid water being present on Mars throughout the planet's history as well as the possibility that near surface liquid water may still exist today. Martian gullies are similar in size, shape, and appearance to gullies on Earth carved by liquid water. Also, there is substantial evidence that the relative age of Martian gullies is quite young, namely lack of impact craters on gully surfaces and the superposition of the gullies on otherwise geologically young features.

Derived from text

Mars Environment; Surface Water; Stability; Craters; Mars Surface

20030111647 Hong Kong Polytechnic, Kowloon, Hong Kong

First Planetary Rock Coring in Our Solar System ESA 2003 Beagle 2 Mars Mission

Ng, T. C.; Yung, K. L.; Yu, C. H.; Chan, C. C.; Lunar and Planetary Science XXXIV; 2003; 1 pp.; In English; See also 20030110578; Copyright; Abstract Only; Available from CASI on CD-ROM only as part of the entire parent document

In 2003, ESA will send a lander to Mars for exobiological exploration. There are three kinds of sampling techniques as follows: 1. Rock Coring for retrieving 100 mg of rock powder. It is the smallest and lightest corer ever designed for planetary sampling,Size of a cigarette pack; weights 370 gm; consume 3 watts of energy; able to core, grind drill; sample of core or powder . 2. Mole Subsoil Sampling for retrieving 20mg of soil under the surface. The mole sampler is fitted at the tip of the Russian mole; utilizes the existing mechanical energy of the mole to open/close of the sampling jaws. 3. Scooping for

retrieving 40 mg of soil on Mars surface. It is an additional sampling device in case the corer and mole do not work. All tools are able to deliver samples into GCMS for in situ analysis. After the 76 Viking mission, scientists realized that the secrets of Mars are hidden inside the rocks or soil beneath the surface of Mars. The sampling tools onboard the Beagle lander stand a reasonable chance to unlock the mystery of exobiology on Mars. The sampling techniques must be explained by ORAL PRESENTATION only.
Author
Exobiology; Mars Exploration; Mars Missions; Mars Surface

20030111649 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Mars Orbiter Laser Altimeter Archive: Final Precision Experiment Data Record Release and Status of Radiometry
Neumann, Gregory A.; Lemoine, F. G.; Smith, D. E.; Zuber, M. T.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A final release (Version L) of the Mars Orbiter Laser Altimeter (MOLA) Precision Experiment Data Record (PEDR) has been submitted to the Planetary Data System (PDS). Additional gridded data record products are forthcoming. These products have evolved since their original description, owing in part to improved gravity modeling and cartographic reference frames, and in part to refinements in calibration. An additional component, the 1064 nm narrowband radiometry data, is also being archived. These data will be invaluable for future studies by Mars explorers and scientists.
Derived from text
Data Systems; Mars (Planet); Data Bases

20030111650 Oulu Univ., Finland
Polygonal Impact Craters as an Indicator of Fracturing - An Example from Greater Hellas Region, Mars
Ohman, T.; Aittola, M.; Kostama, V. - P.; Raitala, J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Polygonal plan view is a long known but largely forgotten feature of impact craters. The aim of this study is to map the distribution of polygonal craters in the greater Hellas region, Mars, and to analyse whether or not polygonal craters can be used as a tool in the investigation of the structural and tectonic features of a planet's crust. One goal of this work is also to revive the concept of polygonal craters in the impact cratering community.
Derived from text
Fracturing; Mars Surface; Polygons; Mars Craters; Volcanology

20030111652 Arkansas-Oklahoma Center for Space and Planetary Sciences, USA
Eros Sulfur Deficiency: A Closer Look at Meteorite Comparisons
Kracher, A.; Sears, D. W. G.; Benoit, P. H.; Meier, A. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NEAR Shoemaker spacecraft that orbited and eventually landed on asteroid 433 Eros carried two experiments to determine the chemistry of the surface layer: an x-ray spectrometer (XRS) and a gamma ray spectrometer (GRS). Arguably the most surprising result obtained by these instruments was the discovery that, in spite of an otherwise chondritic chemistry, the sulfur content of Eros regolith is very low. Here we address several possible explanations, consider their plausibility, and propose steps toward resolving the conundrum.
Derived from text
Sulfur; Asteroids; Chondrites; Regolith

20030111653 California Univ., Los Angeles, CA, USA
Towards an Evaluation of Self-Shielding at the X-Point as the Source of the Oxygen Isotope Anomaly in CAIs
Lyons, J. R.; Young, E. D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Self-shielding during photodissociation of CO is a well-established process for producing depletions in C-17 O and C-18 O relative to C-16 O at the edges of molecular clouds . Recent observations of C-17 O and C-18 O are consistent within errors

with an approximately mass-independent fractionation of the mass 17 and 18 isotopes . Recently Clayton suggested that selfshielding of CO also occurred in the very inner solar nebula (near the X point), and produced a massindependent excess of O-17 and O-18 atoms in the vicinity of the X-point. Incorporation of the excess O-17 and O-18 (which together we will refer to as Q atoms) into silicates, followed by entrainment of the Q-enriched silicates into the X-wind, delivered silicate material to the inner solar system with O-17 comparable to bulk meteorite silicate. In Clayton s hypothesis CAI s and other highly refractory grains resisted isotope exchange, and retained their original O-17 of ~ -20 . The implications of this hypothesis are extraordinary.
Author
Oxygen Isotopes; Meteorites

20030111654 NASA Johnson Space Center, Houston, TX, USA
Ar-39-Ar-40 Ages of Eucrites and the Thermal History of Asteroid 4-Vesta
Bogard, Donald; Garrison, Daniel; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

New Ar-Ar ages of several cumulate and unbrecciated eucrites cluster at approx.4.48 Gyr. We suggest that this age cluster was produced by interruption of eucrite metamorphism within the Vesta parent asteroid by a giant impact, which excavated and rapidly cooled these meteorites. We see no evidence for younger formation ages of the cumulate eucrites, as previously proposed.
Derived from text
Asteroids; Meteoritic Composition; Vesta Asteroid; Metamorphism (Geology); Argon

20030111656 Arizona Univ., Tucson, AZ, USA
Numerical Modeling of Shatter Cones Development in Impact Craters
Baratoux, D.; Melosh, H. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-11493; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Shatter cones are the characteristic forms of rock fractures in impact structures. They have been used for decades as unequivocal fingerprints of meteoritic impacts on Earth. The abundant data about shapes, apical angles, sizes and distributions of shatter cones for many terrestrial impact structures should provide insights for the determination of impact conditions and characteristics of shock waves produced by high-velocity projectiles in geologic media. However, previously proposed models for the formation of shatter cones do not agree with observations. For example, the widely accepted Johnson-Talbot mechanism requires that the longitudinal stress drops to zero between the arrival of the elastic precursor and the main plastic wave. Unfortunately, observations do not support such a drop. A model has been also proposed to explain the striated features on the surface of shatter cones but can not invoked for their conical shape. The mechanism by which shatter cones form thus remains enigmatic to date. In this paper we present a new model for the formation of shatter cones. Our model has been tested by means of numerical simulations using the hydrocodes SALE 2D enhanced with the Grady-Kipp-Melosh fragmentation model.
Derived from text
Fractures (Materials); Shatter Cones; Shock Waves; Hypervelocity Impact; Meteorite Collisions

20030111657 Arizona Univ., Tucson, AZ, USA
Measurements of the Strike and Dip of Layers in Coprates Chasma, Valles Marineris, Mars
Beyer, R. A.; McEwen, A. S.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Orbital Camera (MOC) onboard the Mars Global Surveyor (MGS) spacecraft has observed extensive layering on the martian surface and in the Valles Marineris canyon system [1,2]. Layering seen in the walls of terrestrial canyons is often sedimentary in nature, with new layers being put down by the slow process of deposition from rivers, lakes, or oceans. Alternately, volcanic processes with multiple eruptive episodes can deposit many layers of volcanic rocks. However, unlike any terrestrial canyon the Valles Marineris cuts down over 9 km into the martian crust. Despite this extensive exposure, the origin of the layers is unknown, but there are hypotheses for both sedimentary and volcanic origins. Also relevant to the

exposures that we see today is the formation processes of the giant canyon system itself and what geologic changes the region has gone through since that time.
Derived from text
Mars Surface; Planetary Geology; Planetary Crusts; Deposition

20030111659 Imperial Coll. of Science, Technology and Medicine, London, UK
Crater Morphometry on Venus
Cochrane, C. G.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most impact craters on Venus are pristine, and provide probably the best available analogs for craters on Earth soon after impact; hence the value of measuring their 3-D shape to known accuracy. The USGS list 967 craters: from the largest, Mead at 270 km diameter, to the smallest, unnamed at 1.3 km. Initially, research focussed on the larger craters. Schaber et al (11 craters >50 km) and Ivanov et al (31 craters >70 km) took crater depth from Magellan altimetry. Sharpton (94 craters >18 km) used floor-offsets in Synthetic Aperture Radar (SAR) F-MIDR pairs, as did Herrick & Phillips. They list many parameters but not depth for 891 craters. The LPI database1 now numbers 941. Herrick & Sharpton made Digital Elevation Models (DEMs) of all craters at least partially imaged twice down to 12 km, and 20 smaller craters down to 3.6 km. Using FMAP images and the Magellan Stereo Toolkit (MST) v.1, they automated matches every 900m but then manually edited the resultant data. This research is of a region astride western Aphrodite Terra, because it has the most contiguous Cycle 3 coverage, plus right-looking coverage which will be used to validate the Digital Elevation Models (DEMs). This sample area is 7.5% of the surface area of the planet and contains 78 craters (8.3%) on the LPI database. Several analyses show that the sample area has typical terrains and representative crater types for Venus. It includes the largest crater, Mead, and youngest, Adivar. Only 57 of the craters are sufficiently well covered in both Cycles 1 & 2 for DEM generation. Magellan Stereo Toolkit (MST) v.2 was used to automatically match down to 2x4 groups of 75m pixels, the smallest group that, at these latitudes, is larger than the largest SAR resolution cell (i.e. in Cycle 3).
Derived from text
Venus Surface; Meteorite Craters; Planetary Craters; Geomorphology; Planetary Mapping; Planetary Geology

20030111660 Brown Univ., Providence, RI, USA
Large Hesperian Proglacial Lake in Schmidt Valley, Mars: Evidence for Marginal Pitted Sandar Deposits
Dickson, J. L.; Head, J. W.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous analyses using MOLA data support the general concept that significant volatile-rich deposits formed in the Hesperian period of Mars history in the south circumpolar area [1-4] and that a large quantity of volatiles was lost when portions of the cap underwent retreat toward the present position of the edge of the Amazonian layered terrain [1]. The presence of meltwater is supported by: 1) the presence of sinuous ridges plausibly interpreted as eskers [5], and marking the location of subglacial streams that drained much of the retreating polar cap, and 2) cavi, the surface manifestation of subglacial melting and vertical and lateral movement of water [6]. Portions of the meltwater appear to have ponded in a large lake [7] near the crater Schmidt and then to have drained from a notch in the northern end of the valley, ultimately flowing into the Argyre Basin. Contrasting interpretations are found in [8]. In this contribution we describe the relationships of distinctive topography at the margins of the interpreted lake and the lobate deposits of the Dorsa Argentea Formation (DAF) in the Cavi Angusti region. We assess these features in terms of a range of Earth analogs.
Author
Mars Surface; Formations

20030111661 Tennessee Univ., Knoxville, TN, USA
New Lunar Mineral HAPKEITE: Product of Impact-induced Vapor-Phase Deposition in the Regolith?
Anand, M.; Taylor, L. A.; Nazaraov, M. A.; Shu, J.; Mao, H.-K.; Hemley, R. J.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Dhofar 280 (Dh-280) is a lunar fragmental breccia meteorite found in the Dhofar region of Oman, in April, 2001 [1,2]. A regolithbreccia clast in this meteorite contains some small (e.g. 10-20 m) opaque minerals that optically appear to be FeNi

metal with a slight tarnish. Closer inspection with electron microprobe (EMP) revealed these grains to be consisting of three distinct new lunar mineral phases -- FeSi, Fe2Si, FeSi2 [2]. We report here the results of insitu single-crystal study of one of the phases, Fe2Si. We have named this mineral HAPKEITE after Prof. Bruce Hapke (U Pittsburgh), who was far-sighted in his predictions of the effects of space weathering on the formation of lunar soil and its effects upon reflectance spectra [3].
Author
Meteorites; Iron Compounds; Silicides

20030111662 NASA Ames Research Center, Moffett Field, CA, USA
Micro-Spectroscopy as a Tool for Detecting Micron-Scale Mineral Variations Across a Rock Surface: An Example Using a Thin Section of Martian Meteorite ALH 84001
Dalton, J. Brad; Bishop, Janice L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Imaging spectroscopy is a powerful tool for mineral detection across broad spatial regions. A prototype micro-imaging spectrometer at NASA Ames is tested in this study on a scale of tens to hundreds of microns across rock surfaces. Initial measurements were performed in the visible spectral region on a thin section of martian meteorite ALH 84001.
Derived from text
Imaging Spectrometers; Minerals; SNC Meteorites; Spectroscopy; Igneous Rocks; Detection

20030111663 California Univ., San Diego, CA, USA
Martian Xenology: Indigenous, Radiogenic and Fission Components
Marti, K.; Mathew, K. J.; Marty, B.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We identify Martian interior, radiogenic and fission components in recently recovered shergottites, which further constrain the differentiation and evolution of the mantle.
Author
Mars Surface; Radiogenic Materials

20030111664 Sternberg Astronomical Inst., Moscow, USSR
Lunar Photometry and Composition of Ejecta Terrains with AMIE/SMART-1
Shevchenko. V. V.; Pinet, P.; Chevrel, S.; Pugacheva, S. G.; Daydou, Y.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Important scientific goal of the AMIE experiment to fly onboard the SMART-1 mission (ESA) is to study, at low polar orbit, the South Pole regions of the Moon. We plan to use a new technique for remote sensing estimation of lunar surface structure in meter-scale (distribution of boulders, debris etc.) by means photometry method. On the other hand, a close relationship between the photometric characteristics of the surface layer and composition (thorium abundances) of the terrains is elucidated. The AMIE camera will observe the surface in nadir direction within a large phase angle interval, thus providing photometric investigation of selected regions, in particular the South Pole-Aitken basin.
Derived from text
Photometry; Lunar Surface; Surface Layers; Ejecta; Terrain

20030111665 Southwest Research Inst., Boulder, CO, USA
Does the Pluto System Contain Additional Satellites?
Stern, S. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is not known if Pluto has other satellites besides its binary partner, Charon. However, the very large solar-tidal stability radius of the Pluto-Charon system (i.e., out to approx. 2x10(exp 6) km or approx. 90 arcsec from Pluto), combined with the recent detection of numerous KBO satellites, and the development of NASA's New Horizons Pluto-Kuiper Belt mission, each serve to motivate renewed searches.
Author
Pluto (Planet); Pluto Satellites; Planetary Orbits

20030111666 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Spatial and Temporal Patterns of Tidal Dissipation in Synchronous Satellites

Bills, Bruce G.; Aharonson, Oded; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tidal heating is an important energy source for several solar system bodies, and there is a wide-spread perception that the pattern of surface heat flow is diagnostic of internal structure. We wish to clarify that situation. Our analysis depends upon two important assumptions: First, that heat transport is dominated by conduction. Second, that the body can be modeled by a sequence of spherically symmetric layers, each with a linear visco-elastic rheology. Under these assumptions, surface heat flow patterns in tidally dominated satellites will reflect radially integrated dissipation patterns. For synchronously rotating satellites with zero obliquity, this pattern depends quite strongly on orbital eccentricity but relatively little on purely radial variations in internal structure. The total amount of heat generated within the body does depend sensitively on internal structure, but the spatial pattern is rather insensitive to structure, especially at low orbital eccentricities.

Derived from text

Synchronous Satellites; Spatial Distribution; Temporal Distribution; Tides; Heat Transfer

20030111667 Witwatersrand Univ., Johannesburg, South Africa

Impact Breccias in the Central Vredefort Dome - Revisited

Dressler, B. O.; Reimold, W. U.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Breccias in the central Vredeford Dome are pseudotachylite (pt) (or pseudotachylitic breccia), impact melt breccia (i.e., Granophyre dikes) and, at a single place in the center of the Dome, a breccia that is similar to the Footwall Breccia of the Sudbury Structure. We recently carried out further detailed field investigations ay numerous exposures of the Archean basement complex in the core of the Dome. These field investigations allow us to refine earlier observations and interpretations of the origin and emplacement mechanisms of these breccias.

Derived from text

Breccia; Impact Melts; Rock Intrusions

20030111668 Budapest Planetarium, Budapest, Hungary

Morphological Analysis of Annual Recurrence of Dark Dune Spots on Southern Polar Region of Mars

Horvath, A.; Ganti, T.; Berczi, Sz.; Gesztesi, A.; Szathmary, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analysis of the Mars Global Surveyor narrow-angle images of the dark dune spots (DDSs) in three subsequent Martian winters and springs in Southern Polar Region resulted in the recognition that year by year DDSs reappeared on the same place with almost the same configuration. Comparison of the 1999 and 2001 high-resolution images showed a very interest recovery process.

Author

Mars Surface; Morphology; Dunes

20030111669 Pescara Univ., Pescara, Italy

Dating Sedimentary Processes and Deposits on Mars with LUMACH Instrument

Mitri, G.; Baliva, A.; Butera, F.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The scientific goal of LUMACH (LUminescence MArs CHronology) instrument for in situ analysis is to obtain for the first time the absolute dating of sedimentary deposits on Mars. The dating of the Martian aeolian sediments is a primary goal for the future exploration of the planet. Indeed the age of the deposits on the surface of Mars is a key information to understand the recent surficial evolution of the planet. The recent missions to Mars have clearly shown that sedimentary processes have been active during the geological history of the planet. The current method to date the planetary surface, based on the craters counting, is a relative one. This dating tool, even if with a large error, has been extremely useful for dating surface and geological unit of planets and for comparison the age of Solar System bodies. Last mission data show us that a large range of surficial processes are or have been active in the recent Mars past. These processes are linked to planet wide aeolian activity and probably to limited water flows. Dating of these deposits will be a major leap in the understanding of the recent Mars and

may provide some clues on the present and past relationships between the surface and the atmosphere of the planet. Unfortunately very often the duration of such processes is out of the crater counting resolution range as it is evidenced by the almost complete absence of craters on the sedimentary deposits produced.
Derived from text
Luminescence; Planetary Geology; Chronology; Planetary Surfaces; Sediments; Time Measurement; Deposits

20030111670 Universita degli Studi G. D'Annunzio, Pescara, Italy
Possible Geological Scenarios for the MARSIS Experiment
DiLorenzo, S.; Rossi, A. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two radar instruments with different penetration capabilities, MARSIS and SHARAD, will fly to Mars in the next years. The MARSIS radar experiment, which will be on board the Mars Express mission, will be the first to analyze the characteristics of the subsurface of Mars. In this work we suggest models for a few areas of Mars with different geological settings. This stratigraphical analysis will help us to understand how MARSIS detects geological features in the upper crust of Mars. The surface of Mars is characterized by a variety of geological processes and provinces which are likely to be related to different subsurface structures, however very little is known of the subsurface of Mars. The aim of this work is to simulate the MARSIS response on plausible geological scenarios and help in interpreting future data acquired by the instrument.
Author
Sounding; Radar; Altimeters; Stratigraphy; Data Acquisition; Mars Surface

20030111671 Malin Space Science Systems, San Diego, CA, USA
A New Map of Mars
Caplinger, M. A.; Malin, M. C.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have recently completed the compilation of a new map of Mars using Mars Global Surveyor s Mars Orbiter Camera (MOC) Wide Angle images and a shaded relief map derived from the Mars Orbiting Laser Altimeter (MOLA) global dataset. The map also has contour line and nomenclature overlays and follows the projection and presentation style of the classic USGS single-sheet map.
Author
Mars Surface; Mapping; Relief Maps; Geological Surveys

20030111672 NASA Johnson Space Center, Houston, TX, USA
Spectroscopy of Impacted Serpentine: Implications for Asteroid Surfaces
Rivkin, A. S.; Hiroi, T.; Horz, F.; Cintala, M.; Pierazzo, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations
Contract(s)/Grant(s): NAG5-11882; NAGW5-3871; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The presence of hydrated/hydroxylated minerals (here after 'hydrated minerals') in meteorites has been known for several decades. Spectroscopically, they have been detected on asteroids beginning in the 1970s using a set of strong absorptions near 3 microns While the presence of a 3 micron band on an asteroid has been considered diagnostic for the presence of hydrated minerals on its surface, the interpretation of no feature is not as straightforward. Evidence for spectral changes in the 0.3 - 2.5 micron region and maturation processes in asteroid regoliths has led to the idea that micrometeorite impacts could dehydrate the surfaces of small bodies, lead ing to a 'false negative'. If true, abundant hydrated minerals could plausibly be hidden beneath a dehydrated veneer of old regolith. This issue is particularly important in the case of the martian satellites Phobos and Deimos. These have been found to have no detectable 3 micron band leading to the interpretation that these are largely anhydrous bodies. Because of the possibility that Phobos and Deimos could be used as staging areas for human exploration of Mars, the determination of their hydration state is crucial for proper planning.
Derived from text
Asteroids; Hydration; Mars (Planet); Serpentine

20030111674 California Univ., Santa Cruz, CA, USA

Modeling Global Impact Effects on Middle-sized Saturnian Satellites

Bruesch, L. S.; Asphaug, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impacts are invoked routinely to explain disrupted terrains on many bodies in our solar system. In particular, impacts are thought to cause antipodal disruption, which occurs on the opposite side of the body to the impact site. Through the modeling of large impact events and the analysis of their global effects, we are able to test the validity of the impact-antipode correlation hypothesis, and to probe the compositions of Saturn s satellites and hence their modes of origin. The Saturnian satellites Tethys and Mimas are two of the best examples of satellites with giant impact craters. Antipodal to very large craters, one finds disrupted surface terrains. The antipode of Odysseus Crater (d=400 km) on Tethys (d=1048 km) is a planar region within Ithaca Chasma, a trough system extending nearly 270 degrees around Tethys. The anti-Herschel side of Mimas (d=394 km) is also a trough system thought to have formed during the event that created Herschel Crater (d=135 km). At issue is whether, and to what degree, these features may be correlated, and what such correlation implies for each satellite s interior. Watts et al. modeled antipodal pressures and surface accelerations caused by large impacts into Tethys and Mimas, among other bodies, using a 2D Simplified Arbitrary Lagrangian Eulerian (SALE) code. They found that the impact on Tethys produced sufficient disturbance to account for the observed antipodal terrain (i.e. the modeled surface accelerations and pressures were greater than the assumed surface material strength). However, a 2D model is not a good choice for studying antipodal effects, as all wave energy comes to a perfect focus artificially.

Derived from text

Two Dimensional Models; Saturn Satellites; Craters; Terrain; Antipodes

20030111675 Colorado Univ., Boulder, CO, USA

Spectral Variance Derived from MGS-TES Data as a Tool to Detect Hydrothermal Systems

Martinez-Alonso, S.; Kindel, B. C.; Mellon, M. T.; Jakosky, B. M.; Lunar and Planetary Science XXXIV; March 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Life on Earth thrives and may have originated in areas of hydrothermal activity, where water, energy and biogenic elements were available. Hydrothermal environments on Earth are characterized by the presence of a wide variety of mineral species. Oxides and sulfides may have acted as templates, catalysts and energy sources for the first organic reactions. Phyllosilicate minerals may have provided a substratum for the building blocks of RNA to assemble and grow. Minerals characteristic of hydrothermal systems (both fossil and active) can be identified through their infrared emissivity spectra by instruments such as the Thermal Emission Spectrometer (TES), onboard Mars Global Surveyor. The large variety of mineral species characteristic of hydrothermal systems on Earth translates into a large amount of spectral variance. In this study we describe the methodology applied to identify areas of high spectral variance on Mars, which could correspond to hydrothermal systems, using TES emissivity data.

Author

Emission Spectra; Hydrothermal Systems; Mars (Planet); Planetary Geology; Planetary Mapping

20030111676 Texas Univ., Austin, TX, USA

Modeling of Radiation Above Io's Surface from Pele-type Volcanic Plumes and Underground from the Conduit Wall

Zhang, J.; Miki, K.; Goldstein, D. B.; Varghese, P. L.; Trafton, L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Radiation associated with IO's Pele-type volcanic plumes is studied numerically. Infrared (IR) radiation from three SO2 vibrational bands (v1, v2 and v3) in the plume has been examined previously using an optically thin gas model within DSMC. In the present work, the model is improved such that opacity at the band canters is accounted for; it is found that the plume gas dynamics is appreciably altered. Related thermal issues in the underground conduit that leads to the plume are also investigated. We examine if the gas flow in the conduit is adiabatic or if radiative heating from the wall makes it more nearly isothermal.

Derived from text

Mathematical Models; Thermal Radiation; Io; Volcanoes; Plumes; Walls

20030111677 Carnegie Institution of Washington, Washington, DC, USA

Gas-Drag Induced Migration of Solids in the Vicinity of a Density Enhancement in a Non-Uniform Solar Nebula

Haghighipour, N.; Boss, A. P.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present the results of an extensive numerical study of the orbital evolution of small solids, ranging from dust grains to km-sized objects, in the vicinity of a local density enhancement in a non-uniform solar nebula. In a previous study we have shown that when the motions of such solids are restricted to the midplane of the nebula, the combined effect of gas drag and pressure gradients causes the solids to radially migrate toward the location of the maximum gas density. In this paper, we extend our previous analysis to three-dimensional cases and show that such migrations can occur along both radial and vertical directions. We also show that for a certain range of solids radii, these migrations can be quite rapid. The implications of such rapid migrations for collisional coagulations of small solids and also for enhancement of the growth-rate of planetesimals are also discussed.

Derived from text

Gas Density; Migration; Nonuniformity; Solar Nebula; Solids; Drag; Numerical Analysis

20030111678 Arizona State Univ., Tempe, AZ, USA

Hydrogen Isotopes of Phosphates in the New Martian Meteorite GRV 99027

Guan, Y.; Hsu, Weibiano; Leshin, L. A.; Wang, Henian; Wang, Rucheng; Zhang, Fusheng; Lin, Chengyi; Zhang, Wenlan; Lunar and Planetary Science XXXIV; 20023; 2 pp.; In English; See also 20030110578; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Based on its petrography and mineralogy, the Antarctic meteorite Grove Mountains (GRV) 99027 has been classified as the fourth known lherzolitic shergottite, after ALH 77005, Yamato 793605 and LEW 88516 [1, 2]. It consists mainly of olivine (Fa24-31), low- (En61-76Fs21-27Wo3-14) and high- (En48-52Fs13-16Wo33-38) Ca pyroxenes, and plagioclase (An49-55Or<1), with minor amounts of phosphates, chromite, and ilmenite. In this study, we have determined the hydrogen isotopic compositions of phosphates found in this new meteorite.

Author

Hydrogen Isotopes; Phosphates; Shergottites; Isotope Ratios; Meteoritic Composition; SNC Meteorites

20030111679 Arizona State Univ., Tempe, AZ, USA

Thermal Emission Spectra of Silica-coated Basalt and Considerations for Martian Surface Mineralogy

Kraft, M. D.; Sharp, T. G.; Michalski, J. R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578

Contract(s)/Grant(s): NCC2-1051; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Among the most important discoveries made during the Mars Global Surveyor (MGS) mission was that the rocky materials of Mars are broadly divisible into two distinct rock types. The geological significance of this finding is dependent on the mineralogy of these rock types as well as their geographic and stratigraphic positions. Much work has yet to be done to understand these relationships and the small-scale variability of these units. For now, it is worth considering various scenarios that could have resulted in Mars global-scale mineralogical dichotomy. Such work will make clearer what must be looked for in Thermal Emission Spectrometer (TES) and Thermal Imaging Spectrometer (THEMIS) data, what to test with other data sets, and what geological processes can be considered or ruled out as we advance with interpreting Martian geologic history. Here, we suggest that exogenic coatings of secondary silica on basaltic rocks may provide a plausible explanation for the newly discovered distribution of rock types.

Derived from text

Basalt; Emission Spectra; Mars Surface; Mineralogy; Silicon Dioxide; Thermal Emission; Paleontology

20030111681 Universidad Rey Juan Carlos, Madrid, Spain

Geologic Mapping of the Helen Planitia Quadrangle (V52), Venus: The First Results

Lopez, I.; Hansen, V. L.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Helen Planitia Quadrangle (V52) is located in the southern hemisphere of Venus between 25 deg - 50 deg S and 240

deg - 270 deg E, covering an approximate surface of about 7,000,000 sq km between the mesolands of Eastern Parga Chasmata and the lowlands of Helen Planitia. The mean altitude of V52 is between 0 and 2 km over the mean planetary radius (6051.84 km), although some areas of Helen Planitia are below this mean planetary radius. V52 includes a variety of coronae, large volcanoes, ridge belts, and other volcanic and structural features distributed among regional plains materials, allowing the study of their age relationships and evolutionary sequence. V52 provides the opportunity to investigate: a) the style of tectonism and volcanism in an area of transition between mesolands and lowlands; b) the geologic evolution and the role played in the regional resurfacing model of large tectovolcanic structures (volcanoes, coronae, and large radial fracture systems); c) the relationship of these large structures with other styles of volcanism (e.g. small shields) and tectonism along the quadrangle.
Author
Venus Surface; Planetary Mapping; Thematic Mapping; Geological Surveys; Venus (Planet)

20030111682 Arizona Univ., Tucson, AZ, USA
An Impact Ejecta Behavior Model for Small, Irregular Bodies
Richardson, J. E.; Melosh, H. J.; Greenberg, R.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-12619; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In recent years, spacecraft observations of asteroids 951 Gaspra, 243 Ida, 253 Mathilde, and 433 Eros have shown the overriding dominance of impact processes with regard to the structure and surface morphology of these small, irregular bodies. In particular, impact ejecta play an important role in regolith formation, ranging from small particles to large blocks, as well as surface feature modification and obscuration. To investigate these processes, a numerical model has been developed based upon the impact ejecta scaling laws provided by Housen, Schmidt, and Holsapple, and modified to more properly simulate the late-stage ejection velocities and ejecta plume shape changes (ejection angle variations) shown in impact cratering experiments. A target strength parameter has also been added to allow the simulation of strength-dominated cratering events in addition to the more familiar gravity-dominated cratering events. The result is a dynamical simulation which models -- via tracer particles -- the ejecta plume behavior, ejecta blanket placement, and impact crater area resulting from a specified impact on an irregularly shaped target body, which is modeled in 3-dimensional polygon fashion. This target body can be placed in a simple rotation state about one of its principal axes, with the impact site and projectile/target parameters selected by the user. The gravitational force from the irregular target body (on each tracer particle) is determined using the polygonized surface (polyhedron) gravity technique developed by Werner.
Author
Mathematical Models; Asteroids; Cratering; Asteroid Collisions; Ejecta

20030111683 California Inst. of Tech., Pasadena, CA, USA
Slope-Streak Formation and Dust Deposition Rates on Mars
Schorghofer, Norbert; Aharonson, Oded; Gerstell, Mini; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Slopestreaks are a class of features forming on the surface of present day Mars. They were first discovered in high resolution Viking Orbiter images (1; 2), but only Mars Orbiter Camera (MOC) images (3) revealed that they are currently active. Sullivan et al. (4) developed a kinematic model for dry dust avalanches that is consistent with observed characteristics of slope streaks. Schorghofer et al. (5) correlated streak regions with surface properties including low thermal inertia, topographic roughness, and peak temperature, and suggested that a phase transition of trace amounts of water may play a role in triggering such avalanches. Ferris et al. (6) suggested that more voluminous aqueous processes are involved in streak formation. In this study we choose to avoid questions of slopestreak triggering and formation mechanisms, but assume that the observed albedo contrast is due to an event that removes a (usually brighter) dusty material, exposing a (usually darker) subsurface (4; 5). The varying states of fading seen in streaks are assumed to result from the subsequent redeposition of dust over time.
Author
Mars Surface; Albedo

20030111782 Computer Sciences Corp., Huntsville, AL, USA

Engineering-Level Model Atmospheres For Titan and Mars

Justus, C. G.; Keller, Vernon; August 1, 2003; 1 pp.; In English; Planetary Probe Atmospheric Entry and Descent Trajectory Analysis and Science, 6-9 Oct. 2003, Lisbon, Portugal

Contract(s)/Grant(s): NAS8-60000; No Copyright; Avail: Other Sources; Abstract Only

An engineering-level atmospheric model for Titan has been developed for use in NASA s systems analysis studies of aerocapture and entry, descent and landing (EDL) applications in potential missions to Titan. Analogous to highly successful Global Reference Atmospheric Models for Earth (GRAM) and Mars (Mars-GRAM), the new model is called Titan-GRAM. Like GRAM and Mars-GRAM, an important feature of Titan-GRAM is its ability to simulate quasi-random perturbations for Monte-Carlo analyses in developing guidance, navigation and control algorithms, and for thermal systems design. Titan-GRAM features and sample results will be presented. Features of Mars-GRAM especially related to EDL applications will also be presented and illustrated.

Author

Atmospheric Models; Titan; Control Systems Design; Guidance (Motion); Mars Surface; Reference Atmospheres

20030111803 NASA Ames Research Center, Moffett Field, CA, USA

Obliquity Driven Climate Change in Mars' Recent Past

Haberle, R. M.; Montmessin, F.; Forget, F.; Spiga, A.; Colaprete, A.; [2003]; 4 pp.; In English; 3rd International Conference on Mars Polar Science and Exploration, 13-17 Oct. 2003, Lake Louis, Alberta, Canada; Original contains black and white illustrations

Contract(s)/Grant(s): 344-33-20-16; Copyright; Avail: CASI; A01, Hardcopy

We use the NASA/Ames grid Mars general circulation model with an updated radiation code and cloud nlicrophysics scheme. To speed up the simulations, we run the model at fairly coarse resolution (7.5' latitude x 22.5' longitude). Radiation Code Fluxes and heating rates are calculated from a radiation code based on the two-stream solution to radiative transfer that fully accounts for multiple scattering in the presence of gaseous absorp- tion. The model has 12 spectral intervals. Dust and water ice scattering properties are included. For dust, we use the Ockert-Bell [9] values in the visible, and Forget [IO] values in the infrared. For ice, we can either compute them online as the cloud evolves, or we can specify them. Gaseous opacities for water vapor and CO2 are calculated from correlated k-distributions taken from full line-by-line models. Cloud Microphysics Our cloud scheme is based on momentlorder scheme in which the mass mixing ratio and number density of the cloud ensemble are the advected species. From these we obtain a mean particle size and an estimate or the particle size distribution assuming a variance) which we then divide into 8 bins. Cloud microphysics is performed in each of these bins and includes nucleation, condensation, and gravitational settling. Dust is treated as a tracer and serves as condensation nuclei. The altered size distribution is then converted back into a mean size, a mixing ratio, and a particle number density.

Derived from text

Mars Atmosphere; Atmospheric General Circulation Models; Cloud Physics

20030112096 NASA Ames Research Center, Moffett Field, CA, USA

Cratering Rates in the Outer Solar System

Zahnle, Kevin; [2003]; 1 pp.; In English; Exobiology PI Conference, 25-29 Aug. 2003, Moffett Field, CA, USA

Contract(s)/Grant(s): 344-58-21-08

Report No.(s): Rept-1; No Copyright; Avail: CASI; A01, Hardcopy

We have constructed a self-consistent study of cratering rates in the outer solar system. Two papers were written, one on cratering asymmetries on synchronously rotating satellites and the other on the cratering rates themselves. The first addresses the well-founded expectation that the leading hemisphere of a synchronously rotating satellite should be more heavily cratered than the trailing hemisphere, and how our solar system has avoided showing much sign of this. We conclude that Ganymede has in the past rotated nonsynchronously, which may imply that it once harboured a thicker inner ocean than it does now. The other study began as an attempt to determine the age of the surface of Europa at a time when Europa was regarded as a major Exobiological target. In keeping with changing times the study expanded to the point that it now recommends cratering rates for worlds as diverse as Charon and Pluto, and includes the contributions of several invaluable co-authors, none of whom would agree with all of my conclusions. The nexus of the work is the size-frequency distribution of comets striking Jupiter (Figure). This was determined using the historically observed record of comets striking or nearly striking Jupiter; the size-frequency distributions of craters on lightly cratered surfaces of Europa, Ganymede, and Triton; and the size-frequncy distribution of Kuiper Belt objects. Extreme reductionists will be happy to know that the surface of Europa probably has an age of around 50 million years. Perhaps more intriguing is that Neptune's moon Triton, by origin a giant comet and by capture

and orbital evolution a once fully melted giant comet, has a surface that is probably no older than Europa's.
Author
Cratering; Size Distribution; Frequency Distribution; Exobiology; Craters

20030112251 Massachusetts Inst. of Tech., Cambridge, MA, USA
Implications of Lunar Prospector Data for Lunar Geophysics
Zuber, Maria; [2003]; 4 pp.; In English
Contract(s)/Grant(s): NAG5-8707; No Copyright; Avail: CASI; A01, Hardcopy

Research is sumamrized in the following areas: The Asymmetric Thermal Evolution of the Moon; Magma Transport Process on the Moon;The Composition and Origin of the Deep Lunar Crust;The Redistribution of Thorium on the Moon's Surface.
Derived from text
Lunar Surface; Geophysics; Lunar Evolution

20030112419 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Evaluation of Sulfur Flow Emplacement on Io from Galileo Data and Numerical Modeling
Williams, David A.; Greeley, Ronald; Lopes, Rosaly M. C.; Davies, Ashley G.; Journal of Geophysical Research; December 25, 2001; ISSN 0148-0227; Volume 106, No. E12, pp. 33,161-33,174; In English; Paper-2000JE001340
Report No.(s): ASU-PVA-6600/TE; No Copyright; Avail: Other Sources; Abstract Only

Galileo images of bright lava flows surrounding Emakong Patera have bee0 analyzed and numerical modeling has been performed to assess whether these flows could have resulted from the emplacement of sulfur lavas on Io. Images from the solid-state imaging (SSI) camera show that these bright, white to yellow Emakong flows are up to 370 km long and contain dark, sinuous features that are interpreted to be lava conduits, -300-500 m wide and >lo0 km lorig. Neiu-Infrared Mapping S estimate of 344 K f 60 G131'C) within the Bmakong caldera. We suggest that these bright flows likely resulted from either sulfur lavas or silicate lavas that have undergone extensive cooling, pyroclastic mantling, and/or alteration with bright sulfurous materials. The Emakoag bright flows have estimated volume of -250-350 km', similar to some of the smaller Columbia River Basalt flows, If the Emakong flows did result from effusive sulfur eruptions, then they are orders of magnitude reater in volume than any terrestrial sulfur flows. Our numerical modeling capable of traveling tens to hundreds of kilometers, consistent with the predictions of Sagan. Our modeled flow distances are also consistent with the measured lengths of the Emakong channels and bright flows.
Author
Io; Volcanoes

20030112740 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fractionation of the Early Terrestrial Atmospheres: Dynamical Escape
Hartle, Richard E.; [2002]; 1 pp.; In English; American Geophysical Union Fall Meeting, 6-10 Dec. 2002, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Hydrodynamic escape may have played a significant role in the early fractionation of the atmospheres of the terrestrial planets. This possibility has been demonstrated in the last two decades by numerous models that show radial, transonic flow of hydrogen can occur in the presence of sufficient solar EUV Hydrodynamic escape may have played a significant role in the early fractionation of the atmospheres of the terrestrial planets. This possibility has been demonstrated in the last two decades by numerous models that show radial, transonic flow of hydrogen can occur in the presence of sufficient solar EUV flux, thought to exist in the first 500 My. The models show that the larger the solar flux the greater the mass of the fractionating species, which are accelerated to escape speeds by the hydrogen wind through drag processes. As the atmospheres evolve and the solar EUV flux wanes, the maximum mass of flowing gas constituents decreases until all gases become static. We show that fractionation can continue beyond this point when non-radial flow and dynamically enhanced Jeans escape are considered. For example, the early terrestrial atmospheres are thought to have had large hydrogen contents, resulting in exobase altitudes of a planetary radius or more. In this case, rotational speeds at the exobases of Earth and Mars would be large enough so that light constituents would 'spin' off and fractionate, especially at equatorial latitudes. Also, in the presence of transonic flow of hydrogen only, non-radial expansion throws heavier gases to high altitudes in the exosphere, accompanied by strong bulk speeds at the exobase, which results in enhanced thermal escape fluxes and fractionation. flux, thought to exist in the first 500 My. The models show that the larger the solar flux the greater the mass of the fractionating species, which are accelerated to escape speeds by the hydrogen wind through drag processes. As the atmospheres evolve and the solar EUV flux wanes, the

maximum mass of flowing gas constituents decreases until all gases become static. We show that fractionation can continue beyond this point when non-radial flow and dynamically enhanced Jeans escape are considered. For example, the early terrestrial atmospheres are thought to have had large hydrogen contents, resulting in exobase altitudes of a planetary radius or more. In this case, rotational speeds at the exobases of Earth and Mars would be large enough so that light constituents would 'spin' off and fractionate, especially at equatorial latitudes. Also, in the presence of transonic flow of hydrogen only, non-radial expansion throws heavier gases to high altitudes in the exosphere, accompanied by strong bulk speeds at the exobase, which results in enhanced thermal escape fluxes and fractionation.
Author
Fractionation; Planetary Atmospheres; Terrestrial Planets; Solar Flux; Hydrodynamics

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20030110605 Computer Sciences Corp., Lanham, MD, USA
Effects of Solar Particles on the Mars Odyssey Gamma-Ray Spectrometer
Evans, L. G.; Reedy, R. C.; Boynton, W. V.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Solar energetic particles affect the Mars Odyssey Gamma Ray Spectrometer. These particles distort the measured spectra and create many gamma rays. Gamma rays from some radionuclides made by the energetic solar particles persist after the event. Spectra taken during and some time after an event should only be used after major corrections.
Author
Solar Cosmic Rays; 2001 Mars Odyssey; Gamma Ray Spectrometers

20030110994 NASA Johnson Space Center, Houston, TX, USA
Solar Particle Events Observed by the Odyssey MARIE Instrument at Mars: Dose and Model Calculations
Cleghorn, T. F.; Saganti, P. B.; Zeitlin, C. J.; Cucinotta, F. A.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the primary concerns prior to human exploration of Mars is the need to accurately characterize the charged particle radiation environment both for the surface stay, and for the transit period to and from the planet. The Odyssey spacecraft, currently in Mars orbit includes a charged particle radiation detector, MARIE, which can measure particle fluxes with energies above approx. 30 MeV and charges between 1 and 10. Two classes of particles are of particular interest: the Galactic Cosmic Rays, (GCR), and those charged particles associated with Solar Particle Events, (SPE). The GCR are present continuously throughout the solar activity cycle, and their numbers vary inversely with the level of solar activity. They are characteristically more energetic than those particles originating from solar activity, and hence less influences by the solar magnetic field.
Derived from text
Solar Flares; Solar Magnetic Field; Radiation Counters

20030111427 European Space Agency. European Space Operations Center, Darmstadt, Germany
Transparency of the Inner Heliosphere to the Interstellar Dust Stream During Solar Maximum: Ulysses Measurements and Modelling
Landgraf, M.; Krueger, H.; Altobelli, N.; Gruen, E.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Galactic dust can be captured into closed orbits around the Sun. The amount of galactic dust in interplanetary space depends strongly on the efficiency of the solar wind filtering. Here we report the observation of the variation of the galactic interstellar dust measured by the dust instrument on board the Ulysses spacecraft. An increasing number of interstellar grains has been detected since beginning of 2000. According to our model calculations the increase of interstellar dust in the solar system marks the the beginning of large-scale disturbances of the solar wind magnetic field polarity during solar maximum.

The configuration of the solar wind magnetic field will cause the number of interstellar dust grains in the solar system to steadily increase until the next solar maximum.
Author
Cosmic Dust; Solar Wind; Ulysses Mission; Solar Activity Effects; Heliosphere

20030111608 Hawaii Univ., Honolulu, HI, USA
Modal Analysis and Phase Identification in Meteorite Thin Sections Using 'Freeware' for PC
vanNiekerk, D.; Lunar and Planetary Science XXXIV; 2003; 2 pp.; In English; See also 20030110578; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Automated mapping and determination of mineral modes in thin sections have been the subject of various publications. Automated techniques have advantages that include denser sample counts, speed, and potential elimination of biases in mineral identification. Many of these studies however, have presented techniques based on specialized or expensive software, as well as software that, due to logistical reasons, may not always be widely accessible. A previous study at the University of Hawaii developed a technique for automated mapping and modal analysis of meteorite thin sections, using image processing software. Here I present an extension to that technique that makes it more accessible to a wider range of users, by replacing specialized software with free software for the Windows environment.
Derived from text
Automatic Control; Personal Computers; Mineralogy; Thematic Mapping; SNC Meteorites

20030112438 NASA Glenn Research Center, Cleveland, OH, USA
Ground Tests of High-Voltage Solar Arrays Immersed in a Low Density Plasma
Vayner, Boris; Galofaro, Joel; Ferguson, Dale; February 25, 2003; 11 pp.; In English; 34th AIAA Plasma Dynamics and Lasers Conference, 23-26 Jun. 2003, FL, USA
Contract(s)/Grant(s): 22-755-60-04
Report No.(s): AIAA Paper 2003-4295; Copyright; Avail: CASI; A03, Hardcopy

Five different types of solar arrays have been tested in large vacuum chamber. Arc inception voltages, arc rates, and current collections are measured for samples with different coverglass materials and thickness, interconnect designs, and cell sizes. It is shown that the array with wrapthrough interconnects have the highest arc threshold and the lowest current collection. Coverglass design with overhang results in decrease of current collection and increase of arc threshold. Doubling coverglass thickness does not improve measured array parameters. Both arc inception voltage and current collection increase significantly with increasing a sample temperature to 80 C. Sustained discharges are initiated between adjacent cells with potential differences of 40 V for the sample with 300 pm coverglass thickness and 60 V for the sample with 150 urn coverglass thickness.
Author
Plasmas (Physics); Solar Arrays; High Voltages; Electric Potential

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20030111792 NASA Marshall Space Flight Center, Huntsville, AL, USA
Radiation Shielding for Manned Deep Space Missions
Adams, James H., Jr.; [2003]; 1 pp.; In English; Radiation Safety for Manned Mission to Mars Conference, 28 Sep. - 2 Oct. 2003, Dubna, Russia; No Copyright; Avail: Other Sources; Abstract Only

The arrival of the Expedition 1 Crew at the International Space Station represents the beginning of the continuous presence of man in space. Already we are deploying astronauts and cosmonauts for missions of approx. 6 months onboard the ISS. In the future we can anticipate that more people will be in space and they will be there for longer periods. Even with 6-months deployments to the ISS, the radiation exposure that crew members receive is approaching the exposure limits imposed by the governments of the space- faring nations. In the future we can expect radiation protection to be a dominant consideration for long manned missions. Recognizing this, NASA has expanded their research program on radiation health. This program has three components, bioastronautics, fundamental biology and radiation shielding materials. Bioastronautics

is concerned with the investigating the effects of radiation on humans. Fundamental biology investigates the basic mechanisms of radiation damage to tissue. Radiation shielding materials research focuses on developing accurate computational tools to predict the radiation shielding effectiveness of materials. It also investigates new materials that can be used for spacecraft. The radiation shielding materials program will be described and examples of results from the ongoing research will be shown. Author

Radiation Shielding; Manned Space Flight; Deep Space; Radiation Damage; Radiation Effects

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