National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 41 Issue 21

October 17, 2003

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NASA STI Program ... in Profile

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- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

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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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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 41, OCTOBER 17, 2003

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*.

20030071136 NASA Ames Research Center, Moffett Field, CA, USA
Adaptive Neuro-Fuzzy Modeling of UH-60A Pilot Vibration
Kottapalli, Sesi; Malki, Heidar A.; Langari, Reza; [2003]; 9 pp.; In English; AIAA Dynamics Specialists Conference, 9-10 Apr. 2003, Norfolk, VA, USA
Contract(s)/Grant(s): RTOP 712-92-43; No Copyright; Avail: CASI; A02, Hardcopy

Adaptive neuro-fuzzy relationships have been developed to model the UH-60A Black Hawk pilot floor vertical vibration. A 200 point database that approximates the entire UH-60A helicopter flight envelope is used for training and testing purposes. The NASA/Army Airloads Program flight test database was the source of the 200 point database. The present study is conducted in two parts. The first part involves level flight conditions and the second part involves the entire (200 point) database including maneuver conditions. The results show that a neuro-fuzzy model can successfully predict the pilot vibration. Also, it is found that the training phase of this neuro-fuzzy model takes only two or three iterations to converge for most cases. Thus, the proposed approach produces a potentially viable model for real-time implementation.
Author
Flight Tests; Uh-60a Helicopter; Adaptive Control; Fuzzy Systems; Neural Nets; Aircraft Pilots; Structural Vibration; Aircraft Models

20030071140 NASA, Washington, DC, USA
Evaluation of Flying Qualities and Guidance Displays for an Advanced Tilt-Wing STOL Transport Aircraft in Final Approach and Landing
Frost, Chad R.; Franklin, James A.; Hardy, Gordon H.; [2002]; 9 pp.; In English; 2002 Biennial International Powered Lift Conference and Exhibit, 5-7 Nov. 2002, Williamsburg, VA, USA
Report No.(s): AIAA Paper 2002-6016; No Copyright; Avail: CASI; A02, Hardcopy

A piloted simulation was performed on the Vertical Motion Simulator at NASA Ames Research Center to evaluate flying qualities of a tilt-wing Short Take-Off and Landing (STOL) transport aircraft during final approach and landing. The experiment was conducted to assess the design s handling qualities, and to evaluate the use of flightpath-centered guidance for the precision approach and landing tasks required to perform STOL operations in instrument meteorological conditions, turbulence, and wind. Pilots rated the handling qualities to be satisfactory for all operations evaluated except those encountering extreme crosswinds and severe windshear; even in these difficult meteorological conditions, adequate handling qualities were maintained. The advanced flight control laws and guidance displays provided consistent performance and precision landings.
Author
Aircraft Landing; Approach; Flight Characteristics; Short Takeoff Aircraft; Transport Aircraft; Vertical Motion Simulators; Tilt Wing Aircraft; Aircraft Guidance; Display Devices

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*.

20030069008 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
Two-Dimensional Potential Flow Past an Ordinary Thick Wing Profile
Keune, F.; July 1942; 62 pp.; In English
Report No.(s): NACA-TM-1023; No Copyright; Avail: CASI; A04, Hardcopy

This report deals with the development of a method which gives a lucid and convenient solution of the flow conditions in the vicinity of a common, thick airfoil section wherein the thickness of the profile is taken into account. The method consists in making the airfoil the streamline in a parallel flow by disposing on its mean line certain source and vortex distributions the fields of which are superposed on the parallel flow. These distributions of singularities are secured for the generalized Karman-Trefftz profile by means of conformal transformation from the flow about a circle. Five different distribution functions are afforded for the density of superposition, which combine in a specified manner to the necessary distributions of singularity and represent a generalized Karman-Trefftz profile in parallel flow. For these profiles the speed for each of the five distributions is then computed independently of the angle of attack.
Author
Airfoil Profiles; Trefftz Method

20030071127 NASA Ames Research Center, Moffett Field, CA, USA
Wind Tunnel Measurements and Calculations of Aerodynamic Interactions Between Tiltrotor Aircraft
Johnson, Wayne; Yamauchi, Gloria K.; Derby, Michael R.; Wadcock, Alan J.; [2002]; 10 pp.; In English; 41st AIAA Aerospace Sciences Meeting and exhibit, 6-9 Jan. 2003, Reno, NV, USA
Report No.(s): AIAA Paper 2003-47; Copyright; Avail: CASI; A02, Hardcopy

Wind tunnel measurements and calculations of the aerodynamic interactions between two tiltrotor aircraft in helicopter mode are presented. The measured results include the roll moment and thrust change on the downwind aircraft, as a function of the upwind aircraft position (longitudinal, lateral, and vertical). Magnitudes and locations of the largest interactions are identified. The calculated interactions generally match the measurements, with discrepancies attributed to the unsteadiness of the wake and aerodynamic forces on the airframe. To interpret the interactions in terms of control and power changes on the aircraft, additional calculations are presented for trimmed aircraft with gimballed rotors.
Author
Aerodynamic Forces; Tilt Rotor Aircraft; Wind Tunnel Tests; Aircraft Configurations; Aircraft Models

20030071145 NASA Ames Research Center, Moffett Field, CA, USA
An Aerodynamic Analysis of a Spinning Missile with Dithering Canards
Meakin, Robert L.; Nygaard, Tor A.; [2003]; 29 pp.; In English; 20th AIAA Applied Aerodynamics Conference, 24-26 Jun. 2002, Saint Louis, MO, USA; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

A generic spinning missile with dithering canards is used to demonstrate the utility of an overset structured grid approach for simulating the aerodynamics of rolling airframe missile systems. The approach is used to generate a modest aerodynamic database for the generic missile. The database is populated with solutions to the Euler and Navier-Stokes equations. It is used to evaluate grid resolution requirements for accurate prediction of instantaneous missile loads and the relative aerodynamic significance of angle-of-attack, canard pitching sequence, viscous effects, and roll-rate effects. A novel analytical method for inter- and extrapolation of database results is also given.
Author
Aerodynamic Characteristics; Dithers; Missile Systems; Missile Configurations; Canard Configurations; Maneuverability; Spin Dynamics

20030071256 NASA Ames Research Center, Moffett Field, CA, USA
Rotor Wake Development During the First Revolution
McAlister, Kenneth W.; [2003]; 29 pp.; In English; 59th American Helicopter Society Annual Forum, 6-8 May 2003, Phoenix, AZ, USA; No Copyright; Avail: CASI; A03, Hardcopy

The wake behind a two-bladed model rotor in light climb was measured using particle image velocimetry, with particular emphasis on the development of the trailing vortex during the first revolution of the rotor. The distribution of vorticity was distinguished from the slightly elliptical swirl pattern. Peculiar dynamics within the void region may explain why the peak vorticity appeared to shift away from the center as the vortex aged, suggesting the onset of instability. The swirl and axial velocities (which reached 44 and 12 percent of the rotor-tip speed, respectively) were found to be asymmetric relative to the vortex center. In particular, the axial flow was composed of two concentrated zones moving in opposite directions. The radial distribution of the circulation rapidly increased in magnitude until reaching a point just beyond the core radius, after which the rate of growth decreased significantly. The core-radius circulation increased slightly with wake age, but the large-radius circulation appeared to remain relatively constant. The radial distributions of swirl velocity and vorticity exhibit self-similar behaviors, especially within the core. The diameter of the vortex core was initially about 10 percent of the rotor-blade chord, but more than doubled its size after one revolution of the rotor. According to vortex models that approximate the measured data, the core-radius circulation was about 79 percent of the large-radius circulation, and the large-radius circulation was about 67 percent of the maximum bound circulation on the rotor blade. On average, about 53 percent of the maximum bound circulation resides within the vortex core during the first revolution of the rotor.
Author
Helicopter Wakes; Rotor Dynamics; Computational Fluid Dynamics; Mathematical Models; Rotor Blades; Full Scale Tests

20030075642 National Renewable Energy Lab., Golden, CO
Horizontal Axis Wind Turbine Aerodynamics: Three-Dimensional, Unsteady, and Separated Flow Influences
Robinson, M. C.; Hand, M. M.; Simms, D. A.; Schreck, S. J.; Apr. 1999; 18 pp.
Report No.(s): DE2003-7095; NREL/CP-500-26337; No Copyright; Avail: Department of Energy Information Bridge
Surface pressure data from the National Renewable Energy Laboratory's 'Unsteady Aerodynamics Experiment' were analyzed to characterize the impact of three-dimensionality, unsteadiness, and flow separation effects observed to occur on downwind horizontal axis wind turbines (HAWT). Surface pressure and strain gage data were collected from two rectangular planform blades with S809 airfoil cross-sections, one flat and one twisted. Both blades were characterized by the maximum leading edge suction pressure and by the azimuth, velocity, and yaw at which it occurred. The occurrence of dynamic stall at all but the inboard station (30% span) shows good quantitative agreement with the theoretical limits on inflow velocity and yaw that should yield dynamic stall events. A full three-dimensional characterization of the surface pressure topographies combined with flow visualization data from surface mounted tufts offer key insights into the three-dimensional processes involved in the unsteady separation process and may help to explain the discrepancies observed with force measurements at 30% span. The results suggest that quasi-static separation and dynamic stall analysis methods relying on purely two-dimensional flow characterizations may not be capable of simulating the complex three-dimensional flows observed with these data.
NTIS
Wind Turbines; Aerodynamics; Windpower Utilization

20030075648
Theoretical Aerodynamic Analyses of Six Airfoils for Use on Small Wind Turbines. Period of Performance: July 11, 2002-October 31, 2002
Somers, D. M.; Maughmer, M. D.; Jun. 2003; 99 pp.; In English
Report No.(s): DE2003-15003956; No Copyright; Avail: Department of Energy Information Bridge
Theoretical analyses of six airfoils-the E 387, FX 63-137, S822, S834, SD2030, and SH3055-have been performed for Reynolds numbers from 0.10 x 106 to 1.00 x 106 using the Eppler Airfoil Design and Analysis Code and the XFOIL code. The results from both codes exhibit the typical Reynolds number and roughness effects. Comparisons of the results from the two codes generally show good agreement, particularly for Reynolds numbers greater than 0.10 x 106. The maximum lift coefficient predicted by the XFOIL code is about 0.2 higher, and the Reynolds number and roughness effects are larger. The magnitudes of the zero-lift angle and pitching-moment coefficients predicted by the Eppler code are greater.
NTIS
Wind Turbines; Airfoils; Numerical Analysis; Aeroacoustics; 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*.

20030068967 Naval Postgraduate School, Monterey, CA
Autonomous Agent-Based Simulation of an AEGIS Cruiser Combat Information Center Performing Battle Group Air Defense Commander Operations
Calfee, Sharif H.; Mar. 2003; 251 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414842; No Copyright; Avail: CASI; A12, Hardcopy

The AEGIS Cruiser Air-Defense Simulation is a program that models the operations of a Combat Information Center (CIC) team performing the ADC duties in a battle group using Multi-Agent System (MAS) technology implemented in the Java programing language. Set in the Arabian Gulf region, the simulation is a top-view, dynamic, graphics-driven software implementation that provides a picture of the CIC team grappling with a challenging, complex problem. Conceived primarily as a system to assist ships, waterfront training teams, and battle group staffs in ADC training and doctrine formulation, the simulation was designed to gain insight and understanding into the numerous factors (skills, experience, fatigue, aircraft numbers, weather, etc.) that influence the performance of the overall CIC team and watchstanders. The program explores the team's performance under abnormal or high intensity/stress situations by simulating their mental processes, decision-making aspects, communications patterns, and cognitive attributes. Everything in the scenario is logged, which allows for the reconstruction of interesting events (i. e. watchstander mistakes, chain-of-error analysis) for use in post-scenario training as well as the creation of new, more focused themes for actual CIC team scenarios. The simulation also tracks various watchstander and CIC team performance metrics for review by the user.
DTIC
Air Defense; Simulation; Combat

20030068972 Arizona State Univ., Tempe, AZ
Improving Target Orientation Discrimination Performance in Air-to-Air Flight Simulation
Serfoss, Gary; May 2003; 78 pp.; In English
Report No.(s): AD-A414893; No Copyright; Avail: CASI; A05, Hardcopy

When performing air-to-air combat within visual range of the target aircraft, pilots are in an extremely high workload environment where they are pushing their own limits, as well as that of their aircraft. Nearly all attention is focused visually on trying to acquire, track and assess the adversary's orientation and range. If a pilot detects the enemy just a second or two later than the enemy detects them, or misjudges the orientation of the enemy aircraft and falsely concludes how he is maneuvering - the enemy will likely shoot him down first.
DTIC
Flight Simulation; Workloads (Psychophysiology)

20030068983 Florida Agricultural and Mechanical Univ., Tallahassee, FL
Active Control of Supersonic Impinging Jets Using Supersonic Microjets
Krothapalli, Anjaneyulu; Alvi, Farrukh S.; Shih, Chiang; Annaswamy, Anu; Apr. 28, 2003; 144 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0141
Report No.(s): AD-A414914; FMRL-03-03; AFRL-SR-AR-TR-03-0209; No Copyright; Avail: CASI; A07, Hardcopy

Supersonic impinging jet flows, such as those that occur in the next generation of STOVL aircraft, are highly unsteady due to the presence a feedback loop. This results in large dynamic loads on the nearby aircraft structures and surfaces and diminishes aircraft performance. In this study, a unique active control technique that utilizes arrays of supersonic microjets (less than or equal 400 micrometers) around the periphery of the main jet was examined. The efficacy of microjet control was explored over a large parametric range. This control approach was very successful and the activation of the microjets led to dramatic reductions in ground effect. The lift loss was reduced by up to 40%, while the unsteady loads were reduced by as much as 12 dB. These dramatic gains in performance were achieved with negligible microjet mass flux (less than 0.5%) . A detailed study of this flow was conducted to better understand the governing flow physics. The velocity field data clearly indicates that the activation of microjets generates significant streamwise vorticity while reducing the azimuthal vorticity of the primary jet It is proposed that the streamwise vorticity is mainly a result of the redirection of the azimuthal vorticity, which

weakens the large-scale structures in the primary jet. This is considered to be a primary factor in the efficient disruption of the feedback loop. A new, POD-based, closed-loop control strategy, is also explored in order to achieve optimal and uniform control. The closed-loop control results led to an improvement in the control efficiency compared to the open-loop strategy in a number of cases.
DTIC
Aircraft Structures; Stovl Aircraft

20030068998 Massachusetts Inst. of Tech., Cambridge, MA, USA
Preliminary Design and Evaluation of Portable Electronic Flight Progress Strips
Doble, Nathan A.; Hansman, R. John; [2002]; 8 pp.; In English; 21st Digital Avionics Systems Conference, 2002
Contract(s)/Grant(s): NCC2-1147; MIT-OSP-6890296
Report No.(s): IEEE-02CH37325C; No Copyright; Avail: CASI; A02, Hardcopy

There has been growing interest in using electronic alternatives to the paper Flight Progress Strip (FPS) for air traffic control. However, most research has been centered on radar-based control environments, and has not considered the unique operational needs of the airport air traffic control tower. Based on an analysis of the human factors issues for control tower Decision Support Tool (DST) interfaces, a requirement has been identified for an interaction mechanism which replicates the advantages of the paper FPS (e.g., head-up operation, portability) but also enables input and output with DSTs. An approach has been developed which uses a Portable Electronic FPS that has attributes of both a paper strip and an electronic strip. The prototype flight strip system uses Personal Digital Assistants (PDAs) to replace individual paper strips in addition to a central management interface which is displayed on a desktop computer. Each PDA is connected to the management interface via a wireless local area network. The Portable Electronic FPSs replicate the core functionality of paper flight strips and have additional features which provide a heads-up interface to a DST. A departure DST is used as a motivating example. The central management interface is used for aircraft scheduling and sequencing and provides an overview of airport departure operations. This paper will present the design of the Portable Electronic FPS system as well as preliminary evaluation results.
Author
Air Traffic Control; Airport Towers; Decision Support Systems

20030071085 Army War Coll., Carlisle Barracks, PA
Strategic Air Mobility: Meeting the Demands of the 21st Century
Eisenhut, Joey A.; Apr. 7, 2003; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414934; No Copyright; Avail: CASI; A03, Hardcopy

This project examines the current Strategic Air Mobility policy and the associated strategic deployment challenges to that policy. The current policy analysis is provided to determine if it is the answer to the problems and issues facing our strategic mobility forces (specifically those provided by the USA Air Force's Air Mobility Command). A background of strategic lift is provided to set the stage for our current policy as well as what our future policy ought to be or the direction our policy should be heading. Finally, the project identifies and examines the significant challenges for the future and how our current strategic air mobility decisions are affecting our ability to meet those challenges.
DTIC
Military Technology; Mobility

20030071203 General Accounting Office, Washington, DC
Airline Labor Relations: Information on Trends and Impact of Labor Actions
Jun. 2003; 62 pp.
Report No.(s): PB2003-106193; GAO-03-652; No Copyright; Avail: CASI; A04, Hardcopy

Observers of the interactions between airline management and labor have long characterized these labor relations as contentious and adversarial. Negotiations between unions and airlines, for example, have taken up to 4 years to complete. Unions and airlines have each prolonged negotiations for their financial benefit. The importance of labor relations has recently been magnified by the financial crisis facing many airlines. Since September 11, 2001, US Airways, United Airlines, and Hawaiian Airlines have entered Chapter 11 bankruptcy, and American Airlines is fighting to avoid bankruptcy. US Airways, United, and American have all had to obtain the consent of their unions for contract concessions to substantially cut labor costs. At stake, according to industry observers and financial officials, has been the continued existence of at least two airlines. The process under which labor negotiations in the airline industry take place is substantially different than the process of most other industries. Airline labor contracts do not expire, and their negotiations can include a series of steps--including mediation,

arbitration, and presidential interventions--specifically designed to avoid an impasse that would interrupt the flow of essential commerce.
NTIS
Air Transportation; Labor; Unionization; Industrial Management; Civil Aviation; Airline Operations

20030071235 Massachusetts Inst. of Tech., Cambridge, MA, USA
Runway Operations Planning: A Two-Stage Solution Methodology
Anagnostakis, Ioannis; Clarke, John-Paul; [2003]; 12 pp.; In English
Contract(s)/Grant(s): NCC2-1147; No Copyright; Avail: CASI; A03, Hardcopy

The airport runway is a scarce resource that must be shared by different runway operations (arrivals, departures and runway crossings). Given the possible sequences of runway events, careful Runway Operations Planning (ROP) is required if runway utilization is to be maximized. Thus, Runway Operations Planning (ROP) is a critical component of airport operations planning in general and surface operations planning in particular. From the perspective of departures, ROP solutions are aircraft departure schedules developed by optimally allocating runway time for departures given the time required for arrivals and crossings. In addition to the obvious objective of maximizing throughput, other objectives, such as guaranteeing fairness and minimizing environmental impact, may be incorporated into the ROP solution subject to constraints introduced by Air Traffic Control (ATC) procedures. Generating optimal runway operations plans was approached in with a 'one-stage' optimization routine that considered all the desired objectives and constraints, and the characteristics of each aircraft (weight class, destination, Air Traffic Control (ATC) constraints) at the same time. Since, however, at any given point in time, there is less uncertainty in the predicted demand for departure resources in terms of weight class than in terms of specific aircraft, the ROP problem can be parsed into two stages. In the context of the Departure Planner (OP) research project, this paper introduces Runway Operations Planning (ROP) as part of the wider Surface Operations Optimization (SOO) and describes a proposed 'two stage' heuristic algorithm for solving the Runway Operations Planning (ROP) problem. Focus is specifically given on including runway crossings in the planning process of runway operations. In the first stage, sequences of departure class slots and runwy crossings slots are generated and ranked based on departure runway throughput under stochastic conditions. In the second stage, the departure class slots are populated with specific flights from the pool of available aircraft, by solving an integer program. Preliminary results from the algorithm implementation on real-world traffic data are included.
Author
Air Traffic Control; Airports; Runways; Scheduling; Resource Allocation

20030071245 Air Force Research Lab., Wright-Patterson AFB, OH
A Multi-Purpose Simulation Environment for UAV Research
Nalepka, Joseph P.; Duquette, Matthew M.; May 2003; 10 pp.; In English
Report No.(s): AD-A415133; AFRL-VA-WP-TP-2003-313; ASC-03-1157; No Copyright; Avail: CASI; A02, Hardcopy

Unmanned aerial vehicles (UAVs) are playing an important role in today's military initiatives. UAVs have proven to be invaluable in locating critical targets and reporting enemy movements or positions to battlefield commanders. Integration of new technologies necessitates simulation prior to fielding new systems in order to avoid costly errors. The unique nature of UAVs in a modem combat environment requires the simulation of a significant part of the battle space to test the robustness of new technologies. Furthermore, simulation environments should be flexible and generic to allow for expedient testing of a wide range of concepts. Members of the Air Force Research Laboratory (AFRL) at Wright-Patterson AFB are developing a multi-purpose simulation environment that will allow for the assessment of many different types of UAV technologies. This paper discusses this simulation activity and describes how it fits into AFRL's corporate plan.
DTIC
Remotely Piloted Vehicles; Pilotless Aircraft; Simulation

20030071277 Air Force Inst. of Tech., Wright-Patterson AFB, OH
A Three-Dimensional Heads-Up Primary Navigation Reference Display for Paratroopers Performing High Altitude High Open Jumps
Balazs, Brian A.; Mar. 25, 2003; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415176; AFIT/GCS/ENG/03-02; No Copyright; Avail: CASI; A05, Hardcopy

The Department of Defense (DoD) relies on the para-dropping of resources to meet different objectives in order to accomplish missions during peace-time, war-time, or military operations other than war. The resources dropped to the ground

via parachute range from supplies and equipment to the most valued asset, people. Tactics have been developed to increase the safety of troops parachuting into areas of conflict. These tactics include high-altitude high-opening (HAHO) jumping and night jumping. HAHO jumping allows paratroopers to travel large distances in the air away from the path of the delivering aircraft. While night jumping, done with the aid of night vision goggles (NVGs), provides paratroopers with the cover of night. Both of these tactics aid in avoiding detection. These techniques, however, have their drawback: low cloud cover and fog can often delay mission accomplishment due to a lack of visibility. However, low cloud cover and foggy conditions also provide a tremendous aid in covert insertion missions and enhance the element of surprise. This research introduces a novel application combining three-dimensional graphics and GPS for a primary navigation reference for paratroopers. It uses three-dimensional graphics to realistically portray a paratrooper's movement in the physical world, measured by GPS, as movement in a computer generated scene. This reference, presented as a heads-up display on the NGVs paratroopers already wear, facilitates mission accomplishment in cloudy and foggy conditions. Evaluation of a prototype system validates the effectiveness of such a three-dimensional navigation reference for paratroopers.
DTIC
Parachute Descent; Parachutes; Navigation Aids

20030073449 Federal Aviation Administration, Washington, DC, Northrop Grumman Information Technology, Inc., Fairborn, OH, USA
Function Key and Shortcut Key Use in Airway Facilities
Ahlstrom, V.; Muldoon, R.; Feb. 2003; 58 pp.; In English
Report No.(s): PB2003-106634; DOT/FAA/CT-TN03/07; No Copyright; Avail: CASI; A04, Hardcopy

This document provides information on the function keys and shortcut keys used by systems in the Federal Aviation Administration Airway Facilities (AF) work environment. It includes a catalog of the function keys and shortcut keys used by each system and the associated functionality. Researchers collected these data through analysis of software specifications, computer-based instruction manuals, and field site visits. They extracted human factor guidelines relevant to function key and shortcut key use from human factors guidelines and the research literature. Researchers also collected information on function key and shortcut key use by commercial applications to extract what amounts to de facto industry standards for function key and shortcut key use. The researchers compared current function key and shortcut key use across systems in the AF operational environment. They also compared current AF use of function keys and shortcut keys against human factors guidelines and de facto industry standards. Based on this evaluation, the researchers found little consistency in the assignment of functions to function keys and shortcut keys among different AF systems. The researchers make recommendations toward improving consistency and usability of function keys and shortcut keys in the AF environment.
NTIS
Computers; Human Factors Engineering; Airports

20030073450 Federal Aviation Administration, Atlantic City, NJ, USA
Initial Study of National Airspace System Auditory Alarm Issues in Terminal Air Traffic Control
Ahlstrom, V.; Apr. 2003; 22 pp.
Report No.(s): PB2003-106636; DOT/FAA/CT-TN03/10; No Copyright; Avail: CASI; A03, Hardcopy

A researcher from the Research Development & Human Factors Laboratory of the William J. Hughes Technical Center conducted an exploratory study to examine current National Airspace System (NAS) auditory alarm issues. The purpose was to identify problem areas related to current auditory alarms and to collect opinions from the users on ways to improve auditory alarms in their work area. Based on availability, the participants were from the terminal (Air Traffic Control Tower and Terminal Radar Approach Control) area. Participants rated 15 potential auditory alarm issues on a scale from 0 to 10 on how problematic each issue was in their work area. Based on the comments participants provided, some of the problems that they reported with auditory alarms could be traced to a few specific systems. Other problems were more general in nature, including alarms being too numerous in the work environment. They also reported problems with too many false alarms. Although this study was not meant to be all encompassing, it provides an initial look at the auditory alarm issues within the current NAS environment.
NTIS
Air Traffic Control; Warning Systems; Human Factors Engineering; Auditory Signals

20030075663 National Transportation Safety Board, Washington, DC
Annual Review of Aviation Accident Data: U.S. Air Carrier Operations, Calendar Year 1999
2003; 62 pp.; In English
Report No.(s): PB2002-109241; NTSB/ARC-02/03; No Copyright; Avail: CASI; A04, Hardcopy

This publication presents a statistical compilation and review of accidents that occurred in 1999 involving aircraft operated by U.S. air carriers. In addition to providing accident statistics for 1999, the review also includes general economic and aviation indicators that may have influenced aircraft activity for 1999 as well as contextual accident data from several years preceding the reporting period. This review covers accidents involving aircraft operated by U.S. air carriers under Title 14, Parts 121 and 135, of the Code of Federal Regulations (CFR). Air carriers are generally defined as operators that fly aircraft in revenue service. Title 14, also known as the Federal Aviation Regulations (FARs), describes operating requirements in Part 121 and Part 135. Briefly stated, Part 121 applies to major airlines and cargo carriers that fly large transport-category aircraft while Part 135 applies to commercial air carriers commonly referred to as commuter airlines (i.e., scheduled Part 135) and air taxis (i.e., nonscheduled Part 135).
NTIS
Aircraft Accidents; Statistical Analysis

20030079949 Federal Aviation Administration, Washington, DC
Aircraft Rescue and Firefighting Training Fuel Comparative Evaluation
Bagot, K.; Feb. 2001; In English
Report No.(s): PB2003-106889; DOT/FAA/AR-TN01/4; No Copyright; Avail: National Technical Information Service (NTIS)
Environmental air and water quality regulations are getting more and more stringent. Changes to the regulations are making it difficult for aircraft rescue and firefighting (ARFF) personnel to get quality firefighting training. The environmental regulations are increasing the cost of operating liquid hydrocarbon-based training facilities and forcing several training facilities to close or transition to propane. The Federal Aviation Administration William J. Hughes Technical Centers ARFF research program conducted a comparative evaluation of one of the existing fuels for training (JP8) and two recently developed products produced specifically for firefighting training by Exxon Chemical Company and Envirofuel Incorporated. Both of the new training products showed major improvements in reducing the production of environmentally harmful by-products. Data indicate that the Exxon product produced the least amount of smoke output and contaminated water runoff.
NTIS
Aircraft Fuels; Rescue Operations; Training Evaluation; Fire Fighting

20030079950 Federal Aviation Administration, Atlantic City, NJ, USA
Summary of Progress on the Master Database of Supercooled Large Droplet (SLD) Icing Conditions
Jeck, R.; May 2001; 15 pp.
Report No.(s): PB2003-106892; DOT/FAA/AR-TN01/25; No Copyright; Avail: CASI; A03, Hardcopy
This report summarizes the status to date of the master database of supercooled large droplet (SLD) in-flight icing conditions being compiled at the Federal Aviation Administration (FAA) William J. Hughes Technical Center.
NTIS
Data Bases; Drop Size; Aircraft Icing; Aviation Meteorology

20030079951 Federal Aviation Administration, Washington, DC
Oxygen Enhanced Fires in LD-3 Cargo Containers
Market, T. R.; Diaz, R.; May 1999; 20 pp.
Report No.(s): PB2003-106902; DOT/FAA/AR-TN98-29; No Copyright; Avail: CASI; A03, Hardcopy
Four tests were conducted inside a 169-cubic-foot LD-3 cargo container to demonstrate the hazards associated with the release of gaseous oxygen during suppression of a smoldering fire with Halon 1301. The cargo fires were allowed to burn for a short duration before Halon 1301 was discharged into the container. After the suppressant concentration stabilized to about 3%, the minimum design concentration for inerting, a quantity of oxygen was discharged to simulate the relief of oxygen from an overpressurized cylinder. During the first three tests, 11 cubic feet of oxygen was bled into the container from a remote cylinder. A fourth test was conducted in which 22 cubic feet of oxygen was introduced which produced a severe fire that destroyed the container. Temperature, toxic gases, and halon concentration were measured continuously inside the container and video cameras recorded the tests from three locations external to the container.
NTIS
Aircraft Compartments; Aircraft Accidents; Commercial Aircraft; Oxygen; Fires; Drums (Containers)

20030082045 General Accounting Office, Washington, DC
Airline Ticketing: Impact of Changes in the Airline Ticket Distribution Industry
Jul. 2003; 50 pp.; In English
Report No.(s): PB2003-106948; GAO-03-749; No Copyright; Avail: CASI; A03, Hardcopy

In 2002, when major U.S. airlines posted net operating losses of almost $10 billion, they paid over $7 billion to distribute tickets to consumers. Of these total distribution expenses, airlines paid hundreds of millions of dollars in booking fees to global distribution systemsthe companies who package airline flight schedule and fare information so that travel agents can query it to book (i.e., reserve and purchase) flights for consumers. Each time a consumer purchases an airline ticket through a travel agent, the global distribution system used by the travel agent charges the airline a set booking fee. Concerns have been raised that the global distribution systems may exercise market power over the airlines because most carriers are still largely dependent on each of the global distribution systems for distributing tickets to different travel agents and consumers and therefore must subscribe and pay fees to each. Market power would allow global distribution systems to charge high, noncompetitive fees to airlines, costs that may be passed on to consumers. GAO was asked to examine changes in the airline ticket distribution industry since the late 1990s and the effects on airlines, the impact of these changes on travel agents and consumers, and what the relationship between global distribution systems booking fees and related costs suggest about the use of market power.
NTIS
Airline Operations; Distributing; Commerce

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*.

20030068958 Technische Univ., Delft
Integration of the Horn Concept in a Real Aircraft
Joosen, M.; Apr. 1999; In English
Report No.(s): PB2003-104813; M-872; Copyright; Avail: National Technical Information Service (NTIS)
As a part of the ADIF project (ADaptIver Flugel, Adaptive Wing) several concepts for the active influencing of the flow over airfoils of future aircraft are being developed by DASA Airbus, DLR and DaimlerChrysler Research and Technology. This thesis concerns the integration of a concept developed by DaimlerChrysler Research and Technology is Frankfurt/Main for realization of a wing with a flexible trailing edge. First, an introduction is given to the ADIF project. Its goals and benefits are described. Second, the Horn Concept is introduced, a concept that has been developed in Frankfurt for the realization on a flexible wing trailing edge. Central, multi functional elements of this concepts are horn shape like structures with a curved center line which are mounted turnably in a rigid flap nose. Over these horn structures a skin structure is mounted to generate a smooth surface. By turning the horn structures by means of actuators the amount of cambering can be set. Main objective of this thesis is the creation of a parametric generation for finite element models of a total flap system with a flexible trailing edge. This program is a continuation of the work of other theses.
NTIS
Aircraft Design; Wings; Horns; Aircraft Structures; Adaptive Control

20030068968 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
Wind-Tunnel Investigations of Diving Brakes
Fucha, D.; November 1942; 19 pp.; In English
Report No.(s): NACA-TM-1033; No Copyright; Avail: CASI; A03, Hardcopy
Unduly high diving speeds can be effectively controlled by diving brakes but their employment involves at the same time a number of disagreeable features: namely, rotation of zero lift direction, variation of diviving moment, and, the creation of a potent dead air region.
Author
Wind Tunnel Tests; Aircraft Brakes

20030068977
Unmanned Aerial Vehicles Roadmap 2002 - 2027
Dec. 2002; 205 pp.; In English
Report No.(s): AD-A414908; No Copyright; Avail: CASI; A10, Hardcopy
This document presents the Department of Defense's (DoD) Roadmap for developing and employing Unmanned Aerial

Vehicles (UAVs) and Unmanned Combat Air Vehicles (UCAVs) over the next 25 years (2002 to 2027) DoD's operational UAV systems include Predator, Hunter, Shadow, and Pioneer which have demonstrated tremendous capability in recent military operations Developmental systems such as Global Hawk and many small UAV systems have also been put to the test in recent combat and combat support operations. Taken as a whole, this technology area offers profound opportunities to transform the manner in which this country conducts a wide array of military and military support operations. As with any new technology, there is naturally some reluctance to transition to a radically new capability. The need to fully demonstrate UAVs in combat and realistic training environments is critical to the migration of this technology.
DTIC
Pilotless Aircraft; Education; Combat

20030068996 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
On the Sound Field of a Rotating Propeller
Gutin, L.; Physikalische Zeitschrit der Sowjetinion: Physical magazine of the Soviet Union volume 9 number 1; October 1948; Volume 9, No. 1, pp. 57-71; In English
Report No.(s): NACA-TM-1195; No Copyright; Avail: CASI; A03, Hardcopy
The sound field of a rotating propeller is teated theoretically on the basis of aerodynamic principles. For the lower harmonics, the directional characteristics and the radiated sound energy are determined and are in conformity with existing experimental results.
Author
Propellers; Sound Fields

20030069011 NASA Ames Research Center, Moffett Field, CA, USA
Lessons Learned from NASA UAV Science Demonstration Program Missions
Wegener, Steven S.; Schoenung, Susan M.; [2003]; 9 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy
During the summer of 2002, two airborne missions were flown as part of a NASA Earth Science Enterprise program to demonstrate the use of uninhabited aerial vehicles (UAVs) to perform earth science. One mission, the Altus Cumulus Electrification Study (ACES), successfully measured lightning storms in the vicinity of Key West, Florida, during storm season using a high-altitude Altus(TM) UAV. In the other, a solar-powered UAV, the Pathfinder Plus, flew a high-resolution imaging mission over coffee fields in Kauai, Hawaii, to help guide the harvest.
Derived from text
Imaging Techniques; Solar Powered Aircraft; High Altitude

20030069018 NASA Langley Research Center, Hampton, VA, USA
Radiated Sound Power from a Curved Honeycomb Panel
Robinson, Jay H.; Buehrle, Ralph D.; Klos, Jacob; Grosveld, Ferdinand W.; [2003]; 8 pp.; In English; 9th AIAA/CEAS Aeroacoustics Conference and Exhibition, 12-14 May 2003, Hilton Head, SC, USA
Report No.(s): AIAA Paper 2003-3156; No Copyright; Avail: CASI; A02, Hardcopy
The validation of finite element and boundary element model for the vibro-acoustic response of a curved honeycomb core composite aircraft panel is completed. The finite element and boundary element models were previously validated separately. This validation process was hampered significantly by the method in which the panel was installed in the test facility. The fixture used was made primarily of fiberboard and the panel was held in a groove in the fiberboard by a compression fitting made of plastic tubing. The validated model is intended to be used to evaluate noise reduction concepts from both an experimental and analytic basis simultaneously. An initial parametric study of the influence of core thickness on the radiated sound power from this panel, using this numerical model was subsequently conducted. This study was significantly influenced by the presence of strong boundary condition effects but indicated that the radiated sound power from this panel was insensitive to core thickness primarily due to the offsetting effects of added mass and added stiffness in the frequency range investigated.
Author
Noise Reduction; Aircraft Structures

20030069029 NASA Langley Research Center, Hampton, VA, USA
HART-II: Prediction of Blade-Vortex Interaction Loading
Lim, Joon W.; Tung, Chee; Yu, Yung H.; Burley, Casey L.; Brooks, Thomas; Boyd, Doug; vanderWall, Berend; Schneider, Oliver; Richard, Hugues; Raffel, Markus, et al.; [2003]; 13 pp.; In English; 29th European Rotorcraft Forum, 16-18 Sep. 2003, Friedrichshafen, Germany; Copyright; Avail: CASI; A03, Hardcopy

During the HART-I data analysis, the need for comprehensive wake data was found including vortex creation and aging, and its re-development after blade-vortex interaction. In October 2001, US Army AFDD, NASA Langley, German DLR, French ONERA and Dutch DNW performed the HART-II test as an international joint effort. The main objective was to focus on rotor wake measurement using a PIV technique along with the comprehensive data of blade deflections, airloads, and acoustics. Three prediction teams made preliminary correlation efforts with HART-II data: a joint US team of US Army AFDD and NASA Langley, German DLR, and French ONERA. The predicted results showed significant improvements over the HART-I predicted results, computed about several years ago, which indicated that there has been better understanding of complicated wake modeling in the comprehensive rotorcraft analysis. All three teams demonstrated satisfactory prediction capabilities, in general, though there were slight deviations of prediction accuracies for various disciplines.
Author
Aerodynamic Loads; Blade-Vortex Interaction; Deflection; Rotary Wing Aircraft

20030069036 NASA Ames Research Center, Moffett Field, CA, USA
An Ecological Approach to the Design of UAV Ground Control Station (GCS) Status Displays
Dowell, Susan; Morphew, Ephimia; Shively, Jay; [2003]; 1 pp.; In English; AUV SI, 15-17 Jul. 2003, Baltimore, MD, USA; No Copyright; Avail: Other Sources; Abstract Only

Use of UAVs in military and commercial applications will continue to increase. However, there has been limited research devoted to UAV GCS design. The current study employed an ecological approach to interface design. Ecological Interface Design (EID) can be characterized as representing the properties of a system, such that an operator is encouraged to use skill-based behavior when problem solving. When more effortful cognitive processes become necessary due to unfamiliar situations, the application of EID philosophy supports the application of knowledge-based behavior. With advances toward multiple UAV command and control, operators need GCS interfaces designed to support understanding of complex systems. We hypothesized that use of EID principles for the display of UAV status information would result in better operator performance and situational awareness, while decreasing workload. Pilots flew a series of missions with three UAV GCS displays of status information (Alphanumeric, Ecological, and Hybrid display format). Measures of task performance, Situational Awareness, and workload demonstrated the benefits of using an ecological approach to designing UAV GCS displays. The application of ecological principles to the design of UAV GCSs is a promising area for improving UAV operations.
Author
Ecology; Display Devices; Human Performance; Problem Solving; Ground Based Control; Pilotless Aircraft

20030071086 NASA Ames Research Center, Moffett Field, CA, USA
Measured Aerodynamic Interaction of Two Tiltrotors
Yamauchi, Gloria K.; Wadcock, Alan J.; Derby, Michael R.; [2003]; 12 pp.; In English; 59th American Helicopter Society, International Annual Forum, 6-8 May 2003, Phoenix, AZ, USA; Copyright; Avail: CASI; A03, Hardcopy

The aerodynamic interaction of two model tilrotors in helicopter-mode formation flight is investigated. Three cenarios representing tandem level flight, tandem operations near the ground, and a single tiltrotor operating above thc ground for varying winds are examined. The effect of aircraft separation distance on the thrust and rolling moment of the trailing aircraft with and without the presence of a ground plane are quantified. Without a ground plane, the downwind aircraft experiences a peak rolling moment when the right (left) roto- of the upwind aircraft is laterally aligned with the left (right) rotor of the downwind aircraft. The presence of the ground plane causes the peak rolling moment on the downwind aircraft to occur when the upwind aircraft is further outboard of the downwind aircraft. Ground plane surface flow visualization images obtained using rufts and oil are used to understand mutual interaction between the two aircraft. These data provide guidance in determining tiltrotor flight formations which minimize disturbance to the trailing aircraft.
Author
Aerodynamic Characteristics; Helicopters; Rolling Moments; Tilt Rotor Aircraft

20030071133 NASA Ames Research Center, Moffett Field, CA, USA
Estimating Blade Section Airloads from Blade Leading-Edge Pressure Measurements
vanAken, Johannes M.; [2003]; 21 pp.; In English; 59th American Helicopter Society Annual Forum, 6-8 May 2003, Phoenix, AZ, USA; Copyright; Avail: CASI; A03, Hardcopy

The Tilt-Rotor Aeroacoustic Model (TRAM) test in the Duitse-Nederlandse Wind (DNW) Tunnel acquired blade pressure data for forward flight test conditions of a tiltrotor in helicopter mode. Chordwise pressure data at seven radial locations were

integrated to obtain the blade section normal force. The present investigation evaluates the use of linear regression analysis and of neural networks in estimating the blade section normal force coefficient from a limited number of blade leading-edge pressure measurements and representative operating conditions. These network models are subsequently used to estimate the airloads at intermediate radial locations where only blade pressure measurements at the 3.5% chordwise stations are available.
Author
Pressure Measurement; Helicopters; Flight Tests; Aerodynamic Loads; Aeroacoustics

20030071141 NASA Ames Research Center, Moffett Field, CA, USA
The NASA/Army Autonomous Rotorcraft Project
Whalley, M.; Freed, M.; Takahashi, M.; Christian, D.; Patterson-Hine, A.; Schulein, G.; Harris, R.; October 2002; 14 pp.; In English; 59th American Helicopter Society Annual Forum, 6-8 May 2003, Phoenix, AZ, USA; Copyright; Avail: CASI; A03, Hardcopy

An overview of the NASA Ames Research Center Autonomous Rotorcraft Project (ARP) is presented. The project brings together several technologies to address NASA and US Army autonomous vehicle needs, including a reactive planner for mission planning and execution, control system design incorporating a detailed understanding of the platform dynamics, and health monitoring and diagnostics. A candidate reconnaissance and surveillance mission is described. The autonomous agent architecture and its application to the candidate mission are presented. Details of the vehicle hardware and software development are provided.
Author
Autonomy; Control Systems Design; Diagnosis; Rotary Wing Aircraft; Software Engineering

20030071236 NASA Ames Research Center, Moffett Field, CA, USA
Influence of Wake Models on Calculated Tiltrotor Aerodynamics
Johnson, Wayne; [2001]; 5 pp.; In English; AHS Aerodynamics, Acoustics and test and Evaluation Technical Specialist Meeting, 23-25 Jan. 2002, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The tiltrotor aircraft configuration has the potential to revolutionize air transportation by providing an economical combination of vertical take-off and landing capability with efficient, high-speed cruise flight. To achieve this potential it is necessary to have validated analytical tools that will support future tiltrotor aircraft development. These analytical tools must calculate tiltrotor aeromechanical behavior, including performance, structural loads, vibration, and aeroelastic stability, with an accuracy established by correlation with measured tiltrotor data. The recent test of the Tilt Rotor Aeroacoustic Model (TRAM) with a single,l/4-scale V-22 rotor in the German-Dutch Wind Tunnel (DNW) provides an extensive set of aeroacoustic, performance, and structural loads data. This paper will examine the influence of wake models on calculated tiltrotor aerodynamics, comparing calculations of performance and airloads with TRAM DNW measurements. The calculations will be performed using the comprehensive analysis CAMRAD II.
Author
Tilt Rotor Aircraft; Vertical Landing; Aircraft Design; Aircraft Configurations

20030071238 Ohio Aerospace Inst., Brook Park, OH, USA
Structural Seal Development
DeMange, Jeff; November 29, 2002; 18 pp.; In English
Contract(s)/Grant(s): NCC3-879
Report No.(s): OAI-02-011; No Copyright; Avail: CASI; A03, Hardcopy

NASA currently has aggressive goals for the development of the next generations of Reusable Launch Vehicles (RLV). Many of the goals center around significantly reducing the time and cost of deployment (including payload) for these spacecraft, as well as substantially increasing the safety of the crew and hardware. A core component in the design of these next generation spacecraft is the propulsion system. Many concepts are currently being evaluated including Rocket Based Combined Cycle (RBCC) and Turbine Based Combined Cycle (TBCC) engine technologies, shown.
Author
Cost Reduction; Time Lag; Payloads; Rocket-Based Combined-Cycle Engines

20030071693 Defence Science and Technology Organisation, Fishermans Bend, Australia
Shape Optimisation of Two Closely-Spaced Holes for Fatigue Life Extension
Waldman, Witold; Heller, Manfred; Rose, L. R. Francis; May 2003; 49 pp.; In English
Report No.(s): DSTO-RR-0253; DODA-AR-012-771; Copyright; Avail: Other Sources

This report presents practical solutions to the problem of determining optimal hole shapes for two closely-spaced holes in a large biaxially loaded plate. During this work, enhancements to the recently developed AVD finite element based gradientless shape optimisation procedure have been implemented. Two distinct biaxial loading cases are considered, namely tensile field (remote principal stresses have the same sign) or mixed field (remote principal stresses have the opposite sign). The resulting free-form optimal shapes provide very large reductions in stress (typically greater than 30%), as compared to the initial circular holes. For the tensile field, the solution shape is smooth and non-circular, and the stress is uniform around the hole boundary. However, for the mixed field case, the final optimised shape is approximately rectangular with sharp corners and curved sides. Here, the absolute magnitude of the tangential stress has been rendered piecewise constant. The optimal shapes are presented in a tabular form that allows them to be used readily by designers. In a key numerical result, which has not been identified previously, it was found that the optimal shapes eliminate stress interaction effects, with the stress concentration produced by the optimal holes for both the tensile and mixed field biaxial loading cases being identical to the corresponding single hole optimal. The procedures developed and the results obtained during this work have contributed to an enhanced capability in AVD for determining and specifying optimal shapes for extending the fatigue life of reworked holes in RAAF aircraft structural components.
Author
Fatigue Life; Aircraft Structures

20030073442 Wichita State Univ., Wichita, KS, USA, Purdue Univ., West Lafayette, IN, USA
Characterization of In-Plane, Shear-Loaded Adhesive Lap Joints: Experiments and Analysis
Tomblin, J.; Seneviratne, W.; Kim, H.; Lee, J.; May 2003; In English
Report No.(s): PB2003-106626; No Copyright; Avail: National Technical Information Service (NTIS)

The growing applications of adhesive bonding in aircraft structures requires more emphasis be placed on analytical models to predict failure and load carrying capability. As these analytical models become available, they must also be validated with experimental testing. In this experimental investigation, failure strengths of in-plane, shear-loaded bonded joints were compared with analytical predictions of the Shear-Loaded Bonded Joint (SLBJ) theory. The investigation was carried out in two phases. Phase I was conducted with a particular focus placed on the effect of bondline thickness on joint strength. Phase I specimens were fabricated using E-glass/epoxy cloth and PTM&W ES6292 two-component paste adhesive. A box beam torsion test fixture was used to apply a shear loading. Phase II was carried out to investigate changes in adhesive and adherend properties on SLBJ predictions. Phase II specimens were fabricated using aluminum and carbon adherends with Loctite and Hysol EA9360 paste adhesives. Several joggle (production-style) joints were tested to investigate the effects of joggle adherend on the strength of the adhesive joint. Furthermore, a failure analysis was conducted to study the failure mechanism of these joints. Experimental data and SLBJ predictions indicated a decrease in strength as the bondline thickness was increased. SLBJ predictions for thin bondlines were comparable with experimental data, but for thick bondlines, the SLBJ predictions were lower than the experimental data. Experimental data in this investigation revealed the significance of adhesive characterization and the adhesive joint characterization. When predicting failure of the joint, one must pay attention to the failure mode because it largely contributes to the joint performance. Because SLBJ predictions were based on the adhesive plastic strain, assuming linear elastic behavior of the adherend, the validity of these predictions were limited to the joints with adhesive or cohesive failure with minimal nonlinearity of adherend materials. When these conditions were met, the SLBJ model showed good correlation with the experimental results.
NTIS
Lap Joints; Adhesive Bonding; Bonded Joints

20030073445 Dayton Univ. Research Inst., OH, USA
Statistical Loads Data for Bombardier CRJ100 Aircraft in Commercial Operations
Rustenburg, J. W.; Skinn, D. A.; Tipps, D. O.; Jun. 2003; 100 pp.; In English
Report No.(s): PB2003-106628; UDR-TR-2002-00108; No Copyright; Avail: CASI; A05, Hardcopy

The University of Dayton is supporting Federal Aviation Administration (FAA) research on the structural integrity requirements for the U.S. commercial transport airplane fleet. The primary objective of this research is to develop new and improved methods and criteria for processing and presenting commercial transport airplane flight and ground loads usage data. The scope of activities performed involves (1) defining the service-related factors that affect the operational life of commercial aircraft; (2) designing an efficient software system to reduce, store, and process large quantities of optical quick-access recorder data; and (3) reducing, analyzing, and providing processed data in statistical formats that will enable the FAA to reassess existing certification criteria. Equally important, these new data will also enable the FAA, the aircraft manufacturers, and the airlines to better understand and control those factors that influence the structural integrity of commercial transport

aircraft. Presented herein are Bombardier CRJ100 aircraft operational usage data collected from 467 flights, representing 607.2 flight hours, as recorded by a single airline operator. Statistical data are presented on the aircraft's usage, flight and ground loads data, and systems operational data. The data presented in this report will provide the user with information about the accelerations, speeds, altitudes, flight duration and distance, thrust reverser usage, and gust velocities encountered by the Bombardier CRJ100 during actual operational usage.
NTIS
Commercial Aircraft; Statistical Analysis; Transport Aircraft; Flight Load Recorders

20030073488 General Accounting Office, Washington, DC
Joint Strike Fighter Acquisition: Cooperative Program Needs Greater Oversight to Ensure Goals Are Met
Jul. 2003; 46 pp.
Report No.(s): PB2003-106920; GAO-03-775; No Copyright; Avail: CASI; A03, Hardcopy

The Joint Strike Fighter (JSF) is a cooperative program between the Department of Defense (DOD) and U.S. allies for developing and producing next generation fighter aircraft to replace aging inventories. As currently planned, the JSF program is DOD's most expensive aircraft program to date, costing an estimated $200 billion to procure about 2,600 aircraft and related support equipment. Many in DOD consider JSF to be a model for future cooperative programs. To determine the implications of the JSF international program structure, GAO identified JSF program relationships and expected benefits and assessed how DOD is managing cost sharing, technology transfer, and partner expectations for industrial return.
NTIS
Fighter Aircraft; Cost Estimates

20030075684 NASA Dryden Flight Research Center, Edwards, CA, USA
F/A-18 Performance Benefits Measured During the Autonomous Formation Flight Project
Vachon, M. Jake; Ray, Ronald J.; Walsh, Kevin R.; Ennix, Kimberly; September 2003; 36 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 5-8 Aug. 2002, Monterey, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 706-35-00-E8-28-AFF
Report No.(s): NASA/TM-2003-210734; H-2505; NAS 1.15:210734; No Copyright; Avail: CASI; A03, Hardcopy

The Autonomous Formation Flight (AFF) project at the NASA Dryden Flight Research Center (Edwards, California) investigated performance benefits resulting from formation flight, such as reduced aerodynamic drag and fuel consumption. To obtain data on performance benefits, a trailing F/A-18 airplane flew within the wing tip-shed vortex of a leading F/A-18 airplane. The pilot of the trail airplane used advanced station-keeping technology to aid in positioning the trail airplane at precise locations behind the lead airplane. The specially instrumented trail airplane was able to obtain accurate fuel flow measurements and to calculate engine thrust and vehicle drag. A maneuver technique developed for this test provided a direct comparison of performance values while flying in and out of the vortex. Based on performance within the vortex as a function of changes in vertical, lateral, and longitudinal positioning, these tests explored design-drivers for autonomous stationkeeping control systems. Observations showed significant performance improvements over a large range of trail positions tested. Calculations revealed maximum drag reductions of over 20 percent, and demonstrated maximum reductions in fuel flow of just over 18 percent.
Author
Autonomy; Formation Flying; Flight Tests; F-18 Aircraft; Aircraft Performance; Mathematical Models

20030075758 NASA Dryden Flight Research Center, Edwards, CA, USA
Modeling Aircraft Wing Loads from Flight Data Using Neural Networks
Allen, Michael J.; Dibley, Ryan P.; September 2003; 20 pp.; In English; SAE World Aviation Congress, 11 Sep. 2003, Montreal, Quebec, Canada; Original contains color and black and white illustrations
Contract(s)/Grant(s): WU 710-61-14
Report No.(s): NASA/TM-2003-212032; H-2546; NAS 1.15:212032; No Copyright; Avail: CASI; A03, Hardcopy

Neural networks were used to model wing bending-moment loads, torsion loads, and control surface hinge-moments of the Active Aeroelastic Wing (AAW) aircraft. Accurate loads models are required for the development of control laws designed to increase roll performance through wing twist while not exceeding load limits. Inputs to the model include aircraft rates, accelerations, and control surface positions. Neural networks were chosen to model aircraft loads because they can account for uncharacterized nonlinear effects while retaining the capability to generalize. The accuracy of the neural network models was improved by first developing linear loads models to use as starting points for network training. Neural networks were then

trained with flight data for rolls, loaded reversals, wind-up-turns, and individual control surface doublets for load excitation. Generalization was improved by using gain weighting and early stopping. Results are presented for neural network loads models of four wing loads and four control surface hinge moments at Mach 0.90 and an altitude of 15,000 ft. An average model prediction error reduction of 18.6 percent was calculated for the neural network models when compared to the linear models. This paper documents the input data conditioning, input parameter selection, structure, training, and validation of the neural network models.
Author
Aeroelastic Research Wings; Aeroelasticity; Loads (Forces); Neural Nets; F-18 Aircraft; Mathematical Models; Data Processing

20030082132 Flight Problems Research and Development Society of Georgia, Tbilisi, Georgia
Monolith Composite Structures: Trend for Creation Low Life Cycle Cost Airframes
Pkhaladze, Nodar W.; Rusiashvili, Giorgi O.; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 17-1 - 17-11; In English; See also 20030082129; Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy

Principles of creation Low Life Cycle Cost monolith integral composite airframes for military application by new technological approach are presented. New technological approach including airframe fabrication in whole opening self-heating press from by Resin Film Infusion process is offered. Typical technological process including the operations and transitions are described. Impact of new technological approach to design principles is discussed. Bases of Low Life Cycle Cost economical analysis for creation airframes by high technological efficiency are presented. Recent achievements enabling performing of new technological approach are summarized.
Author
Composite Structures; Cost Analysis; Airframes; Life Cycle Costs; Low Cost

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*.

20030071067
Nondestructive Evaluation of Ceramic Matrix Composite Combustor Components
Sun, J. G.; Verrilli, M. J.; Stephan, R.; Barnett, T. R.; Ojard, G.; 2002; 13 pp.; In English
Report No.(s): DE2003-805256; No Copyright; Avail: Department of Energy Information Bridge

Combustor liners fabricated from a SiC/SiC composite were nondestructively interrogated before and after combustion rig testing. The combustor liners were inspected by X-ray, ultrasonic and thermographic techniques. In addition, mechanical test results were obtained from witness coupons, representing the as-manufactured liners, and from coupons machined from the components after combustion exposure. Thermography indications were found to correlate with reduced material properties obtained after rig testing. Microstructural examination of the SiC/SiC liners revealed the thermography indications to be delaminations and damaged fiber tows.
NTIS
Ceramic Matrix Composites; Combustion Chambers; Fabrication; Nondestructive Tests

20030071650 Massachusetts Inst. of Tech., Cambridge, MA, USA
Effects of Impeller-Diffuser Interaction on Centrifugal Compressor Performance
Tan, Choon S.; September 2003; 67 pp.; In English
Contract(s)/Grant(s): NAG3-2732; No Copyright; Avail: CASI; A04, Hardcopy

This research program focuses on characterizing the effect of impeller-diffuser interactions in a centrifugal compressor stage on its performance using unsteady threedimensional Reynolds-averaged Navier-Stokes simulations. The computed results show that the interaction between the downstream diffuser pressure field and the impeller tip clearance flow can account for performance changes in the impeller. The magnitude of performance change due to this interaction was examined for an impeller with varying tip clearance followed by a vaned or vaneless diffuser. The impact of unsteady impeller-diffuser interaction, primarily through the impeller tip clearance flow, is reflected through a time-averaged change in impeller loss, blockage and slip. The results show that there exists a tip clearance where the beneficial effect of the impeller-diffuser

interaction on the impeller performance is at a maximum. A flow feature that consists of tip flow back leakage was shown to occur at design speed for the centrifugal compressor stage. This flow phenomenon is described as tip flow that originates in one passage, flows downstream of the impeller trailing edge and then returns to upstream of the impeller trailing edge of a neighboring passage. Such a flow feature is a source of loss in the impeller. A hypothesis is put forth to show that changing the diffuser vane count and changing impeller-diffuser gap has an analogous effect on the impeller performance. The centrifugal compressor stage was analyzed using diffusers of different vane counts, producing an impeller performance trend similar to that when the impeller-diffuser gap was varied, thus supporting the hypothesis made. This has the implication that the effect impeller performance associated with changing the impeller-diffuser gap and changing diffuser vane count can be described by the non-dimensional ratio of impeller-diffuser gap to diffuser vane pitch. A procedure is proposed and developed for isolating impeller passage blockage change without the need to define the region of blockage generation (which may incur a certain degree of arbitrariness). This method has been assessed for its applicability and utility.
Author
Centrifugal Compressors; Impellers; Vaneless Diffusers

20030071652 NASA Glenn Research Center, Cleveland, OH, USA
High Frequency Adaptive Instability Suppression Controls in a Liquid-Fueled Combustor
Kopasakis, George; July 2003; 16 pp.; In English; 39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS- 22-708-28-09
Report No.(s): NASA/TM-2003-212535; E-14099; NAS 1.15:212535; AIAA Paper 2003-4491; No Copyright; Avail: CASI; A03, Hardcopy

This effort extends into high frequency (>500 Hz), an earlier developed adaptive control algorithm for the suppression of thermo-acoustic instabilities in a liquidfueled combustor. The earlier work covered the development of a controls algorithm for the suppression of a low frequency (~280 Hz) combustion instability based on simulations, with no hardware testing involved. The work described here includes changes to the simulation and controller design necessary to control the high frequency instability, augmentations to the control algorithm to improve its performance, and finally hardware testing and results with an experimental combustor rig developed for the high frequency case. The Adaptive Sliding Phasor Averaged Control (ASPAC) algorithm modulates the fuel flow in the combustor with a control phase that continuously slides back and forth within the phase region that reduces the amplitude of the instability. The results demonstrate the power of the method - that it can identify and suppress the instability even when the instability amplitude is buried in the noise of the combustor pressure. The successful testing of the ASPAC approach helped complete an important NASA milestone to demonstrate advanced technologies for low-emission combustors.
Author
Thermoacoustic Effects; Acoustic Instability; Combustion Stability

20030071677 National Renewable Energy Lab., Golden, CO
Dynamic Characterization of the AWT-26 Turbine for Variable Speed Operation
Larwood, S. M.; Jul. 1998; 24 pp.; In English
Report No.(s): DE2003-631214; NREL/TP-500-24919; No Copyright; Avail: Department of Energy Information Bridge

This report was prepared by Scott Larwood of the National Wind Technology Center. It describes an experiment to determine critical rotor speeds on the Advanced Wind Turbines, Inc. AWT-26/Protoype 3 for variable speed operation. The turbine was instrumented to measure accelerations and the data were reduced to determine areas of potential resonance. Critical rotor speeds were determined for incorporation into the variable speed control algorithm.
NTIS
Wind Turbines; Rotors; Critical Velocity

20030073443 Galaxy Scientific Corp., Egg Harbor Township, NJ, USA
On-Wing Testing of Large Turbofan Engines
Westfield, W. T.; Lynch, E.; Muller, M.; Tahliani, J.; May 2003; 32 pp.; In English
Report No.(s): PB2003-106627; No Copyright; Avail: CASI; A03, Hardcopy

This report addresses the issue of on-wing testing of large turbofan engines used in transport aircraft. The expanded use of installed testing is addressed along with the factors pertinent to the decision of doing on-wing testing. The maintenance capabilities of the operator, environmental concerns, space requirements, and available instrumentation need to be considered

carefully. Several aircraft and engine maintenance manuals were reviewed in relation to summarizing the original equipment manufacturer's requirements and precautions for on-wing testing. Asymmetric power limits, exhaust and inlet hazard areas, ice and snow, and cross/tail-wind restrictions are some of the areas of concern. The benefits and drawbacks are outlined along with proposed solutions to anticipated problems.
NTIS
Turbofan Engines; Maintenance

20030077824 Fluidtherm Engineering, Boulder, CO, USA
Flow Integrating Section for a Gas Turbine Engine in Which Turbine Blades are Cooled by Full Compressor Flow
Steward, W. G.; May 15, 2000; 32 pp.; In English
Report No.(s): DE2003-764563; No Copyright; Avail: Department of Energy Information Bridge

An innovation in gas turbine engine design, which was the subject of a 1991 SBlR Phase 1 study by FTE, would increase efficiency by maximizing the cooling of turbine blades, thus allowing them to operate at far greater turbine inlet gas temperature than is possible with current cooling methods. Consolidation of the two major components, turbine and compressor, to route all of the compressor airflow through hollow turbine blades would also result in an unusually compact engine configuration. The SBIR study, and subsequent work, indicate that efficiency gain due to increased turbine inlet temperature, greatly outweighs the adverse effects of heat transfer during compression and expansion. With the use of state-of-the art high temperature materials and regeneration (utilization of waste exhaust heat) the engine could compete with or surpass the most efficient of piston engines on the basis of performance and fuel consumption alone.
NTIS
Gas Turbine Engines; Turbine Blades; Compressors

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*.

20030069003 Army Aviation and Missile Command, Moffett Field, CA, USA
Dynamic Stall Measurements and Computations for a VR-12 Airfoil with a Variable Droop Leading Edge
Martin, P. B.; McAlister, K. W.; Chandrasekhara, M. S.; Geissler, W.; [2003]; 18 pp.; In English; AHS International Forum 59, 6-8 May 2003, Phoenix, AZ, USA; No Copyright; Avail: CASI; A03, Hardcopy

High density-altitude operations of helicopters with advanced performance and maneuver capabilities have lead to fundamental research on active high-lift system concepts for rotor blades. The requirement for this type of system was to improve the sectional lift-to-drag ratio by alleviating dynamic stall on the retreating blade while simultaneously reducing the transonic drag rise of the advancing blade. Both measured and computational results showed that a Variable Droop Leading Edge (VDLE) airfoil is a viable concept for application to a rotor high-lift system. Results are presented for a series of 2D compressible dynamic stall wind tunnel tests with supporting CFD results for selected test cases. These measurements and computations show a dramatic decrease in the drag and pitching moment associated with severe dynamic stall when the VDLE concept is applied to the Boeing VR-12 airfoil. Test results also show an elimination of the negative pitch damping observed in the baseline moment hysteresis curves.
Author
Rotor Lift; Lift Drag Ratio; Helicopters; Drag Reduction; Aerodynamic Stalling

20030069014 NASA Ames Research Center, Moffett Field, CA, USA
Piloted Evaluation of a UH-60 Mixer Equivalent Turbulence Simulation Model
Lusardi, Jeff A.; Blanken, Chris L.; Tischeler, Mark B.; October 2002; 12 pp.; In English; American Helicopter Society's 59th Annual Forum and Technology Display, 6-8 May 2003, Phoenix, AZ, USA; Copyright; Avail: CASI; A03, Hardcopy

A simulation study of a recently developed hover/low speed Mixer Equivalent Turbulence Simulation (METS) model for the UH-60 Black Hawk helicopter was conducted in the NASA Ames Research Center Vertical Motion Simulator (VMS). The experiment was a continuation of previous work to develop a simple, but validated, turbulence model for hovering rotorcraft. To validate the METS model, two experienced test pilots replicated precision hover tasks that had been conducted in an instrumented UH-60 helicopter in turbulence. Objective simulation data were collected for comparison with flight test data, and subjective data were collected that included handling qualities ratings and pilot comments for increasing levels of

turbulence. Analyses of the simulation results show good analytic agreement between the METS model and flight test data, with favorable pilot perception of the simulated turbulence. Precision hover tasks were also repeated using the more complex rotating-frame SORBET (Simulation Of Rotor Blade Element Turbulence) model to generate turbulence. Comparisons of the empirically derived METS model with the theoretical SORBET model show good agreement providing validation of the more complex blade element method of simulating turbulence.
Author
Aircraft Pilots; Controllability; Turbulence Models; Rotary Wing Aircraft; Flight Tests

20030069038 Sikorsky Aircraft, Stratford, CT, USA
Piloted Evaluation of Modernized Limited Authority Control Laws in the NASA-Ames Vertical Motion Simulator (VMS)
Sahasrabudhe, Vineet; Melkers, Edgar; Faynberg, Alexander; Blanken, Chris L.; [2003]; 24 pp.; In English; American Helicopter Society Annual Forum, 6-8 May 2003, Phoenix, AZ, USA
Contract(s)/Grant(s): NCC2-9019; Copyright; Avail: CASI; A03, Hardcopy

The UH-60 BLACK HAWK was designed in the 1970s, when the US Army primarily operated during the day in good visual conditions. Subsequently, the introduction of night-vision goggles increased the BLACK HAWK'S mission effectiveness, but the accident rate also increased. The increased accident rate is strongly tied to increased pilot workload as a result of a degradation in visual cues. Over twenty years of research in helicopter flight control and handling qualities has shown that these degraded handling qualities can be recovered by modifying the response type of the helicopter in low speed flight. Sikorsky Aircraft Corporation initiated a project under the National Rotorcraft Technology Center (NRTC) to develop modern flight control laws while utilizing the existing partial authority Stability Augmentation System (SAS) of the BLACK HAWK. This effort resulted in a set of Modernized Control Laws (MCLAWS) that incorporate rate command and attitude command response types. Sikorsky and the US Army Aeroflightdynamics Directorate (AFDD) conducted a piloted simulation on the NASA-Ames Vertical h4otion Simulator, to assess potential handling qualities and to reduce the risk of subsequent implementation and flight test of these modern control laws on AFDD's EH-60L helicopter. The simulation showed that Attitude Command Attitude Hold control laws in pitch and roll improve handling qualities in the low speed flight regime. These improvements are consistent across a range of mission task elements and for both good and degraded visual environments. The MCLAWS perform better than the baseline UH-60A control laws in the presence of wind and turbulence. Finally, while the improved handling qualities in the pitch and roll axis allow the pilot to pay more attention to the vertical axis and hence altitude performance also improves, it is clear from pilot comments and altitude excursions that the addition of an Altitude Hold function would further reduce workload and improve overall handling qualities of the aircraft.
Author
Flight Characteristics; Flight Control; Goggles; Attitude Control; Evaluation; Improvement

20030075641 Instituto Nacional de Tecnica Aeroespacial, Spain
Sensibility of High Lift Behavior of a Civil Transport to the Geometry of Lateral Gaps
Lopez-Puigcerver, Gabriel Liano; Sanchez, Jose Manuel Olalla; [2002]; 57 pp.; In Spanish
Report No.(s): INTA-AT/TNO/4410/013/INTA/02; No Copyright; Avail: CASI; A04, Hardcopy

The present work is part of EPISTLE WP3.4. It is intended to investigate the sensitivity of high lift behavior of a supersonic civil transport with regard to the geometry of the lateral gaps between segments of the leading edge flap.
Author
Lift; Supersonic Transports

20030075697 NASA Dryden Flight Research Center, Edwards, CA, USA
A Fuzzy Technique for Performing Lateral-Axis Formation Flight Navigation Using Wingtip Vortices
Hanson, Curtis E.; September 2003; 33 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 710-35-14-SE-45-AAR
Report No.(s): NASA/TM-2003-212033; H-2523; NAS 1.15:212033; No Copyright; Avail: CASI; A03, Hardcopy

Close formation flight involving aerodynamic coupling through wingtip vortices shows significant promise to improve the efficiency of cooperative aircraft operations. Impediments to the application of this technology include internship communication required to establish precise relative positioning. This report proposes a method for estimating the lateral relative position between two aircraft in close formation flight through real-time estimates of the aerodynamic effects imparted by the leading airplane on the trailing airplane. A fuzzy algorithm is developed to map combinations of vortex-induced drag

and roll effects to relative lateral spacing. The algorithm is refined using self-tuning techniques to provide lateral relative position estimates accurate to 14 in., well within the requirement to maintain significant levels of drag reduction. The fuzzy navigation algorithm is integrated with a leader-follower formation flight autopilot in a two-ship F/A-18 simulation with no intership communication modeled. It is shown that in the absence of measurements from the leading airplane the algorithm provides sufficient estimation of lateral formation spacing for the autopilot to maintain stable formation flight within the vortex. Formation autopilot trim commands are used to estimate vortex effects for the algorithm. The fuzzy algorithm is shown to operate satisfactorily with anticipated levels of input uncertainties.
Author
Formation Flying; Fuzzy Systems; Wing Tip Vortices; Lateral Control; F-18 Aircraft; Autonomous Navigation

20030079970 NASA Dryden Flight Research Center, Edwards, CA, USA
Real-Time Stability and Control Derivative Extraction From F-15 Flight Data
Smith, Mark S.; Moes, Timothy R.; Morelli, Eugene A.; September 2003; 36 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 11-14 Aug. 2003, Austin, TX, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 745-20-00-SE-40
Report No.(s): NASA/TM-2003-212027; H-2542; NAS 1.15:212027; No Copyright; Avail: CASI; A03, Hardcopy

A real-time, frequency-domain, equation-error parameter identification (PID) technique was used to estimate stability and control derivatives from flight data. This technique is being studied to support adaptive control system concepts currently being developed by NASA (National Aeronautics and Space Administration), academia, and industry. This report describes the basic real-time algorithm used for this study and implementation issues for onboard usage as part of an indirect-adaptive control system. A confidence measures system for automated evaluation of PID results is discussed. Results calculated using flight data from a modified F-15 aircraft are presented. Test maneuvers included pilot input doublets and automated inputs at several flight conditions. Estimated derivatives are compared to aerodynamic model predictions. Data indicate that the real-time PID used for this study performs well enough to be used for onboard parameter estimation. For suitable test inputs, the parameter estimates converged rapidly to sufficient levels of accuracy. The devised confidence measures used were moderately successful.
Author
F-15 Aircraft; Parameter Identification; Real Time Operation; Stability Derivatives; Control Stability; Control Systems Design; Frequency Domain Analysis

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*.

20030071111 NASA Marshall Space Flight Center, Huntsville, AL, USA
Marshall Space Flight Center Overview
Geveden, Rex D.; August 21, 2003; 25 pp.; In English; 6th Annual Space and Missile Defense Conference, 21 Aug. 2003, Huntsville, AL, USA; No Copyright; Avail: CASI; A03, Hardcopy

This presentation gives an overview of Marshall Spaceflight Center (MSFC), including its history and activities. The six enterprises to carry out NASA's mission are: Space Science; Earth Science; Biological and Physical Research; Aerospace Technology; Education (our newest); and Space Flight. These are explained, as well as MSFC's contributions toward these NASA enterprises. The presentation also covers cooperation between MSFC and the Department of Defense (DoD).
CASI
NASA Programs; Research And Development; Research Facilities

13
ASTRODYNAMICS

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

20030071202 Air Force Research Lab., Edwards AFB, CA, USA
Propulsion Technologies for Microsatellite Missions
Bromaghim, Daron; Singleton, James; Bushman, Stewart; Spores, Ron; Johnson, Lee; Apr. 11, 2003; 3 pp.; In English
Contract(s)/Grant(s): Proj-6340
Report No.(s): AD-A415035; AFRL-PR-ED-AB-2003-089; No Copyright; Avail: CASI; A01, Hardcopy

Many near, to mid-term satellite missions have been identified for 200 kg class spacecraft. For many of these applications, significant delta-v capability is desired in order to perform orbit transfer, on-orbit repositioning and formation flying. Several of these systems are in advanced engineering development and could be ready to support flight opportunities as early as summer 2004. A 200 W Hall Effect Thruster (RET) system is being developed to satisfy traditional high specific impulse (Isp) missions such as stationkeeping and orbit transfer, and has demonstrated Isp of 1,370 sec, thrust of 12.2 mN and 35% total efficiency. This system, however, has also demonstrated the ability to produce very small impulse bits, as low as 1.5 mN-sec, for formations flying applications that require precise maneuvers. To complement this system, a suite of miniaturized sensors is also in development that will enable a full description of the integration impacts of METs on Department of Defense (DoD), National Aeronautic and Space Administration (NASA), and commercial satellites. This instrumentation package consists of a xenon ion energy analyzer, electron (Langmuir) probes, radiometric and photometric sensors, and a solar array experiment. The combined package, including the instruments, electronics, harness, chassis, etc., is less than 2 kg total mass - representing a significant improvement in capability vs. mass and cost. The third system in advanced development is a micro pulsed plasma thruster (MPPT) for applications in propulsive attitude control, which can reduce a l50-kg class microsatellite's attitude control system mass by 90%. This thruster, based on traditional pulsed plasma thrusters, weighs approximately 1.5 kg, and has three orthogonal thrust axes, each of which can be fired to produce impulse about any spacecraft axis. MPPT performance is now being optimized, but is expected to be from 25-100 microN, with an estimated Isp of 500-800 sec.
DTIC
Microsatellites; Artificial Satellites; Space Missions; Spacecraft Propulsion; Thrust

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*.

20030071094 Army Construction Engineering Research Lab., Champaign, IL, USA
NASA MODIS Products for Military Land Monitoring and Management
Lozar, Robert C.; Balbach, Harold E.; Nov. 2002; 78 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414942; ERDC/CERL-TR-02-31; No Copyright; Avail: CASI; A05, Hardcopy

Land managers have a need for products derived from remote sensing instruments on satellites. In 1999 NASA launched the first of its Earth Science Enterprise (ESE) satellites, Terra. Terra is the first satellite whose instruments were designed to complement each other in producing digital products that corrected for atmospheric clarity, surface reflectance, seasonal changes, sun angle, and cloudiness to mention only a few concerns. Though its purpose is to study climatic damage issues, many of these products have potential use to military land managers. The Strategic Environmental Research and Development Program (SERDP) Ecosystem Management Project (SEMP) sponsored a preliminary investigation to access and manipulate several example products generated from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument for storage in the SEMP data repository. The MODIS products include land cover, vegetation indices, leaf area index, net photosynthesis, fraction-of-photosynthetically active radiation, and vegetation cover conversion. This report describes those products, how they were processed, what they look like, and how they can be used for military land monitoring and management.
DTIC
Artificial Satellites; Ecosystems

20030075777 NASA Ames Research Center, Moffett Field, CA, USA
Accelerating the Design of Space Vehicles
Laufenberg, Larry, Editor; Infusion; August 08, 2003; 4 pp.; In English
Contract(s)/Grant(s): UPN 704-00-00; No Copyright; Avail: CASI; A01, Hardcopy

One of NASA's key goals is to increase the safety and reduce the cost of space transportation. Thus, a key element of NASA's new Integrated Space Transportation Plan is to develop new propulsion, structures, and operations for future generations of reusable launch vehicles (RLVs). As part of this effort to develop the next RLV, the ClCT Program's Computing, Networking, and Information Systems (CNIS) Project is developing and demonstrating collaborative software technologies that use the collective power of the NASA Grid to accelerate spacecraft design. One of these technologies, called AeroDB, automates the execution and monitoring of computational fluid dynamics (CFD) parameter studies on the NASA Grid. About the NASA Grid The NASA Grid, or Information Power Grid,. is being developed to leverage the distributed resources of NASA's many computers. instruments, simulators, and data storage systems. The goal is to use these combined resources to sdve difficult NASA challenges, such as iimulating the entire flight of a space vehicle from ascent to descent.To realize the vision of the NASA Grid, the CNIS Project is developing the software framework and protocols for building domain-specific environments and interfaces, new Grid services based on emerging industry standards, and advanced networking and computing testbeds to support new Grid-based applications such as AeroDB.
Author
Reusable Launch Vehicles; Computational Fluid Dynamics

20030079974 NASA Langley Research Center, Hampton, VA, USA
Hypervelocity Impact Test Results for a Metallic Thermal Protection System
Karr, Katherine L.; Poteet, Carl C.; Blosser, Max L.; August 2003; 79 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 721-21-87-07
Report No.(s): NASA/TM-2003-212440; L-18192; NAS 1.15:212440; No Copyright; Avail: CASI; A05, Hardcopy

Hypervelocity impact tests have been performed on specimens representing metallic thermal protection systems (TPS) developed at NASA Langley Research Center for use on next-generation reusable launch vehicles (RLV). The majority of the specimens tested consists of a foil gauge exterior honeycomb panel, composed of either Inconel 617 or Ti-6Al-4V, backed with 2.0 in. of fibrous insulation and a final Ti-6Al-4V foil layer. Other tested specimens include titanium multi-wall sandwich coupons as well as TPS using a second honeycomb sandwich in place of the foil backing. Hypervelocity impact tests were performed at the NASA Marshall Space Flight Center Orbital Debris Simulation Facility. An improved test fixture was designed and fabricated to hold specimens firmly in place during impact. Projectile diameter, honeycomb sandwich material, honeycomb sandwich facesheet thickness, and honeycomb core cell size were examined to determine the influence of TPS configuration on the level of protection provided to the substructure (crew, cabin, fuel tank, etc.) against micrometeoroid or orbit debris impacts. Pictures and descriptions of the damage to each specimen are included.
Author
Hypervelocity Impact; Impact Tests; Thermal Protection; Fabrication; Intermetallics

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*.

20030071240 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Columbia Accident Probe Widens
Covault, Craig; Aviation Week and Space Technology; May 26, 2003, pp. 42-43; In English; Copyright; Avail: Other Sources

The Columbia Accident Investigation Board has identified about a dozen shuttle program safety concerns it will address in its final report, in addition to foam shedding from the Lockheed Martin external tank-believed by many board members to be the direct cause for the loss of Columbia and her crew. As new evidence narrows the location of Columbia's left-wing breach to a lower corner of reinforced carbon-carbon (RCC) Panel 8 and its adjoining T-seal, the board is broadening its penetration of other shuttle safety issues. As the board works in Houston, United Space Alliance technicians here at Kennedy last week sent the first six of 22 RCC panels from the orbiter Atlantis left wing to Vought Aircraft Industries Inc. in Dallas

for extensive testing to assess their integrity. The move is a key step toward both returning the shuttle to flight with Atlantis and obtaining more data on RCC panels subjected to fewer flights, and less exposure to the weather, than the older panels used on Columbia.
Author
Columbia (Orbiter); Aerospace Safety; Accident Investigation; Accidents; Safety Factors

20030071248 NASA Ames Research Center, Moffett Field, CA, USA
Surviving Atmospheric Spacecraft Breakup
Szewczyk, Nathaniel J.; Conley, Catharine A.; July 10, 2003; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

In essence, to survival a spacecraft breakup an animal must not experience a lethal event. Much as with surviving aircraft breakup, dissipation of lethal forces via breakup of the craft around the organism is likely to greatly increase the odds of survival. As spacecraft can travel higher and faster than aircraft, it is often assumed that spacecraft breakup is not a survivable event. Similarly, the belief that aircraft breakup or crashes are not survivable events is still prevalent in the general population. As those of us involved in search and rescue know, it is possible to survive both aircraft breakup and crashes. Here we make the first report of an animal, C. elegans, surviving atmospheric breakup of the spacecraft supporting it and discuss both the lethal events these animals had to escape and the implications implied for search and rescue following spacecraft breakup.
Author
Spacecraft Breakup; Atmospheric Entry; Space Shuttles; NASA Space Programs; Exobiology

20030073469 NASA Johnson Space Center, Houston, TX, USA
STS-113 Mission Highlights Resource Tape Flight Days 1-3. Tape: 1 of 4
[2003]; In English; Tape: 1 of 4, 1 hr., 27 mins. playing time, in color with sound
Report No.(s): JSC-1946; No Copyright; Avail: CASI; V04, Videotape-VHS; B04, Videotape-Beta

This video, part 1 of 4, shows the activities of the crew of Space Shuttle Endeavour during flight days 1-3 of STS-113. The crew consists of Commander Jim Wetherbee, Pilot Paul Lockhart, Mission Specialists Michael Lopez-Alegria and John Herrington. With them were the Expedition 6 crewmembers of the International Space Station (ISS), Ken Bowersox, Nikolai Budarin, and Don Pettit. Pre-launch procedures are shown, and the rain-delayed night launch is shown from several camera angles. On flight day 2 there was a check out of the Canadarm on Endeavour, and some intravehicular activity. Flight day 3 highlights the docking of Endeavour and the ISS, and preparation for an extravehicular activity (EVA) the following day. Earth views include the English Channel at night with a close-up of London, the coast of Ecuador, and some views of Endeavour with the Earth in the background.
CASI
Spacecrews; Endeavour (Orbiter); International Space Station; Spacecraft Docking; Spacecraft Launching

20030075645 NASA Johnson Space Center, Houston, TX, USA
STS-113 Mission Highlights Resource Tape Flight Days 12-15. Tape: 4 of 4
[2003]; In English; Tape: 4 of 4, 20 mins. playing time, in color with sound
Report No.(s): JSC-1946; No Copyright; Avail: CASI; V02, Videotape-VHS; B02, Videotape-Beta

This short video, Part 4 of 4, shows the activities of the crew of Space Shuttle Endeavour and the Expedition 5 crew of the International Space Station (ISS) on the final day of STS-113. The shuttle's crew consists of Commander Jim Wetherbee, Pilot Paul Lockhart, and Mission Specialists Michael Lopez-Alegria and John Herrington, together with the Expedition 5 crew, Commander Valery Korzun, Flight Engineer Sergei Treschev, and NASA ISS Science Officer Peggy Whitson. Onboard video is not available for flight days 12 through 14, but footage of flight day 15 includes suiting up into flight suits, reentry and landing from different angles, including Pilot Point of View (PPOV), and replays of landing.
CASI
Endeavour (Orbiter); International Space Station; Spacecrews; Horizontal Spacecraft Landing

20030075670 NASA Johnson Space Center, Houston, TX, USA
STS-113 Mission Highlights Resource Tape Flight Days 7-11. Tape: 3 of 4
[2003]; In English; Tape: 3 of 4, 1 hr., 25 mins., 44 sec. playing time, in color with sound
Report No.(s): JSC-1946; No Copyright; Avail: CASI; V04, Videotape-VHS; B04, Videotape-Beta

This video, part 3 of 4, shows the activities of the crew of Space Shuttle Envdeavour and the Expedition 5 and 6 crews of the International Space Station (ISS) during flight days 7 through 11 of STS-113. Endeavour's crew consists of Commander

Jim Wetherbee, Pilot Paul Lockhart, and Mission Specialists Michael Lopez-Alegria and John Herrington. Footage of flight day 7 includes a change of command ceremony on board the ISS, and Endeavour dumping supply water through a nozzle. On flight day 8 the Space Station Mobile Transporter jams while traveling on the P1 truss of the ISS, and Herrington attempts to free it as part of a lengthy extravehicular activity (EVA) with Lopez-Alegria. Flight day 9 is the last full day the three crews spend together. Expedition 5 NASA ISS Science Officer Peggy Whitsun troubleshoots the Microgravity Glovebox on board the ISS with her successor Don Pettit. The undocking of Endeavour and the ISS is the main activity of flight day 10. Endeavour also deploys a pair of experimental tethered microsatellites for the Department of Defense. The footage from flight day 11 shows the Expedition 5 crew exercising, laying in recumbant seats to help them adjust to the gravity on Earth, and sleeping. The video includes numerous views of the earth, some with the ISS and Endeavour in the foreground. There are close-ups of Italy, Spain and Portugal, Tierra del Fuego, and Baja California, and a night view of Chicago and the Great Lakes.
CASI
Endeavour (Orbiter); International Space Station; Spacecrews; Extravehicular Activity

20030079946 Sandia National Labs., Albuquerque, NM
Cassini Spacecraft Uncertainty Analysis Data and Methodology Review and Update, Volume 1, Updated Parameter Uncertainty Models for the Conseequence Analysis
Wheeler, T. A.; Wyss, G. D.; Harper, F. T.; Dec. 06, 2000; 162 pp.; In English
Report No.(s): DE2003-769026; SAND-2000-2719/1-Vol-1; No Copyright; Avail: Department of Energy Information Bridge
Uncertainty distributions for specific parameters of the Cassini General Purpose Heat Source Radioisotope Thermoelectric Generator (GPHS-RTG) Final Safety Analysis Report consequence risk analysis were revised and updated. The revisions and updates were done for all consequence parameters for which relevant information exists from the joint project on Probabilistic Accident Consequence Uncertainty Analysis by the USA Nuclear Regulatory Commission and the Commission of European Communities.
NTIS
Cassini Mission; Radioisotope Heat Sources; Thermoelectric Generators; Space Probes; Mariner Mark 2 Spacecraft

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*.

20030071684 National Inst. of Standards and Technology, USA
The Need for Communication with the Critical Viscosity Experiment
Berg, Robert F.; December 07, 1993; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only
The principal investigators will need the ability to communicate with the Critical Viscosity Experiment in flight. Although the nominal plan calls for the experiment to proceed automatically, communication ability will greatly reduce the chance of experiment failure. Examples of technical problems which could be mitigated by communication include an unexpected shift in the apparent critical temperature and an unexpected, prolonged period of severe vibration. The first problem could be corrected by modifying the temperature control schedule. The second problem could be mitigated by taking additional data in the affected temperature range. Examples of problems due to unexpected sample behavior include difficulty in automatically resolving T(sub c) and unexpectedly long equilibration times. The former might be handled by manual analysis and the latter would require a change in the temperature schedule. Real-time communication is not necessary. For the examples cited above, the slow speed of the viscosity experiment's temperature sweeps would make tolerable communication delays of as much as one hour. Full control of the experiment or complete reporting of all acquired data is also not necessary. For example, only an occasional interrogation of the oscillator's frequency response would be needed to verify its proper operation. The Critical Point Facility which flew on IML-1 experienced thermometry difficulties about 50 mK in amplitude. This would have been disastrous for the Thermal Equilabration Experiment had it been allowed to run automatically according to the nominal plan. However, observation of the apparent shift in T(sub c) allowed the TEQ investigators to partially compensate for the problem by reprogramming the CPF's temperature control schedule. An additional problem, peculiar to TEQ, was that the planned method for excitation of density gradients by stepping the temperature proved ineffective. This also was mitigated during the

flight by reprogramming the stirrer to create transient temperature gradients. The experience with CPF convinced us of the value of communication with the experiment.
Author
Spaceborne Experiments; Space Communication; Viscometers

18
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*.

20030075798 Alabama Univ., Huntsville, AL, USA
Correlation of Accelerometer Data on STS-50 (USML-1)
Rogers, Melissa J. B.; Wolf, Randall P.; Alexander, J. Iwan D.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 893-907; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The quasi-steady acceleration and vibrational environment on STS-50 as measured and recorded by the Passive Accelerometer System (PAS), the Orbital Acceleration Research Experiment (OARE), and the Space Acceleration Measurement System (SAMS) is analyzed. The blowing disturbance sources are investigated: Flash Evaporator System and water dump activity, crew exercise, and Reaction Control System firings.
Author
Acceleration Measurement; Vibration; Data Correlation

20030075812 Canopus Systems, Inc., Ann Arbor, MI, USA
Orbital Acceleration Research Experiment Instrument Performance on STS-50
McNally, Patrick J.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 771-784; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The Orbital Acceleration Research Experiment (OARE) instrument performance for the STS 50 mission is described, with particular attention given to bias calibrations and bias stability. The STS 50 mission results show extremely stable sensor output, resolving the in-flight anomalies from the STS 40 mission. In order to determine absolute acceleration levels on the shuttle to frequencies well below 1 Hz, instrument driffs with respect to several variables need to be modeled and removed from the data. Since OARE is the first accelerometer system to include a complete calibration subsystem, the OARE results will define how the miniature electrostatic accelerometer (MESA) operates over 14 day missions. The OARE sensor collects three axes of data, each with three commandable dynamic ranges. Most of the STS 50 mission had the sensor in the 'C' range, representing a resolution of 3.05 nano-g and dynamic range of 100 micro-g in the X axis and a resolution of 4.6 nano-g and dynamic range of 150 micro-g in the Y and Z axes. The bias results as a function of time after the launch event we described. The X axis bias level (sensor cylindrical axis) is shown to decay with a time constant of approximately 42 hours from an initial value of approximately 40 micro-g. The X axis continues to take valid data during this decay period. This decay is not seen on the Y and Z axes and is probably due to dielectric charging of the ceramic insulator material which surrounds the cylindrical axis electrodes. The bias results as a function of sensor range and axis are illustrated with several charts. This data shows a variation of bias with range due to the pick-off null offset of the sensor and the reference voltage range scaling. The bias results as a function of temperature are also illustrated with Several charts. Bias-temperature coefficients for the MESA are -0.036 micro-g/ C: for the X axis, +0.027 micro-g/ C; for the Y axis, and -0.019 micro-g/ C: for the Z axis. The OARE output is very stable even though the shuttle is very noisy (by nano-g standards) and accelerations change direction and magnitude often. Through modeling of errors related to sensor accurate estimates of bias and scale factor parameters for the most sensitive range can be made by comparing data from the less sensitive ranges. This technique can be used to achieve greater performance from the OARE instrument even in the presence of large disturbances from the shuttle.
Author
Space Transportation System; Accelerometers; Space Missions; Miniaturization; Spacecraft Instruments; Spacecraft Performance; Electrostatics

20030075814 NASA Lewis Research Center, Cleveland, OH, USA

Summary Status of the Space Acceleration Measurement System (SAMS), September 1993

DeLombard, Richard; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 797-811; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The Space Acceleration Measurement System (SAMS) was developed to measure the microgravity acceleration environment to which NASA science payloads are exposed during microgravity science missions on the shuttle. Six flight units have been fabricated to date. The inaugural flight of a SAMS unit was on STS-40 in June 1991 as part of the First Spacelab Life Sciences mission. Since that time, SAMS has flown on six additional missions and gathered eighteen gigabytes of data representing sixty-eight days of microgravity environment. The SAMS units have been flown in the shuttle middeck and cargo bay, in the Spacelab module, and in the Spacehab module. This paper summarizes the missions and experiments which SAMS has supported. The quantity of data and the utilization of the SAMS data is described. Future activities are briefly described for the SAMS project and the Microgravity Measurement and Analysis project (MMAP) to support science experiments and scientists with microgravity environment measurement and analysis.

Author

Acceleration Measurement; Microgravity; Payloads; Bioastronautics

20030075815 Canopus Systems, Inc., USA

Further Enhancements in Nano-g Accelerometry: The Cube MESA

McNally, Patrick J.; Dietrich, Robert W.; Lange, William G.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 827-837; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

This paper discusses an evolution of the cylindrical proofmass Miniature Electrostatic Accelerometer used on the Orbital Acceleration Research Experiment into a cube shaped proofmass, known as the Cube MESA. The current approach of the OARE instrument using the cylindrical proofmass is briefly summarized. The Cube MESA design is explained and compared with the cylindrical MESA. A low cost approach to obtaining flight experience with a Cube MESA while utilizing a major portion of the OARE flight hardware is proposed.

Author

Electrostatics; Accelerometers; Miniaturization; Cylindrical Bodies

20030075822 Entwicklungsring Nord, Bremen, Germany

EURECA Microgravity Environment: Preliminary Flight Data

Eilers, D.; Stark, H. R.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 869-891; In English; See also 20030075796; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

EURECA, the European Retrievable Carrier, provides a new platform to perform microgravity research in a low gravity orbital environment over extended duration of at least six months. The first mission was launched in August 1992. After the free flying period, the EURECA spacecraft was successfully retrieved by the Space Shuttle and landed on June 24, 1993. EURECA has been designed for at least five launches and retrievals. In order to comply with the stringent microgravity requirements, the EURECA system, subsystem and payload performances shall maintain a controlled microgravity environment and shall not exceed a limited acceleration response spectrum at the payload mechanical interfaces. Intensive design, development and optimization activities were implemented and verified by simulations, analyses and during an integrated system test on-ground. finally, on-board acceleration measurement system completed the information about the quality of the micro-g environment. This paper summarizes the preliminary review of the residual accelerations as measured during the first mission period of EURECA between 07.08.92 end the 1.10.92 in correlation with the previous analysis and ground test results, as well as some later data. The on-board Microgravity Measurement Subsystem (MMS) detected the residual accelerations after command from ESOC, the European Space Operations Center, in Darmstadt, Germany. This review is namely based on a set of 906 acceleration measurements during the initial period, with a duration of 3.167 minutes and in some cases up to 657.6 minutes. The MMS data were transmitted from ESOC to the Microgravity User Support Centre (MUSC) at DLR, Koin-Porz, for processing and presentation. The preliminary evaluation provided very interesting results. For instance, a dominant vibration frequency of 0.85 Hz is observed which can correspond to a FEM-mode shape. A modulation frequency of 0.04 Hz could also be caused by two adjacent mode shapes. Measurements over orbit periods show repetitive slight changes in the vibration behavior beginning with and during each ecipse phase, etc. The paper will present these findings

and the conclusion that the desire design goal for the microgravity quality on EURECA was met.
Author
Microgravity; Eureca (Esa); European Space Programs; Data Processing; Aerospace Environments; Mathematical Models

20030079975 NASA Langley Research Center, Hampton, VA, USA
Structured Uncertainty Bound Determination From Data for Control and Performance Validation
Lim, Kyong B.; August 2003; 136 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 706-21-71-01
Report No.(s): NASA/TM-2003-212441; L-18156; NAS 1.15:212441; No Copyright; Avail: CASI; A07, Hardcopy

This report attempts to document the broad scope of issues that must be satisfactorily resolved before one can expect to methodically obtain, with a reasonable confidence, a near-optimal robust closed loop performance in physical applications. These include elements of signal processing, noise identification, system identification, model validation, and uncertainty modeling. Based on a recently developed methodology involving a parameterization of all model validating uncertainty sets for a given linear fractional transformation (LFT) structure and noise allowance, a new software, Uncertainty Bound Identification (UBID) toolbox, which conveniently executes model validation tests and determine uncertainty bounds from data, has been designed and is currently available. This toolbox also serves to benchmark the current state-of-the-art in uncertainty bound determination and in turn facilitate benchmarking of robust control technology. To help clarify the methodology and use of the new software, two tutorial examples are provided. The first involves the uncertainty characterization of a flexible structure dynamics, and the second example involves a closed loop performance validation of a ducted fan based on an uncertainty bound from data. These examples, along with other simulation and experimental results, also help describe the many factors and assumptions that determine the degree of success in applying robust control theory to practical problems.
Author
Mathematical Models; Control Theory; Robustness (Mathematics); Linear Transformations; Uncertain Systems; Dynamic Structural Analysis; Spacecraft Performance; Program Verification (Computers)

19
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*.

20030075818 Entwicklungsring Nord, Bremen, Germany
Microgravity Measurement Assembly (MMA): A Centralized On-Board Measurement Facility
Gerhard, Ingo; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 839-856; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The Microgravity Measurement Assembly (MMA) is a centralized measurement facility for ground and on-orbit disturbance accelerations, currently designed for Spacelab applications, and has demonstrated it's full functionality the first time during the German Spacelab Mission D-2 in April / May 1993. The system is using a new generation of micromechanical acceleration detectors. Small dimensions of the triaxial sensor packages allow for installation very close to scientific experiments. The mass is significantly reduced compared to previously used systems. The system capability to connect up to seven sensors to the central MMA computer lead for the D-2 mission to the following system configuration: Four of these mini-sensor packages have been installed near to the most g-sensitive experiments inside Spacelab racks. In addition two mobile sensor packages were available to be handled by the astronauts inside the cabin. These sensors could be installed near to various vibration sources like pumps, centrifuges etc. or any other location. An impact hammer inducing defined forces was used together with MMA in order to support determination of structural transfer functions on-ground as well as on-orbit. All data were collected and formatted by the MMA computer and send via High Rate Multiplexer to the ground. On ground the MMA Ground Station processed the data on-line to support either the other experiments or the transfer function determination. Thus, for the first time, synchronized and comparable precision acceleration data were available in real time on ground for on-line judgment of the microgravity environment desired for experiment success, offering the possibility e.g. of experiment repetition in case of excessive g-disturbances. Furthermore MMA allows for immediate feedback to the crew concerning the microgravity effects of their own body movements with the aim to improve crew training towards lower crew induced

disturbances. The MMA on-board system and ground station is planned to be utilized for future Spacelab Missions and in modified configuration also for MIR.
Author
Microgravity; Onboard Equipment; Acceleration Measurement; Micromechanics; NASA Space Programs

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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*.

20030068982 Michigan Univ., Ann Arbor, MI
Evidence of Collisionless Shocks in a Hall Thruster Plume
Beal, Brian E.; Gallimore, Alec D.; Hargus, William A.; Apr. 25, 2003; 45 pp.; In English
Contract(s)/Grant(s): Proj-1011
Report No.(s): AD-A414913; AFRL-PR-ED-TP-2003-102; No Copyright; Avail: CASI; A03, Hardcopy

Triple Langmuir probes and emissive probes are used to measure the electron number density, electron temperature, and plasma potential downstream of a low-power Hall thruster. The results show a high density plasma core with elevated electron temperature and plasma potential along the thruster centerline. These properties are believed to be due to collisionless shocks formed as a result of the ion/ion acoustic instability. A simple model is presented that shows the existence of a collisionless shock to be consistent with the observed phenomena.
DTIC
Ion Engines; Electron Density (Concentration)

20030069049 NASA Marshall Space Flight Center, Huntsville, AL, USA
Summary of Recent Inducer Testing at MSFC and Future Plans
Skelley, Stephen; [2003]; 24 pp.; In English; 2003 Thermal and Fluids Analysis Workshop, 18-22 Aug. 2003, Hampton, VA, USA; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation covers water flow tests on the RS-83 Main LOX Inducer for the Space Shuttle Main Engine (SSME). The presentation lists recent water tests on the SSME liquid oxygen (LOX) pump inducer, includes images and diagrams of the water test facility at Marshall Space Flight Center (MSFC), profiles inducer hydrodynamic forces, and diagrams the performance of the RS-83 inducer.
CASI
Test Facilities; Induction; Liquid Oxygen; Fuel Pumps; Performance Tests

20030071110 ATK-Thiokol Propulsion, Brigham City, UT, USA
Multiple Changes to Reusable Solid Rocket Motors, Identifying Hidden Risks
Greenhalgh, Phillip O.; McCann, Bradley Q.; May 05, 2003; 8 pp.; In English; 21st International System Safety Conference, 4-8 Aug. 2003, Ottawa, Ontario, Canada
Contract(s)/Grant(s): NAS8-97238; No Copyright; Avail: CASI; A02, Hardcopy

The Space Shuttle Reusable Solid Rocket Motor (RSRM) baseline is subject to various changes. Changes are necessary due to safety and quality improvements, environmental considerations, vendor changes, obsolescence issues, etc. The RSRM program has a goal to test changes on full-scale static test motors prior to flight due to the unique RSRM operating environment. Each static test motor incorporates several significant changes and numerous minor changes. Flight motors often implement multiple changes simultaneously. While each change is individually verified and assessed, the potential for changes to interact constitutes additional hidden risk. Mitigating this risk depends upon identification of potential interactions. Therefore, the ATK Thiokol Propulsion System Safety organization initiated the use of a risk interaction matrix to identify potential interactions that compound risk. Identifying risk interactions supports flight and test motor decisions. Uncovering hidden risks of a full-scale static test motor gives a broader perspective of the changes being tested. This broader perspective compels the program to focus on solutions for implementing RSRM changes with minimal/mitigated risk. This paper discusses use of a change risk interaction matrix to identify test challenges and uncover hidden risks to the RSRM program.
Author
Space Shuttle Boosters; Reusable Rocket Engines; Risk; Full Scale Tests; Static Tests; Engine Tests

20030071260 Pennsylvania State Univ., University Park, PA, USA

Focused RBCC Experiments: Two-Rocket Configuration Experiments and Hydrocarbon/Oxygen Rocket Ejector Experiments

Santoro, Robert J.; Pal, Sibtosh; September 2003; 74 pp.; In English

Contract(s)/Grant(s): NAG8-1844; No Copyright; Avail: CASI; A04, Hardcopy

This addendum report documents the results of two additional efforts for the Rocket Based Combined Cycle (RBCC) rocket-ejector mode research work carried out at the Penn State Propulsion Engineering Research Center in support of NASA s technology development efforts for enabling 3 d generation Reusable Launch Vehicles (RLV). The tasks reported here build on an earlier NASA MSFC funded research program on rocket ejector investigations. The first task investigated the improvements of a gaseous hydrogen/oxygen twin thruster RBCC rocket ejector system over a single rocket system. The second task investigated the performance of a hydrocarbon (liquid JP-7)/gaseous oxygen single thruster rocket-ejector system. To gain a systematic understanding of the rocket-ejector s internal fluid mechanic/combustion phenomena, experiments were conducted with both direct-connect and sea-level static diffusion and afterburning (DAB) configurations for a range of rocket operating conditions. For all experimental conditions, overall system performance was obtained through global measurements of wall static pressure profiles, heat flux profiles and engine thrust. Detailed mixing and combustion information was obtained through Raman spectroscopy measurements of major species (gaseous oxygen, hydrogen, nitrogen and water vapor) for the gaseous hydrogen/oxygen rocket ejector experiments.

Author

Combustion Physics; Ejectors; Hydrogen Oxygen Engines; Rocket-Based Combined-Cycle Engines; Spacecraft Configurations; Hydrocarbon Fuels; Computational Fluid Dynamics

20030071266 Pennsylvania State Univ., University Park, PA, USA

Focused Rocket-Ejector RBCC Experiments

Santoro, Robert J.; Pal, Sibtosh; September 2003; 104 pp.; In English

Contract(s)/Grant(s): NAG8-1844; No Copyright; Avail: CASI; A06, Hardcopy

This document reports the results of additional efforts for the Rocket Based Combined Cycle (RBCC) rocket-ejector mode research work carried out at the Perm State Propulsion Engineering Research Center in support of NASA s technology development efforts for enabling 3rd generation Reusable Launch Vehicles (RLV). The two tasks conducted under this program build on earlier NASA MSFC funded research program on rocket ejector investigations. The first task continued a systematic investigation of the improvements provided by a gaseous hydrogen (GHz)/oxygen (GO2) twin thruster RBCC rocket ejector system over a single rocket system. In a similar vein, the second task continued investigations into the performance of a hydrocarbon (liquid JP-7)/gaseous oxygen single thruster rocket-ejector system. To gain a systematic understanding of the rocket-ejector s internal fluid mechanic/combustion phenomena, experiments were conducted with both direct-connect and sea-level static diffusion and afterburning (DAB) configurations for a range of rocket operating conditions. For all experimental conditions, overall system performance was obtained through global measurements of wall static pressure profiles, heat flux profiles and engine thrust. For the GH2/GO2 propellant rocket ejector experiments, high frequency measurements of the pressure field within the system were also made to understand the unsteady behavior of the flowfield.

Author

Ejectors; Rocket-Based Combined-Cycle Engines; Spacecraft Propulsion; Gaseous Rocket Propellants; Computational Fluid Dynamics

20030071272 Aerojet-General Corp., Sacramento, CA, USA

Non-Toxic Dual Thrust Reaction Control Engine Development for On-Orbit APS Applications

Robinson, Philip J.; Veith, Eric M.; [2003]; 11 pp.; In English; 39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 20-23 Jul. 2003, Huntsville, AL, USA; No Copyright; Avail: CASI; A03, Hardcopy

A non-toxic dual thrust proof-of-concept demonstration engine was successfully tested at the Aerojet Sacramento facility under a technology contract sponsored by the National Aeronautics and Space Administration's (NASA) Marshall Space Flight Center (MSFC). The goals of the NASA MSFC contract (NAS8-01109) were to develop and expand the technical maturity of a non-toxic, on-orbit auxiliary propulsion system (APS) thruster under the Next Generation Launch Technology (NGLT) program. The demonstration engine utilized the existing Kistler K-1 870 lbf LOX/Ethanol orbital maneuvering engine (O m) coupled with some special test equipment (STE) that enabled engine operation at 870 lbf in the primary mode and 25 lbf in the vernier mode. Ambient testing in primary mode varied mixture ratio (MR) from 1.28 to 1.71 and chamber pressure (P(c) from 110 to 181 psia, and evaluated electrical pulse widths (EPW) of 0.080, 0.100 and 0.250 seconds. Altitude testing in vernier mode explored igniter and thruster pulsing characteristics, long duration steady state operation (greater than

420 sec) and the impact of varying the percent fuel film cooling on vernier performance and chamber thermal response at low PC (4 psia). Data produced from the testing provided calibration of the performance and thermal models used in the design of the next version of the dual thrust Reaction Control Engine (RCE).
Author
Auxiliary Propulsion; Oxygen-Hydrocarbon Rocket Engines

20030077847 NASA Marshall Space Flight Center, Huntsville, AL, USA
Experimental Performance Evaluation of a Supersonic Turbine for Rocket Engine Applications
Snellgrove, Lauren M.; Griffin, Lisa W.; Sieja, James P.; Huber, Frank W.; July 08, 2003; 11 pp.; In English; 39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA
Report No.(s): AIAA Paper 2003-4918; Copyright; Avail: CASI; A03, Hardcopy

In order to mitigate the risk of rocket propulsion development, efficient, accurate, detailed fluid dynamics analysis and testing of the turbomachinery is necessary. To support this requirement, a task was developed at NASA Marshall Space Flight Center (MSFC) to improve turbine aerodynamic performance through the application of advanced design and analysis tools. These tools were applied to optimize a supersonic turbine design suitable for a reusable launch vehicle (RLV). The hot gas path and blading were redesigned-to obtain an increased efficiency. The goal of the demonstration was to increase the total-to-static efficiency of the turbine by eight points over the baseline design. A sub-scale, cold flow test article modeling the final optimized turbine was designed, manufactured, and tested in air at MSFC s Turbine Airflow Facility. Extensive on- and off-design point performance data, steady-state data, and unsteady blade loading data were collected during testing.
Author
Supersonic Turbines; Reusable Launch Vehicles; Turbine Blades; Aerodynamic Characteristics

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*.

20030068962 Naval Health Research Center, Wright-Patterson AFB, OH, USA
Derivation of Navy Occupational Exposure Limits (OELS) for Two Solvent Compounds: Vertrel MCA and HFE-71DE
Arfsten, Darryl P.; Kane, Linda V.; Jederberg, Warren W.; Mar. 2003; 14 pp.; In English
Report No.(s): AD-A414627; TOXDET-EHEL-03-08; No Copyright; Avail: CASI; A03, Hardcopy

Currently the US Navy uses the solvent HFC-141b to clean hydraulic gauges in a semi-closed system prior to gauge calibration. The US Navy will not be able to use the solvent HFC-141b after 31 December 2002 because of a ban on its manufacture. The Navy is considering both Vertrel MCA and HFE-71DE as replacements for HFC-141b. Both solvents are azeotropic mixtures consisting of trans 1,2-DCE and either fluorocarbons or ethers Both Vertrel MCA and HFE-71DE have high vapor pressures therefore they are expected to volatilize at room temperature. The potential routes of exposure to solvent during the gauge cleaning process are inhalation of vapors and dermal contact with liquid when pouring new and spent solvents into flasks and containers.
DTIC
Solvents; Cleaning

20030068980 General Electric Co., Schenectady, NY, USA
Diffusion Concept in Phase Stability of High Temperature Composites
Zhao, Ji-Cheng; Jackson, Melvin R.; Feb. 2003; 230 pp.; In English
Contract(s)/Grant(s): F49620-99-C-0026
Report No.(s): AD-A414912; No Copyright; Avail: CASI; A11, Hardcopy

A high-efficiency 'diffusion multiple' approach was employed to determine the phase diagrams of nine ternary systems Nb-Ti-Si, Nb-Cr- Si, Nb-Cr-Ti, Ti-Cr-Si, Nb-Si-Al, Nb-Cr-Al, Nb-Ti-Al, Ti-Si-Al, and Ti-Cr-Al. These phase diagrams are very important for the design of Nb silicide based composites and their coatings for advanced military aircraft engines. Most of these ternary systems are very complex-some contain up to 14 phases, thus they also serve as excellent examples to test the applicability of the diffusion multiple approach to such complex systems. A total of seven different diffusion multiples were made to map the phase diagrams of these nine ternary systems. It would take more than a thousand individual alloys to

accomplish the same amount of phase diagram mapping. All the equilibrium phases reported in these systems were observed in the diffusion multiples and an extremely large amount of phase equilibrium information was obtained to construct isothermal section phase diagrams. The results clearly demonstrate the applicability of this novel approach to very complex phase diagrams. We have gained extensive experience on how to make diffusion multiples and how to most efficiently analyze such complex systems. The experimental data were used to model thermodynamic parameters for extrapolating the ternary data into multicomponent alloys to provide critical data for computational design of alloys. Our results provide a much clearer picture of the phase equilibria in the Nb-Si-Ti-Cr-Hf-Al composites.
DTIC
Silicides; Phase Diagrams; Refractory Coatings

20030069027 Environmental Protection Agency, Washington, DC
Toxic Substances Control Act (TSCA): ASCII Text Data, July 2003. TSCA Chemical Substances Inventory: Revised Inventory Synonym and Preferred Name File and PMN Number to EPA Accession Number Link (Raw Data File)
Jul. 2003; In English
Report No.(s): PB2003-500102; No Copyright; Avail: National Technical Information Service (NTIS)

The TSCA Chemical Substance Inventory provides chemical identity information for the 64,978 non-confidential substances on the TSCA Master Inventory File. The datafile contains no TSCA Confidential Business Information. New versions of the TSCA Inventory are issued at approximately six month intervals. The data provided for each chemical substance include the CAS Registry Number, Preferred CA Index Name, molecular formula, and other appropriate information, such as valid chemical names reported by submitters. The entries are in ascending CAS Registry Number order. The PMN Number to EPA Accession Number Link provides a cross-reference of these number for commenced PMNs on the confidential portion of the TSCA Master Inventory File. Neither this cross-reference nor the additional information included is TSCA Confidential Business Information. Provided on the diskette for each confidential commenced PMN are the PMN Case Number, EPA Accession Number, Generic Name, and EPA special flags. The sequence of the file is in ascending PMN case Number order with 'P' case numbers sorted first, followed by 'Y' case numbers.
NTIS
Toxicity; Molecular Structure

20030069048 Bureau of Reclamation, Denver, CO, USA, Montana State Univ., Bozeman, MT, USA
Biological Pretreatment for Membrane Systems. Agreement No. 98-FC-81-0010: Desalination and Water Purification Research and Development Program
Wend, C. F.; Camper, A. K.; Apr. 2003; 122 pp.; In English
Report No.(s): PB2003-104577; DWPR-79; No Copyright; Avail: CASI; A06, Hardcopy

Investigators at the Center for Biofilm Engineering proposed a technology to increase the biological stability of water to be further processed by reverse osmosis membranes. It was proposed to reduce membrane fouling by pretreating feed water using biological reactors to remove organic nutrients that support formation of fouling biofilms. The goal of the work was to determine if biological pretreatment can reduce fouling in membrane systems. Specific objects include: (1) determine if biological pretreatment using biologically active carbon and iron oxide coated sand as support media will reduce downstream fouling; (2) determine if chlorination as an oxidation step for feed water will influence downstream fouling; (3) determine if filtration of feed water will reduce downstream fouling; and (4) develop evaluation methods of these objections by developing and testing assays. The results of this work supported the acceptance of all objectives except the use of chlorination as an oxidation step for the organic amendment. The biological treatment coupled with filtration resulted in the best reduction in downstream fouling as measured by the assays employed. The reduction shown in biofilm cell numbers supported the assumptions made in the cost analysis.
NTIS
Pretreatment; Desalinization; Membranes; Research And Development; Water Treatment; Water Pollution

20030071065 Department of Energy, Washington, DC
Conductive Polymers
Bohnert, G. W.; 2002; 14 pp.
Report No.(s): DE2003-804936; No Copyright; Avail: Department of Energy Information Bridge

No abstract available
NTIS
Polymers; Conductivity; Semiconductors (Materials)

20030071275 NASA Marshall Space Flight Center, Huntsville, AL, USA
Performance Testing of Thermal Interface Filler Materials in a Bolted Aluminum Interface Under Thermal/Vacuum Conditions
Glasgow, S. D.; Kittredge, K. B.; June 2003; 18 pp.; In English
Report No.(s): NASA/TM-2003-212500; M-1075; NAS 1.15:212500; No Copyright; Avail: CASI; A03, Hardcopy

A thermal interface material is one of the many tools often used as part of the thermal control scheme for space-based applications. Historically, at Marshall Space Flight Center, CHO-THERM 1671 has primarily been used for applications where an interface material was deemed necessary. However, numerous alternatives have come on the market in recent years. It was decided that a number of these materials should be tested against each other to see if there were better performing alternatives. The tests were done strictly to compare the thermal performance of the materials relative to each other under repeatable conditions and do not take into consideration other design issues, such as off-gassing, electrical conduction, isolation, etc. The purpose of this Technical Memorandum is to detail the materials tested, test apparatus, procedures, and results of these tests. The results show that there are a number of better performing alternatives now available.
Author
Aluminum; Thermal Protection; Interfaces; Performance Tests

20030075652
Thermodyamic and Kinetic Behavior of Systems with Intermetallic and Intermdiate Phases
2003; 16 pp.; In English
Report No.(s): DE2003-809877; No Copyright; Avail: Department of Energy Information Bridge

The expired project was supported by the Division of Materials Science of the Department of Energy for a two-year period; September 15, 1996- September 15, 1998. A theoretical investigation of the displacive coherent transformations in metal and ceramic materials was conducted. The fmal objective of this investigation is the development of realistic computer models, which would take advantage of the recent advances of the materials theory and computational methods to characterize the mesoscopic microstructure evolution of materials in materials processing. This research was focused on a behavior of coherent systems (martensitic systems, metal and ceramic, and ferroelectric systems) with defects. Although a presence of defects is an inherent property of practically any material and any transformation, there is a lack of knowledge of how the defects affect the transformation kinetics and thermodynamics. This is especially true for the theoretical study of this problem. The main aspect of the problem that was attacked, is a role of the long-range interaction between the transformation mode and the defects. This interaction is generated by the coherency strain caused by the crystal lattice misfit between the transformation products and the parent phase and the electrostatic dipole-dipole interaction in the ferroelectric materials.
NTIS
Phase Transformations; Ceramics; Ferroelectric Materials

20030075778 Army War Coll., Carlisle Barracks, PA
Transforming Army Petroleum Under the Executive Agency Concept
Foster, James M.; Apr. 7, 2003; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415052; No Copyright; Avail: CASI; A03, Hardcopy

Senior Army leaders must fully embrace executive agency (EA) to ensure the U.S. Army continues meeting its bulk petroleum mission today and well into the future. To do so, these leaders must first understand what EA is and then comprehend the Army's bulk petroleum mission and how it relates to EA. They must understand the Army petroleum organization for force management and policy development and how they relate to EA. Last, but not least, senior leaders need to know the changes necessary to take full advantage of EA. These same leaders must fully embrace the necessary changes and become full, participating partners with the Defense Logistics Agency (DLA) and the other Services to breathe life into EA for bulk petroleum. This new approach to managing a commodity is expected to provide the opportunity for senior Army leaders to improve the Army's ability to perform its bulk petroleum mission and to enhance its relevancy by being a principle architect in the new strategic system for managing bulk petroleum. The Army will benefit by ensuring bulk petroleum logistics

remain a combat/force multiplier. The end result will be better bulk petroleum support for all U.S. land-based forces.
DTIC
Petroleum Products; Military Technology; Crude Oil

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COMPOSITE MATERIALS

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

20030069065 Sandia National Labs., Albuquerque, NM, Foam Matrix, Inc., Inglewood, CA, USA
Blade Manufacturing Improvement Project
Sherwood, K.; Oct. 2002; 156 pp.; In English
Report No.(s): DE2003-803291; SAND-2002-3101; No Copyright; Avail: Department of Energy Information Bridge

The Blade Manufacturing Improvement Project explores new, unique and improved materials integrated with innovative manufacturing techniques that promise substantial economic enhancements for the fabrication of wind turbine blades. The primary objectives promote the development of advanced wind turbine blade manufacturing in ways that lower blade costs, cut rotor weight, reduce turbine maintenance costs, improve overall turbine quality and increase ongoing production reliability. Foam Matrix (FMI) has developed a wind turbine blade with an engineered foam core, incorporating advanced composite materials and using Resin Transfer Molding (RTM) processes to form a monolithic blade structure incorporating a single molding tool. Patented techniques are employed to increase blade load bearing capability and insure the uniform quality of the manufactured blade. In production quantities, FMI manufacturing innovations may return a sizable per blade cost reduction when compared to the cost of producing comparable blades with conventional methods.
NTIS
Manufacturing; Structural Stability; Wind Turbines

20030071126 Air Force Research Lab., Edwards AFB, CA, USA
Investigating the Crack Growth Behavior in a Particulate Composite Material Under Multi-Axial Loading Conditions
Liu, C. T.; Apr. 23, 2003; 14 pp.; In English
Contract(s)/Grant(s): Proj-2302
Report No.(s): AD-A414986; AFRL-PR-ED-VG-2003-100; No Copyright; Avail: CASI; A03, Hardcopy

This report contains viewgraphs that investigate the effects of loading conditions on crack growth behavior in a particulate composite materials under confining pressure. The loading conditions that were observed were 1) Constant strain rate : 5.8 cm/cm/min; 2) Constant strain: 12%, 15% and 18%; 3) Confining pressures: Ambient pressure and 6897 Kpa.
DTIC
Strain Rate; Crack Propagation; Composite Materials

20030071234 NASA Ames Research Center, Moffett Field, CA, USA
Aerogel Composites for Aerospace Thermal Protection
White, Susan; July 03, 2003; 1 pp.; In English; 7th International Symposium on Aerogels, 2-5 Nov. 2003, Alexandria, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

Aerogel composites formed by infiltrating organic and/or inorganic aerogels into fiber matrix materials enable us to exploit the low thermal conductivity and low density of aerogels while maintaining the strength, structure and other useful properties of a porous fiber matrix. New materials for extreme heating ranges are needed to insulate future spacecraft against the extreme heat of planetary atmospheric entry, but the insulation mass must be minimized in order to maximize the payload. A reusable system passively insulates to survive heating unchanged for relatively low heating. Ablators, which sacrifice mass to control heating, are used to protect vehicles against more extreme heating for a single use thermal protection system (TPS). Aerogel composites were fabricated and tested for spacecraft thermal protection. The high-temperaturey high heat flux tests described in this paper were performed in NASA Ames arc-jet facilities to simulate spacecraft atmospheric entry, and include heating conditions predicted for the forebody and backshell of the Mars Science Lander (MSL) entry probe. The aerogel composites tested showed excellent thermal performance in the arc-jet tests, functioning both as reusuable insulation under lower heat fluxes, and as ablative aerogels under the extreme heating predicted for the MSL forebody.
Author
Aerogels; Thermal Protection; Temperature Effects; Ablative Materials

20030071239 Computer Sciences Corp., Moffett Field, CA, USA
Carbon based Nanotechnology Nano-Materials, Electronics, and Machines
Srivastava, D.; December 4, 2002; 6 pp.; In English; Carbon versus Silicon: Thinking Small Thinking Fast, 7-11 Aug. 2003, Banff, Alberta, Canada
Contract(s)/Grant(s): DTT559-99-D-00437; No Copyright; Avail: CASI; A02, Hardcopy

A viewgraph presentation on carbon based nanotechnology with applications of various nanomaterials, electronics and machines are given.

CASI
Carbon; Nanotechnology; Electronics; Smart Materials; Micromachining

20030071268 Air Force Research Lab., Edwards AFB, CA, USA
Investigating the Effects of Confining Pressure on Cumulative Damage and the Constitutive Behavior of a Particulate Composite Material
Liu, C. T.; Yen, M.; Apr. 23, 2003; 15 pp.; In English
Contract(s)/Grant(s): Proj-2302
Report No.(s): AD-A415189; AFRL-PR-ED-VG-2003-099; No Copyright; Avail: CASI; A03, Hardcopy

This document is a report of Investigating the Effects of Confining Pressure on Cumulative Damage and the Constitutive Behavior of a Particulate Composite Material.

DTIC
Composite Materials; Cumulative Damage; Pressure Effects

20030073507 National Renewable Energy Lab., Golden, CO
Subcritical Crack Growth in Ceramic Composites at High Temperature Measured Using Digital Image Correlation
Mumm, D. R.; Morris, W. L.; Daadkhah, M. S.; Cox, B. N.; Nov. 1996; 18 pp.
Report No.(s): DE2003-3042; No Copyright; Avail: Department of Energy Information Bridge

An in situ experimental technique is described that allows high resolution, high sensitivity determination of displacements and full-field strains during high temperature mechanical testing. The technique is used to investigate elevated temperature crack growth in SiC/Nicalon sub f composites. At 1150 degrees C, the reinforcing fibers have a higher creep susceptibility than the matrix. Fiber creep leads to relaxation of crack bridging tractions, resulting in subcritical crack growth. Differential image analysis is used to measure the crack opening displacement profile u(x) of an advancing, bridged crack. With appropriate modeling, such data can be used to determine the traction law, from which the mechanics of cracking and failure may be determined.

NTIS
Ceramic Matrix Composites; Crack Propagation; High Temperature; Fibers; Creep Properties

25
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*.

20030068949
Engineering Evaluation of the Effectiveness of DST Annulus Ventilation Systems for Corrosion Mitigation
Dalpiaz, E.; Fredenburg, E.; Ogden, D.; Shuford, D.; Thurgood, M.; Jun. 20, 2001; 62 pp.; In English
Report No.(s): DE2003-807141; No Copyright; Avail: Department of Energy Information Bridge

This engineering study evaluates the corrosion mitigation effectiveness of the annulus ventilation systems for the 241-AN, 241-AP, 241-AW, 241-AY, 241-AZ, and 241-SY tank farms, and provides the technical basis for the Administrative Control for DST annulus ventilation systems. The study shows that maintenance of annulus ventilation is important to mitigating risk of condensation and resulting corrosion due to postulated water ingress into DST annuli.

NTIS
Corrosion; Ventilation; Engineering

20030068971 California Univ., San Diego, La Jolla, CA
Spectroscopy and Dynamics of Transient Energetic Species
Continetti, Robert; Apr. 30, 2003; 11 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0010; Proj-2303
Report No.(s): AD-A414886; AFRL-SR-AR-TR-03-0208; No Copyright; Avail: CASI; A03, Hardcopy

Studies of the spectroscopy and dynamics of transient energetic species by anion photodetachment and cation recombination processes are reported. Experimental efforts focused on sulfur, nitrogen and oxygen clusters. The research included the first report of a 5-fold coincidence measurement in a study of O bar-8 -> O2+O2+O2+O2+e.
DTIC
Spectroscopy; Surges

20030068976 Materials Research Society, Warrendale, PA
Symposium C: Bio-Inspired Nanoscale Hybrid Systems
Schmid, Guenter; Simon, Ulrich; Stranick, Stephen J.; Arrivo, Steven M.; Dec. 2002; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-03-1-0021; Proj-2312
Report No.(s): AD-A414905; AFRL-SR-AR-TR-03-201; No Copyright; Avail: CASI; A03, Hardcopy

Symposium C, Bio-Inspired Nanoscale Hybrid Systems, provided an extensive overview of the new and advanced approach to synthesize functional materials and to fabricate nanoscale devices utilizing biomolecules as a key building block. Nature utilizes molecular recognition between complex biomacromolecules to form sophisticated meso- and macroscopic architectures with tremendous control over the placement and orientation of nanoscopic building blocks. On the other hand, the advances of nanotechnology provide us new nanoscale structures including nanoparticles, nanowires, nanofabricated circuits etc. The marriage between biomolecules and these new nanostructructures allows us to envision many scientific breakthroughs and commercial applications. For example, specific interactions between biomolecules can be utilized as a major driving force to build sophisticated 1D, 2D and 3D architectures. C. A. Mirkin (Northwestern Univ.) demonstrated 'biodirected synthesis of functional materials using nanoscale building blocks' where biomolecular interactions such as DNA hybridization is utilized to direct the assembly of nanoparticles to form desired architectures. Several researchers reported various bio-inspired synthesis and assembly results such as the synthesis of metallic nanowires from peptides, DNA-mediated assembly of carbon nanotubes, and 3D assembly of nanoparticles using virus as a template.
DTIC
Polymers; Nanotechnology; Biomimetics; Biochemistry; Nanoparticles

20030071084 Army Cold Regions Research and Engineering Lab., Hanover, NH
Stability of CL-20, TNAZ, HMX, RDX, NG, and PETN in Moist, Unsaturated Soil
Jenkins, Thomas F.; Bartolini, Claudia; Ranney, Thomas A.; Apr. 2003; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414926; ERDC/CRREL-TR-03-7; SFIM-AEC-PC-CR-2003008; No Copyright; Avail: CASI; A03, Hardcopy

The stability of a number of the chemical components of energetic materials was evaluated in three moist, unsaturated soils. This study was conducted to evaluate the stability of several components of currently used energetic materials and two chemicals that may be used in future energetic material compositions in unsaturated, moist surface soils from three military training ranges. The compounds studied were nitroglycerin (NG), pentaerythritol tetranitrate (PETN), hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), octahydro-1, 3,5,7-tetranitro-1,3,5,7- tetrazocine (HMX), hexanitrohexaazaisowurtzitane (CL-20), and 1,3, 3-trinitroazetidine (TNAZ). Three soils from military training ranges were fortified using an aqueous spiking solution and the residual concentrations were measured after 0, 1, 4, 8, 14, and 29 days at 228C in the dark. The results indicate that the half-life of TNAZ and NG in all three test soils was less than one day, the half-life for PETN varied from 0.45 to 2.4 days, the half-life for RDX ranged from 94 to 154 days, the half-life for HMX varied from 133 to 2,310 days, and the halflife for CL-20 varied from 144 to 686 days.
DTIC
Chemical Composition; Soils

20030071153 NASA Ames Research Center, Moffett Field, CA, USA
Chemically Defined Medium and Caenorhabditis elegans: A Powerful Approach
Szewczyk, N. J.; Kozak, E.; Conley, C. A.; July 9, 2003; 7 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

C. elegans has been established as a powerful genetic system. Growth in a chemically defined medium (C. elegans Maintenance Medium (CeMM)) now allows standardization and systematic manipulation of the nutrients that animals receive. Liquid cultivation allows automated culturing and experimentation and should be of me in large-scale growth and screening of animals. Here we present our initial results from developing culture systems with CeMM. We find that CeMM is versatile and culturing is simple. CeMM can be used in a solid or liquid state, it can be stored unused for at least a year, unattended actively growing cultures may be maintained longer than with standard techniques, and standard C. elegans protocols work well with animals grown in defined medium. We also find that there are caveats of using defined medium. Animals in defined medium grow more slowly than on standard medium, appear to display adaptation to the defined medium, and display altered growth rates as they change defined medium composition. As was suggested with the introduction of C. elegans as a potential genetic system, use of defined medium with C. elegans should prove a powerful tool.
Derived from text
Cultivation; Genetics; Solid State; Worms

20030071155 NASA Ames Research Center, Moffett Field, CA, USA
The Chemistry and Excitation of Water in Molecular Clouds
Hollenbach, David; [2003]; 1 pp.; In English; Ecole Normale Superieure Astrophysics Seminar, 22 Sep. 2003; No Copyright; Avail: Other Sources; Abstract Only

We model the chemistry and thermal balance of opaque molecular clouds exposed to an external flux of ultraviolet photons. We include the processes of gas phase and grain surface chemical reactions; in particular we examine closely the freezing of atoms and molecules onto grain surfaces and the desorption of molecules from grain surfaces as a function of depth into a molecular cloud. We find that on the surface of a molecular cloud the gas phase water abundances are low because of photodissociation, and the grain phase water (ice) abundance is low because of photodesorption of water from the grain surfaces. Deeper into the cloud, at A(sub v) less than or approximately 2-8 depending on the strength of the external ultraviolet flux, the gas phase water abundance increases with depth as the photodissociation rates decline due to dust attenuation of the ultraviolet field. However, beyond A(sub v) less than or approximately 2-8 the gas phase water abundance declines because the water freezes as water ice on the grains, and photodesorption is no longer effective in clearing the ice. A peak water abundance of about 10(exp -6) to 10(exp -7) occurs at about A(sub v) approximately 2-8, relatively independent of the gas density and the ultraviolet field. We show that such a model matches very closely the observations of the Submillimeter Wave Astronomical Satellite (SWAS), a NASA Small Explorer Mission. The model elucidates several mechanisms that have been recently invoked to understand gas phase chemistry in clouds, including-the freeze-out of molecules onto grain surface, the desorption of these molecules from the surfaces, and the abundance gradients of molecules as functions of depth into molecular clouds.
Author
Excitation; Molecular Clouds; Chemical Reactions; Water Vapor; Abundance

20030071164 University of South Florida, Tampa, FL
Upper-Level College Chemistry Students' Concepts of the Particulate Nature of Matter
Bass, Roger W.; Feb. 7, 2003; 140 pp.; In English
Report No.(s): AD-A415023; No Copyright; Avail: CASI; A07, Hardcopy

Democritus suggested that certain observations made of objects and of changes can be explained by the idea of tiny indivisible particles of matter, which could not be directly observed by the senses. The theory of the particulate nature of matter (PNM) is a central concept in chemistry and pivots on the belief that all matter consists of individual particles and this core belief lends itself to an explanation of various observable phenomena such as changes in molecular connectivity, geometry, aggregation, state, and concentration. The explanatory power of this theory is also the basis of understanding for other chemistry-related topics such as acid-base reactions, electrochemistry, solubility, kinetics, and statistical thermodynamics. As will be discussed in-depth, learning in general and more specifically the learning about the particulate nature of matter is an individual process for each individual learner, because the meaning a learner assigns to concepts like PNM is based on individual variables. It is the individualized conceptions of PNM that are the subject of this study. It is widely accepted that the information relayed by an educator is not necessarily what is gained by the learner, and as such, learners often tend to form meanings of concepts that greatly vary from the educator's original intent. An attempt is made by the science education community to expose the PNM conceptions formed by elementary, secondary, and college students during the learning process. A majority of these published works tend not to focus on the whole conceptions of PNM, but rather focus on how learners' conceptions differ from what is scientifically accepted. These variant types of conceptions have been identified by several terms including alternative conceptions, misconceptions, preconceptions, and everyday conceptions.

What is not represented by the body of literature is the conceptions of PNM within the population of upper-level college students.
DTIC
Particulates; Physical Chemistry; Matter (Physics); Education

20030071168 Massachusetts Inst. of Tech., Cambridge, MA, USA
Studies of Trace Gas Chemical Cycles Using Inverse Methods and Global Chemical Transport Models
Prinn, Ronald G.; [2003]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-12099; No Copyright; Avail: CASI; A01, Hardcopy

We report progress in the first year, and summarize proposed work for the second year of the three-year dynamical-chemical modeling project devoted to: (a) development, testing, and refining of inverse methods for determining regional and global transient source and sink strengths for long lived gases important in ozone depletion and climate forcing, (b) utilization of inverse methods to determine these source/sink strengths using either MATCH (Model for Atmospheric Transport and Chemistry) which is based on analyzed observed wind fields or back-trajectories computed from these wind fields, (c) determination of global (and perhaps regional) average hydroxyl radical concentrations using inverse methods with multiple titrating gases, and (d) computation of the lifetimes and spatially resolved destruction rates of trace gases using 3D models. Important goals include determination of regional source strengths of methane, nitrous oxide, methyl bromide, and other climatically and chemically important biogenic/anthropogenic trace gases and also of halocarbons restricted by the Montreal protocol and its follow-on agreements and hydrohalocarbons now used as alternatives to the restricted halocarbons.
Derived from text
Trace Elements; Trace Contaminants; Gases; Three Dimensional Models; Atmospheric Models; Transport Theory

20030071228 Princeton Univ., NJ
Fuels Combustion Research: Supercritical Fuel Pyrolysis
Wornat, Mary J.; Ledesma, Elmer B.; Felton, Philip G.; Sivo, Joseph A.; Marsh, Nathan D.; Nov. 2002; 66 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0298; Proj-2308
Report No.(s): AD-A415123; AFRL-SR-AR-TR-03-0214; No Copyright; Avail: CASI; A04, Hardcopy

Supercritical pyrolysis experiments were conducted with toluene, methyl cyclohexane, and n-heptane at temperatures up to 585 C, pressures up to 100 atm, and residence times up to 550 sec Analysis, by HPLC/UV, of the toluene reaction products led to the unequivocal identification of 27 individual PAH, up to 10 rings in size. The experiments showed that PAH yields increased exponentially with pressure. For each of the product PAH, values of the preexponential factor. A arid the activation volume V* were determined for the pressure-dependent global first-order kinetic rate constant. PAH yields were also extremely sensitive to temperature. At 100 atm and 480 C, PAH of only up to 2 rings were observed; at 535 C, PAH up to 10 rings were formed; at 585 C, solid deposits formed, plugging the reactor. Similar pressure and temperature sensitivities were exhibited by the PAH produced by methyl cyclohexane. The nature of the PAH product distributions suggested that condensation reactions, involving the addition of aromatic structures and hydrogen loss, were a dominant mechanism for PAH formation in the supercritical environment.
DTIC
Fuel Systems; Hypersonic Aircraft; Combustion

20030071270 Engineering Research and Consulting Inc (ERC Inc) Edwards AFB CA, Edwards AFB, CA, USA
Conceptual Problems in Main Group Chemistry
Christe, K.; May 7, 2003; 3 pp.; In English
Contract(s)/Grant(s): F04611-99-C-0025; Proj-DARP
Report No.(s): AD-A415187; AFRL-PR-ED-AB-2003-125; No Copyright; Avail: CASI; A01, Hardcopy

This document is a report of conceptual problems in main group chemistry.
DTIC
Chemical Bonds; Problems

20030071274 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Photoluminescence Excitation Spectroscopy of Carbon-Doped Gallium Nitride
Reuter, E. E.; Zhang, R.; Kuech, T. F.; Bishop, S. G.; Jan. 1999; 6 pp.; In English
Contract(s)/Grant(s): ECD89-43166; MDA972-94-1-004
Report No.(s): AD-A415181; No Copyright; Avail: CASI; A02, Hardcopy

We have done a comparative study of carbon-doped GaN and undoped GaN utilizing photoluminescence (PL) and photoluminescence excitation (PLE) spectroscopies in order to investigate deep levels involved in yellow luminescence (YL) and red luminescence (RL). When the GaN was excited by above-bandgap light, red luminescence (RL) centered at 1.82 eV was the dominant below-gap PL from undoped GaN, but carbon-doped GaN below-gap PL was dominated by yellow luminescence (YL) centered at 2.2 eV. When exciting PL below the band-gap with 2.4 eV light, undoped GaN had a RL peak centered at 1.5 eV and carbon-doped GaN had a RL peak centered at 1.65 eV. PLE spectra of carbon-doped GaN, detecting at 1.56 eV, exhibited a strong, broad excitation band extending from about 2,1 to 2.8 eV with an unusual shape that may be due to two or more overlapping excitation bands. This RL PLE band was not observed in undoped GaN. We also demonstrate that PL spectra excited by below gap light in GaN films on sapphire substrates are readily contaminated by 1.6-1.8 eV and 2.1-2.5 eV chromium-related emission from the substrate. A complete characterization of the Cr emission and excitation bands for sapphire substrates enables the determination of the excitation and detection wavelengths required to obtain GaN PL and PLE spectra that are free of contributions from substrate emission.
DTIC
Spectroscopy; Photoluminescence; Broadband; Gallium Nitrides

20030071279 Engineering Research and Consulting, Inc., Edwards AFB, CA, USA
Quantitative Measure for the Nakedness of Fluoride Ion Sources
Christe, Karl O.; Jenkins, B.; Apr. 23, 2003; 22 pp.; In English
Contract(s)/Grant(s): F04611-99-C-0025; Proj-DARP
Report No.(s): AD-A415192; AFRL-PR-ED-TP-2003-101; No Copyright; Avail: CASI; A03, Hardcopy
A quantitative measure for the donor strength or 'nakedness' of fluoride ion donors is presented. It is based on the free energy change associated with the transfer of a fluoride ion from the donor to a given acceptor molecule. Born-Haber cycle calculations were used to calculate both the free energy and enthalpy change for this process.
DTIC
Ions; Fluorides

20030071280
Matchmaking in Polynitrogen Chemistry: Search for Prospective Anions for Combination with N+5
Ashwani, Vij; Apr. 21, 2003; 36 pp.; In English
Contract(s)/Grant(s): F04611-99-C-0025; Proj-DARP
Report No.(s): AD-A415198; AFRL-PR-ED-VG-2003-091; No Copyright; Avail: CASI; A03, Hardcopy
This document is a report of the matchmaking in polynitrogen chemistry: search for prospective anions for combination with N+5.
DTIC
Synthesis (Chemistry); Chemical Reactions

20030071662 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Temperature Gradients on the Cell Wall in the Critical Viscosity Experiment
Berg, Robert F.; Moldover, Michael R.; December 07, 1993; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy
Because of the diverging susceptibility delta rho/delta Tau near the liquid-vapor critical point, temperature gradients must be kept small to maintain adequate sample homogeneity. In our Science Requirements Document we paid particular attention to radial density gradients caused by equilibration of the xenon sample. Axial density gradients were addressed through the requirement that the cell's copper wall have a gradient less than 22 microK/m. This report re-examines the cell wall's temperature distribution in more detail by estimating all known significant contributions to temperature differences on the cell's wall.
Author
Temperature Distribution; Critical Point; Viscosity; Xenon

20030071668 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Feasibility of Electrostriction for Measurement of the Critical Temperature in the Critical Viscosity Experiment
Berg, Robert F.; Moldover, Michael R.; December 07, 1993; 15 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy
The large compressibility of a pure fluid near its critical point is a potential means of measuring the critical temperature. At the suggestion of Prof. Ferrell we observed electrostriction in xenon by applying a large voltage across a small, open

capacitor immersed in the sample and then measuring the capacitance change caused by the subsequent increase in the xenon's local density. This scheme was attractive because the compressibility is a large, well-understood effect and because we were already familiar with low-voltage capacitance measurements. We found qualitative agreement with our initial expectations based on the fluid's compressibility. However, we also found an additional effect comparable in size to the expected electrostriction but proportional to the applied voltage. We have no explanation for this effect. Thus, given the Science Panel's recommendation against investing extensive effort in this direction, we are abandoning further development of an alternate means for measuring the critical temperature.
Author
Critical Temperature; Viscosity; Xenon; Temperature Measurement; Critical Point; Electrostriction

20030071685 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Scientific Objectives of the Critical Viscosity Experiment
Berg, R. F.; Moldover, M. R.; December 07, 1993; 13 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

In microgravity, the Critical Viscosity Experiment will measure the viscosity of xenon 15 times closer to the critical point than is possible on earth. The results are expected to include the first direct observation of the predicted power-law divergence of viscosity in a pure fluid and they will test calculations of the value of the exponent associated with the divergence. The results, when combined with Zeno's decay-rate data, will strengthen the test of mode coupling theory. Without microgravity viscosity data, the Zeno test will require an extrapolation of existing 1-g viscosity data by as much as factor of 100 in reduced temperature. By necessity, the extrapolation would use an incompletely verified theory of viscosity crossover. With the microgravity viscosity data, the reliance on crossover models will be negligible allowing a more reliable extrapolation. During the past year, new theoretical calculations for the viscosity exponent finally achieved consistency with the best experimental data for pure fluids. This report gives the justification for the proposed microgravity Critical Viscosity Experiment in this new context. This report also combines for the first time the best available light scattering data with our recent viscosity data to demonstrate the current status of tests of mode coupling theory.
Author
Critical Point; Microgravity; Viscosity; Xenon; Spaceborne Experiments

20030073564 Osaka Univ., Toyonaka, Japan
Infrared Spectra of Melilite Solid Solution
Chihara, H.; Tsuchiyama, A.; Koike, C.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 19; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

We report the infrared optical properties of crystalline melilite solid solution for the first time. Melilite is known as one of a ring silicate which have higher equilibrium condensation temperature of 1625 K at a solar nebula pressure of 10(exp -3) atm. The general chemical formula for terrestrial sample is represented as (Ca,Na)2[(Mg,Fe(+2),Al,Si)3 O7]. This mineral species commonly occurred in CAIs of primitive chondrite, and in this case, melilite system forms a solid solution between the Al-end member, gehlenite (Ge: Ca2Al22SiO7) and the Mg-end member, Akermanite (Ak Ca2MgSi2O7). From an astronomical point of view, melilite is expected to condense in an equilibrium condensation sequence at a slightly higher pressure (approximately 10(exp -3). The optical properties of high temperature condensates give us some important information such as thermal structure or history of circumstellar dust shell, mechanism of nucleation of dust grain and the nature of heterogeneous grain. In this study, we synthesized the melilite solid solution and measured absorption spectra in the infrared region (6-100 m). In addition, the reflectance spectra for each optical axis were obtained by use of single crystals of the two end members synthesized by the Czochralski (CZ) method.
Derived from text
Infrared Spectra; Mineralogy; Solid Solutions; Optical Properties; Synthesis (Chemistry)

20030073583 Kent Univ., Canterbury, UK
Aerogel Capture at the University of Kent
Burchell, M. J.; Creighton, J. A.; Gwatkins, J.; Mann, R.; Kearsley, A.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 16; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

In order to extract the maximum benefit from space missions using aerogel capture cells, it is necessary to fully understand the capture mechanism and to develop appropriate analysis methods. The capture event in space typically takes place at speeds of many kilometers per second. This is in what is normally, but misleadingly, called the Hyper Velocity Impact (HVI) regime. HVI typically involves shock pressures that vaporize the projectile. Here of course the whole point of the use of aerogel as

the target is to avoid this and capture the projectile relatively intact. However, the tag HVI is often attached to any impact at great than a few kilometers per second and is thus still used with aerogel capture in space. One recurring feature of HVI studies in general is that models and analytic solutions of the impact event are often insufficient by themselves, and laboratory experimentation is thus crucial in better understanding HVI events. This is particularly true for aerogel capture. Since the original report of successful capture in aerogel at speeds in excess of a few kilometers per second, there have been many subsequent reports including work from Kent. Recently at the University of Kent we switched from examining the mechanical properties of capture (e.g. variation of track length with impact speed to development of analysis techniques and investigation of physical alteration of samples during capture. These are held to be of more significance as aerogel capture becomes more common and the volume of material collected for analysis increases. Work on capture of particles in aerogel is continuing at the University of Kent using the Kent two stage light gas gun. The emphasis has moved from capture of the particles to their subsequent analysis and characterization. The use of Raman analysis techniques is particularly recommended. This can be combined with subsequent extraction for further study via other methods.
Derived from text
Aerogels; Chemical Analysis; Extraction; Hypervelocity Projectiles; Particles

20030075785 Draper (Charles Stark) Lab., Inc., Cambridge, MA
A Palm Size Micron-gap ThermoPhoto Voltaic (MTPV) Energy Converter
DiMatteo, Robert; Mar. 26, 2002; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-C-0064
Report No.(s): AD-A415056; FR-09; ARO-42651.1-CH; No Copyright; Avail: CASI; A02, Hardcopy

The goal of this project was to demonstrate that enhanced photovoltaic cell output can be achieved as a function of the physical gap between emitter and receiver in a Micron-gap ThermoPhotoVoltaic (MTPV) system. This was successfully demonstrated. Test specimen assemblies were first built for small gap MTPV testing. Tests were then performed with 0.2 micron gap heater chips on InGaAs photovoltaic cells provided by Dave Wilt of NASA Glenn. Small gap (down) and large gap (up) experiments at 300 deg C, 400 deg C, and 500 deg C were performed. Measurements with 0.2 micron gap heater chips were also made with 0. 74 eV GaSb photovoltaic cells supplied by EdTek. In all conditions greater than 100% enhancement was measured. In both small gap ('DOWN') and large gap ('UP') positions heater power was shut off and the short circuit currents did not shut off but thermally decayed demonstrating that the short circuit current enhancement demonstrated were not artifacts of the heater electrical power.
DTIC
Energy Conversion; Photovoltaic Effect

20030075787 Carnegie-Mellon Univ., Pittsburgh, PA
Silicon Carbide Substrates for GaN Research and Development
Skowronski, Marek; Dec. 2002; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-00-C-5410; Proj-4348
Report No.(s): AD-A415063; AFRL-ML-WP-TR-2003-4013; No Copyright; Avail: CASI; A03, Hardcopy

6H-SiC boules have been grown by physical vapor transport (PVT) method and analyzed using mass spectroscopy (glow discharge and secondary ion) and transport methods. The dominant impurities in crystals grown from commercial SiC charge are nitrogen and boron. Nitrogen concentrations decrease toward the tail while that of boron and aluminum increase. The Fermi level in all crystals started at being pinned to nitrogen donor level in the seed end of the boule and dropped to the shallow boron acceptor level at the tail end. The middle part exhibited either a narrow or wide band of high-resistivity material, depending primarily on the impurity content and segregation. The transition metals have a low incorporation coefficient in 6H-SiC and even in intentionally doped crystals were below mass spectroscopy detection limit.
DTIC
Silicon Carbides; Gallium Nitrides

20030077844 Case Western Reserve Univ., Cleveland, OH
Ambient Reactive Sorption OF CW Simulants on Cation Exchanged Zeolites
Greene, Howard; Morrison, Philip; Swanson, Meghan; Nov. 25, 2002; 4 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0620
Report No.(s): AD-A415071; ARO-41959.1-CH; No Copyright; Avail: CASI; A01, Hardcopy

Zeolite sorbent/catalyst materials were prepared, characterized and then utilized to determine their surface interactions at

ambient temperature with common CW simulants for VX and HD. From this research, new insights regarding reactive sorption pathways of simulants on exchanged zeolites at ambient temperature have been proposed which will aid in developing superior alternates for sorption and detoxification of CW agents in the field. Experiments utilized a Bomem FTIR spectrometer with Harrick cell for in situ measurements of interactions between zeolite and CW simulant. Zeolite Si/Al ratios were varied from 15 to 40. Three sorbent/catalyst media were evaluated (Chromium-ZSM-5, Silver-ZSM-5 and standard gamma alumina). Results showed maximum destruction of TCE and DEMP simulants by Chromium-ZSM-5, followed by Silver-ZSM-5. Gamma alumina was found to be the least destructive. Initial work with dichloropropene (DCP), which is a common pesticide and also a CW simulant showed ambient chemisorption and also chemical rearrangement on Chromium-ZSM-5.
DTIC
Sorption; Zeolites; Cations; Continuous Radiation

20030079935
Bimetalic Complexes as Methanol Oxidation Catalysts
Apr. 19, 2002; 16 pp.; In English
Report No.(s): DE2003-771348; No Copyright; Avail: Department of Energy Information Bridge
The work on the electrocatalyzed oxidation of methanol was initially motivated by the interest in methanol as an anodic reactant in fuel cells. The literature, on electrochemical oxidation of alcohols can be roughly grouped into two sets: fuel cell studies and inorganic chemistry studies. Work on fuel cells primarily focuses on surface-catalyzed oxidation at bulk metal anodes, usually Pt or Pr/Ru alloys. In the surface science/electrochemistry approach to these studies, single molecule catalysts are generally not considered. In contrast, the inorganic community investigates the electrooxidation of alcohols in homogeneous systems, Ruthenium complexes have been the most common catalysts in these studies.
NTIS
Electrochemical Oxidation; Electrochemistry; Catalysts; Fuel Cells; Methyl Alcohol

20030079942
Pilot-Scale Testing Report
Apr. 17, 1998; 658 pp.; In English
Report No.(s): DE2003-772442; No Copyright; Avail: Department of Energy Information Bridge
The Eco Logic Process is a mobile, gas-phase chemical reduction process with demonstrated experience in the destruction of high and low strength organic wastes such as polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), dioxins and furans (PCDDs and PCDFs), hexachloride wastes, organophosphorus pesticides, chemical warfare agents, and other organic compounds. The Process involves the gas-phase reduction of organic compounds at temperatures of approximately 850 degrees C and ambient pressure. Chlorinated hydrocarbons such as PCBs and PCDDFs are chemically reduced to methane and hydrochloric acid, while non-chlorinated compounds such as napalm are reduced to methane and minor amounts of other light hydrocarbons. All outputs from the Process, including product gas, can be held and tested to determine their compliance with regulatory criteria, prior to reuse in the system or disposal. The Eco Logic Process has undergone regulatory testing at both pilot- and full-scale, with results of 99.9999 % (6 nines) destruction and removal efficiency (DRE) for materials tested.
NTIS
Chemical Reactions; Polychlorinated Biphenyls; Vapor Phases; Chlorocarbons

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METALS AND METALLIC MATERIALS

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

20030068978
Studies of Transport Phenomena and Their Effect on Weld Quality in Laser Beam Welding
Tsai, Hai-Lung; Mar. 31, 2001; 25 pp.; In English
Contract(s)/Grant(s): DAAG55-98-1-0097
Report No.(s): AD-A414909; ARO-37833.1-MS; No Copyright; Avail: CASI; A03, Hardcopy
The objective of this project was to study complicated transport phenomena (laser-material interaction, heat transfer, and molten metal fluid dynamics) and their effect on weld quality in laser beam welding. The study investigated the formation of keyholes, keyhole dynamics, and possible weld defects caused by keyhole instability. A mathematical model based on

continuum formulation (for handling metal flow during alloy melting/solidification) and volume-of-fluid (for handling free surfaces) was successfully developed to simulate the transient behavior of a keyhole in laser beam welding. The authors are now able to predict the following: (1) the formation and collapse of an axisymmetric keyhole, (2) the formation of porosity in the weld, (3) interaction between filler materials and weld pool, (4) zinc vapor escape in laser welding of galvanized steel, and (5) 3-D moving laser welding. Based on mathematical modeling, the authors proposed three methods to eliminate/reduce porosity in the weld. The predicted porosity formation compares favorably with published experimental reports. Simulation results show that the formation of porosity is caused by two competing mechanisms: one is the solidification rate of the molten metal surrounding the keyhole, and the other is the speed at which molten metal backfills the keyhole after laser energy is terminated. By controlling laser pulses or applying an electromagnetic force after laser energy has ceased, pores in the weld can be reduced or eliminated. The results from simulation illustrate that uniform composition of weld pool is difficult to achieve by filler metals due to the very rapid solidification of weld pool in laser welding. In laser welding of galvanized steel, keyhole can be utilized as the channel for releasing the zinc vapor and, as a result, pores caused by the trapped zinc vapor are avoided. Avoiding the interaction between zinc vapor and the welding pool can improve welding shape. (18 figures)
DTIC
Heat Transfer; Laser Welding

20030071134 Naval Postgraduate School, Monterey, CA
Deformation Banding and Grain Refinement in FCC Materials
Swisher, Douglas L.; Mar. 2003; 181 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414996; No Copyright; Avail: CASI; A09, Hardcopy

Microscopy methods in the scanning and transmission electron microscopes have been employed to assess microstructures developed by deformation processing of selected face centered cubic (FCC) materials. Grain maps constructed from orientation data and analysis of transmission data illustrate the presence of fine grains and deformation bands in which the lattice orientation contains symmetric variants of a texture component. A banded, deformation microstructure is present to various degrees in FCC material systems irrespective of processing and material composition. The specific components of the deformation bands were observed to vary depending upon processing conditions of the material and the specific material.
DTIC
Face Centered Cubic Lattices; Microstructure

20030073486 Spire Corp., Bedford, MA, USA, National Renewable Energy Lab., Golden, CO
Phase Separation and Facet Formation During the Growth of (GaAs)(sub 1-x)(Ge(sub 2))(sub x) Alloy Layers by Metal Organic Vapour Phase Epitaxy
Norman, A. G.; Olson, J. M.; Geisz, J. F.; Moutinho, H. R.; Mason, A.; Sep. 1999; 10 pp.; In English
Report No.(s): DE2003-12158; NREL/CP-520-26319; No Copyright; Avail: Department of Energy Information Bridge

Metal organic vapour phase epitaxy (GaAs)1-x(Ge2)x alloy layers, 0 lesser than x lesser than 0.22, were grown at temperatures between 640 degrees and 690 degrees C, on vicinal (001) GaAs substrates. Phase separation occurred in all the layers. The phase-separated microstructure changed with alloy composition, growth temperature, and substrate orientation. In x approx. 0.1 layers grown at 640 degrees C, Ge segregation occurred on (115)B planes associated with a (115)B surface faceting. Increase in growth temperature led to the formation of large, (001)-oriented, irregular-shaped platelets of Ge-rich material. Growth on (115)B substrates resulted in a 'natural superlattice' of GaAs/Ge along the growth direction.
NTIS
Alloys; Phase Transformations; Gallium Arsenides; Epitaxy

20030075676 NASA Langley Research Center, Hampton, VA, USA
Characterization of Al-Cu-Mg-Ag Alloy RX226-T8 Plate
Lach, Cynthia L.; Domack, Marcia S.; August 2003; 45 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WU 703-63-61-01
Report No.(s): NASA/TM-2003-212639; L-18313; NAS 1.15:212639; No Copyright; Avail: CASI; A03, Hardcopy

Aluminum-copper-magnesium-silver (Al-Cu-Mg-Ag) alloys that were developed for thermal stability also offer attractive ambient temperature strength-toughness combinations, and therefore, can be considered for a broad range of airframe structural applications. The current study evaluated Al-Cu-Mg-Ag alloy RX226-T8 in plate gages and compared performance with sheet gage alloys of similar composition. Uniaxial tensile properties, plane strain initiation fracture toughness, and plane

stress tearing resistance of RX226-T8 were examined at ambient temperature as a function of orientation and thickness location in the plate. Properties were measured near the surface and at the mid-plane of the plate. Tensile strengths were essentially isotropic, with variations in yield and ultimate tensile strengths of less than 2% as a function of orientation and through-thickness location. However, ductility varied by more than 15% with orientation. Fracture toughness was generally higher at the mid-plane and greater for the L-T orientation, although the differences were small near the surface of the plate. Metallurgical analysis indicated that the microstructure was primarily recrystallized with weak texture and was uniform through the plate with the exception of a fine-grained layer near the surface of the plate. Scanning electron microscope analysis revealed Al-Cu-Mg second phase particles which varied in composition and were primarily located on grain boundaries parallel to the rolling direction. Fractography of toughness specimens for both plate locations and orientations revealed that fracture occurred predominantly by transgranular microvoid coalescence. Introduction High-strength, low-density Al-Cu-Mg-Ag alloys were initially developed to replace conventional 2000 (Al-Cu-Mg) and 7000 (Al-Zn-Cu-Mg) series aluminum alloys for aircraft structural applications [1]. During the High Speed Civil Transport (HSCT) program, improvements in thermal stability were demonstrated for candidate aircraft wing and fuselage skin materials through the addition of silver to Al-Cu-Mg alloys based on Al 2519 chemistry [2]. Thermal stability of the resulting Al-Cu-Mg-Ag alloys, C415-T8 and C416-T8, was due to co-precipitation of the thermally stable . (AlCu) and ‘ (Al2Cu) strengthening phases [1-4]. The strength and toughness behavior was investigated for these alloys produced as 0.090-inch thick rolled sheet in the T8 condition and after various thermal exposures. The mechanical properties were shown to be competitive with conventional aircraft alloys, 2519-T8 and 2618-T8 [2]. During the Integral Airframe Structure (IAS) program, advanced aluminum alloys were examined for use in an integrally stiffened airframe structure where the skin and stiffeners would be machined from plate and extruded frames would be mechanically attached (see Figure 1) [5]. Advantages of integrally stiffened structure include reduced part count, and reduced assembly times compared to conventional built-up airframe structure. The near-surface properties of a thick plate are of significance for a machined integrally stiffened airframe structure since this represents the skin location. Properties measured at the mid-plane of the plate are more representative of the stiffener web. RX226 was developed to exploit strength-toughness improvements and thermal stability benefits of Al-Cu-Mg-Ag alloys in plate gages. This study evaluated the microstructure and properties of three gages of plate produced in the T8 condition.
Author
Aluminum Alloys; Copper Alloys; Mechanical Properties; Recrystallization

20030075761 California Univ., Irvine, CA, USA
Synthesis and Chemistry of Yttrium and Lanthanide Metal Complexes
Evans, W. J.; Mar. 12, 1999; 18 pp.; In English
Report No.(s): DE2003-761788; No Copyright; Avail: Department of Energy Information Bridge
The overall objective of this research project is to develop the basic chemistry of complexes of the lanthanide metals which will allow the design and synthesis of materials with unique chemical, physical, and catalytic properties. This report summarizes advances made since the last three year progress report in October 1995. During this time, references 1-16 have been published, references 17-20 have been accepted for publication, and references 21-22 have been submitted for publication. Highlights only of these results are reported here in sections on polymetallic europium chemistry, polymetallic Zirconium chemistry, aIkyl alkoxide chemistry, fundamental lanthanide halide chemistry, and arylamido complexes.
NTIS
Yttrium; Lanthanum; Metals

20030079937
Origins of Asymmetric Stress-Strain Response in Phase Transformation
Sehitoglu, H.; 2003; 22 pp.; In English
Report No.(s): DE2003-771356; No Copyright; Avail: Department of Energy Information Bridge
For the first time, experiments on NiTi under pressure loadings were conducted in Ref. (1). This work showed that the stress-strain response of NiTi is highly pressure sensitive and there was an asymmetry of tension and compression results. The results were obtained based on the special rig developed by Sehitoglu and his students. Several experiments under pressure were also conducted on CuZnAl alloys with also pressure dependent response.
NTIS
Titanium Alloys; Stress-Strain Relationships; Phase Transformations; Nickel Alloys; Binary Alloys

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*.

20030068954 Kentucky Univ., Lexington, KY, Kentucky Transportation Cabinet, Frankfort, KY
Investigation of Soluble Salts on Kentucky Bridges
Palle, S.; Younce, R.; Hopwood, T.; Jan. 2003; 31 pp.; In English
Report No.(s): PB2003-106005; KTC-03-02/UI-4-02-1F; No Copyright; Avail: CASI; A03, Hardcopy

Invisible soluble salts present on steel highway structures can act to promote corrosion even after maintenance painting. Soluble salts include chloride, nitrate and sulfate ions. Soluble salts found on bridge decks and roadways are the result of usage of deicing salts (chlorides), and the deposition of atmospheric pollution (nitrates and sulfates) on exterior surfaces. Typical pollution-related sources of soluble salts are coal-fired power plants, refineries, farming operations, vehicle emissions, and chemical plants. Sites for soluble salt damage on bridges include: beam ends under open or leaking expansion joints, flanges and lower portions of webs of overpass structures, lower chords and connecting members (end posts, portals, vertical posts and diagonals), and guard rails of truss bridges near roadway level, and outside faces of fascia girders and other bridge elements constantly exposed to the environment.
NTIS
Steel Structures; Highways; Salts; Solubility

20030068969 Air Force Research Lab., Edwards AFB, CA, USA
Review of Poss Effects on Polymers and the Future 6.1 Research Direction of the Poss PWG
Gonzalex, Rene I.; Mar. 10, 2003; 105 pp.; In English
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A414885; AFRL-PR-ED-VG-2003-063; No Copyright; Avail: CASI; A06, Hardcopy

No abstract available
Insulation; Polymers; Polyethylenes

20030068993
New Materials Design
Boatz, Jerry; Gordon, Mark; Voth, Greg; Hammes-Schiffer, Sharon; Pachter, Ruth; May 19, 2003; 39 pp.; In English
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A414920; AFRL-PR-ED-VG-2003-138; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available
Organic Materials; High Energy Interactions

20030071112 Wyoming Univ., Laramie, WY
Sequence of Spider Aciniform and Piriform Silks
Lewis, Randolph V.; Sep. 19, 2001; 4 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0569
Report No.(s): AD-A414965; No Copyright; Avail: CASI; A01, Hardcopy

The aciniform glands from Argiope Trifasciata were used to construct a cDNA library. The library was probed with various DNA probes based on known spider silk protein sequences. A large 9kb clone was identified and partial sequencing has been done. The C-terminal sequence is clearly related to the same sequence in a number of other spider silks. The 5' end of the clone still appears to be repetitive sequence and thus it is unlikely to be a full-length clone. We have completed about 4.5 kb of sequence at this point. The remaining sequence is being completed. There were an additional clones of smaller length found but all contain the same sequence as the largest one. The sequence to date shows some homology to other spider silks but is distinctly different. It appears to have a repeat sequence of a cDNA library from Nephila clavipes has been constructed from the aciniform/piriform glands and is in the process of screening. This will be used to compare the aciniform silk sequences as well as to identify the piriform silk sequences.
DTIC
Proteins; Silk; Spiders

20030071128 Princeton Univ., NJ, USA
Basic Research Problems in Mechanics and Heat Transfer for Integrally Woven, Transpiration Cooled Ceramic Composite Turbine Engine Combustor Walls
Brown, Garry L.; Jun. 2003; 22 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0272
Report No.(s): AD-A414988; AFRL-SR-AR-TR-03-0218; No Copyright; Avail: CASI; A03, Hardcopy

A special purpose wind tunnel designed to test the fluid mechanical and heat transfer properties of ceramic matrix structures was designed, constructed, and subjected to performance testing. The facility was completed and assembled in early 2002. Two problems occurred during the initial testing phases of the facility. A persistent leak that limited the pressures that could be achieved was solved by remachining a flange surface and installing large 0-ring seals. A pumping bearing problem is being addressed by the pump manufacturer under warranty. Direct numerical simulation calculations were initiated. This work is aimed at predicting the effectiveness of transpiration cooling for a turbulent boundary layer at low Reynolds number. DTIC
Heat Transfer; Ceramic Matrix Composites; Wind Tunnel Tests

20030071665 Utah Univ., Salt Lake City, UT, USA
[Results of Simulation Studies]
[2003]; 3 pp.; In English
Contract(s)/Grant(s): NAG1-2319; UU Proj. 56000088; No Copyright; Avail: CASI; A01, Hardcopy

Lattice Monte Carlo and off-lattice molecular dynamics simulations of h(sub 1)t(sub 4) and h(sub 4)t(sub l) (head/tail) amphiphile solutions have been performed as a function of surfactant concentration and temperature. The lattice and off-lattice systems exhibit quite different self-assembly behavior at equivalent thermodynamic conditions. We found that in the weakly aggregating regime (no preferred-size micelles), all models yield similar micelle size distributions at the same average aggregation number, albeit at different thermodynamic conditions (temperatures). In the strongly aggregating regime, this mapping between models (through temperature adjustment) fails, and the models exhibit qualitatively different micellization behavior. Incipient micellization in a model self-associating telechelic polymer solution results in a network with a transient elastic response that decays by a two-step relaxation: the first is due to a heterogeneous jump-diffusion process involving entrapment of end-groups within well-defined clusters and this is followed by rapid diffusion to neighboring clusters and a decay (terminal relaxation) due to cluster disintegration. The viscoelastic response of the solution manifests characteristics of a glass transition and entangled polymer network.
Derived from text
Polymers; Glass; Lattice Vibrations; Molecular Dynamics; Monte Carlo Method; Simulation

20030073594 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Organics Synthesized Using Iron-Grain Silicates
Johnson, N. M.; Cody, G. D.; Nuth, J. A., III; Workshop on Cometary Dust in Astrophysics; 2003, pp. 37; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

We use Fischer-Tropsch type (FTT) synthesis to produce hydrocarbons by hydrogenating carbon monoxide via catalytic reactions. The products of these reactions have been studied using 'natural' catalysts and calculations of the efficiency of FTT synthesis in the Solar Nebula suggest that these types of reactions could make significant contributions to the composition of material near three AU. We coat Fe-silicate grains with organic material using FTT synthesis to simulate the chemistry in the early Solar Nebula. In our experimental setup, we roughly model a nebular environment where grains are successively transported from hot to cold regions of the nebula. In other words, the starting gases and FTT products are continuously circulated through the grains at high temperature with intervals of cooling. Organics generated in this manner could represent the carbonaceous material incorporated in comets and meteorites. We analyze the resulting organics and present the results. Derived from text
Hydrocarbons; Synthesis (Chemistry); Silicates; Organic Materials

20030075750 Sandia National Labs., Albuquerque, NM
Joining Si(sub 3)N(sub 4) for Advanced Turbomachinery Applications
Glass, S. J.; Loehman, R. E.; Hosking, F. M.; Stephens, J. J.; Vianco, P. T.; Sep. 01, 2000; 270 pp.; In English
Report No.(s): DE2003-760738; No Copyright; Avail: Department of Energy Information Bridge

The main objective of this project was to develop reliable, low-cost techniques for joining silicon nitride (Si,N,) to itself

and to metals. For Si,N, to be widely used in advanced turbomachinery applications, joining techniques must be developed that are reliable, cost-effective, and manufacturable. This project addressed those needs by developing and testing two Si, N, joining systems; oxynitride glass joining materials and high temperature braze alloys. Extensive measurements were also made of the mechanical properties and oxidation resistance of the braze materials. Finite element models were used to predict the magnitudes and positions of the stresses in the ceramic regions of ceramic-to-metal joints sleeve and butt joints, similar to the geometries used for stator assemblies.
NTIS
Joining; Silicon Nitrides; Turbomachinery

20030075806 Alabama Univ., Huntsville, AL, USA
Fiber Pulling in Microgravity (FPM)
Naumann, Robert J.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 657-662; In English; See also 20030075796; No Copyright; Avail: CASI; A02, Hardcopy

The Fiber Pulling in Microgravity experiment sought to separate the role of gravity drainage from capillarity effect in break-up of slender cylindrical liquids. Both effects tend to limit the parameter range of viscosity and surface tension over which fiber can successfully drawn. Slender liquid strands of various materials were pulled manually by the Mission Specialist to well beyond the Rayleigh stability limit and the break-up was observed. The time required for break-up was estimated and compared with theory. The break-up times for silicone oil correlated with viscosity as would be expected. Interestingly, strands of corn syrup and honey broke-up almost immediately, making it impossible to draw fiber from these materials in the absence of gravity.
Author
Gravitational Effects; Fiber Composites; Viscosity; Cylindrical Bodies

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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*.

20030068945
Spent Nuclear Fuel Project Canister Storage Building Procurement Specifications
Bazinet, G. D.; May 01, 2000; 604 pp.; In English
Report No.(s): DE2003-803687; SNF-6130; No Copyright; Avail: Department of Energy Information Bridge

This specification section defines the welding, brazing, thermal treatment, examination and testing requirements for carbon steel, and stainless steel piping.
NTIS
Cans; Procurement; Spent Fuels; Systems Engineering

20030068997
High Thrust to Weight Bipropellant Reentry Vehicle Thrust Vector Control Thru Micro-Miniaturization
Figueiredo, William; May 8, 2003; 15 pp.; In English
Contract(s)/Grant(s): Proj-4847
Report No.(s): AD-A414922; AFRL-PR-ED-TP-2003-131; No Copyright; Avail: CASI; A03, Hardcopy

With the advent of nanosat and picosat-size satellites, the design of miniature, efficient, high thrust-to-weight (T/W) ratio thrust vector control (TVC) thrusters with liquid bipropellants has been evolving. The extremely high T/W ratios achievable with micro miniaturization of liquid bipropellant engines are a result of the ‘cube-square-law’. As the engine is scaled down linearly, the propellant flow, and thus the power, decreases with chamber cross-sectional area or the square of the linear size, while the weight decreases with the volume of the engine or the cube of the linear size As a result, the power-to-weight ratio increases linearly as the engine size is reduced. Only recently, by going to micron-scale microelectromechanical system (MEMS) silicon wafer fabrication technology, has the increase in TAV ratio at reduced bipropellant engine scales been realized over existing T/W ratios for TVC thrusters MEMS and possibly nanotechnology fabrication techniques are the enabling technologies for achieving these higher propulsive system T/W ratios. A fundamental problem with achieving high specific impulse or thrust performance at these reduced engine scales is the combustion residence time. By increasing combustion

chamber pressure and adjusting oxidizer to fuel mixture ratio to fuel rich at these reduced engine scales, efficient bipropellant combustion is shown to he analytically and experimentally achievable at engine characteristic lengths one to two orders of magnitude smaller then characteristic lengths of typical spacecraft or satellite TVC thrusters. The advantages of using reduced scale TVC thrusters in improving reentry vehicle (RV) targeting accuracy and mission impulse. requirements will be discussed with RV and nano RV reaction control systems
DTIC
Reentry Vehicles; Microelectromechanical Systems; Microminiaturization

20030071201 Air Force Research Lab., Edwards AFB, CA, USA
Simplified Liquid Rocket Engine Performance and Weight Model
Paulson, Eric; Burkhardt, Wendel M.; Mysko, Steve; Jenkins, Tim; Apr. 25, 2003; 3 pp.; In English
Contract(s)/Grant(s): Proj-4847
Report No.(s): AD-A415050; AFRL-PR-ED-AB-2003-104; No Copyright; Avail: CASI; A01, Hardcopy

The Air Force Research Laboratory is developing a tool to analyze liquid propellant launch systems. This tool, called Integrated Propulsion Analysis Tool (IPAT), requires the capability to predict the weight of the vehicle components as well as the performance of the rocket engines. For IPAT, a simplified model was developed to predict liquid rocket engine (LRE) performance and weight. The LRE model was developed to be very flexible and model a wide variety of rocket engines. The model allows the user to select the propellants used for the fuel and oxidizer from a list that includes hydrogen, hydrocarbons such as RP-1, storable propellants, and oxygen. The user can select the engine power cycle from a list that includes expander, staged combustion, gas generator, and pressure fed. Other parameters used by the model include engine thrust, chamber pressure, overall engine mixture ratio, nozzle exit area ratio, and materials of manufacture. The model uses a combination of physical relationships and weight correlations to calculate the weight of individual rocket engine components. The model predicts liquid rocket engine performance using combustion gas properties provided by the Chemical Equilibrium with Applications (CEA) computer code. This paper will describe the analysis approach used in the model and show comparisons of weight predictions to actual flight rocket engines.
DTIC
Liquid Propellant Rocket Engines; Spacecraft Propulsion; Spacecraft Models; Structural Weight; Computer Programs

20030071219
An Analysis of Microbial Contamination in Military Aviation Fuel Systems
Graef, Harold W.; Mar. 2003; 236 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415117; AFIT/GEE/ENV/03-10; No Copyright; Avail: CASI; A11, Hardcopy

Military aviation fuel systems can be an ideal environment for microorganisms. Microbial growth in hydrocarbon fuel systems arises because of the impracticality of keeping fuel tanks sterile and the inevitable presence of water from condensation. Microbial contaminants in aviation fuel systems are a concern because of their potential to degrade the fuel, accelerate tank corrosion, and threaten flight safety. This research addresses the concern of using more environmentally friendly Fuel System Icing Inhibitors (FSII), which are also biocidal. Are significant levels of microorganisms growing in military aviation fuel systems, and if so, are there any common variables? Forty aviation fuel samples were collected from fuel storage tanks (including flexible expeditionary fuel bladders), refueling trucks, and aircraft from 12 U,S, military bases. Samples were analyzed using peak naming and pattern recognition algorithms of sample extracts processed on a gas chromatograph. Significant levels of microorganisms were found in military aviation fuel systems 90% (36 of 40) of fuel samples produced microbial growth. Over 40% of the serial dilutions that produced microbial growth were characterized as moderately or heavily contaminated samples. The microorganisms isolated were overwhelmingly Gram negative, anaerobic, bacilli with populations varying by orders of magnitude.
DTIC
Aircraft Fuels; Microorganisms

20030075804 NASA Lewis Research Center, Cleveland, OH, USA
Microgravity Smoldering Combustion on the USML-1 Space Shuttle Mission
Stocker, Dennis P.; Olson, Sandra L.; Torero, Jose L.; Fernandez-Pello, A Carlos; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 609-629; In English; See also 20030075796; No Copyright; Avail: CASI; A02, Hardcopy

Preliminary results from an experimental study of the smolder characteristics of a porous combustible material (flexible

polyurethane foam) in normal and microgravity are presented. The experiments, limited in fuel sample size and power available for ignition, show that the smolder process was primarily controlled by heat losses from the reaction to the surrounding environment. In microgravity, the reduced heat losses due to the absence of natural convection result in only slightly higher temperatures in the quiescent microgravity test than in normal gravity but a dramatically larger production of combustion products in all microgravity tests. Particularly significant is the proportionately larger amount of carbon monoxide and light organic compounds produced in microgravity, despite comparable temperatures and similar char patterns. This excessive production of fuel-rich combustion products may be a generic characteristic of smoldering polyurethane in microgravity, with an associated increase in the toxic hazard of smolder in spacecraft.
Author
Microgravity; Smoldering; Polyurethane Foam; Combustion Products; Spaceborne Experiments

20030075805 NASA Lewis Research Center, Cleveland, OH, USA
Wire Insulation Flammability Experiment: USML-1 One Year Post Mission Summary
Greenberg, Paul S.; Sacksteder, Kurt R.; Kashiwagi, Takashi; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 631-655; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

Herein we report the results from the Wire Insulation Flammability (WIF) Experiment performed in the Glovebox Facility on the USML-1 mission. This experiment explored various aspects of electrically induced fire scenarios in a reduced gravity environment. Under quiescent microgravity conditions, heat and mass transfer are dominated by diffusive and radiative transport; while in normal-gravity buoyancy induced convection often dominates. Of considerable scientific and practical interest is the intermediate situation of combustion occurring in the presence of imposed gas flows, with lower characteristic velocities than those induced by buoyancy in noma1 gravity. Two distinct cases naturally arise: flow direction opposed to, or concurrent with, the flame spread direction. Two tests of each kind were conducted in the WIF experiment, providing the first controlled demonstration of flame spreading in forced convection ever conducted in space. Four test modules were flown. The wire insulation, 1.5 mm in diameter, was polyethylene, extruded onto nichrome wire. Temperatures of the wh3 cores and insulation heated in quiescent and flowing environments were measured. Video and still-camera images of the samples, burning in air flowing at approximately 10 cm/sec, were recorded to obtain flame characteristics including spread rate, structure and temperature. Flame spread rates in concurrent flow were approximately twice those in opposed flow. In concurrent and opposed flow regimes, the spreading flames stabilized around a bead of molten insulation material, within which bubble nucleation was observed. An ignition attempt without flow mated a quiescent cloud of vaporized fuel which ignited dramatically yet failed to sustain normal flame spread. Finally, all tests produced substantial soot agglomerates, particularly the concurrent flow tests; and the collected soot has a morphology very distinct from soot formed in normal gravity flames. Several unexpected and unique microgravity combustion phenomena were observed.
Author
Microgravity; Flame Propagation; Electrical Insulation; Spaceborne Experiments; Combustion Physics

20030075810 NASA Lewis Research Center, Cleveland, OH, USA
Candle Flames in Microgravity: USML-1 Results - 1 Year Later
Ross, H. D.; Dietrich, D. L.; Tien, J. S.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 541-568; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

We report on the sustained behavior of a candle flame in microgravity determined in the glovebox facility aboard the First USA Microgravity Labomtofy. In a quiescent, microgmvjfy environment, diffusive transport becomes the dominant mode of heat and mass transfer; whether the diffusive transport rate is fast enough to sustain low-gravity candle flames in air was unknown to this series of about 70 tests. After an initial transient in which soot is observed, the microgravity candle flame in air becomes and remains hemispherical and blue (apparently soot-Ne) with a large flame standoff distance. Near flame extinction, spontaneous flame oscillations are regularly observed; these are explained as a flashback of flame through a premixed combustible gas followed by a retreat owed to flame quenching. The frequency of oscillations can be related to diffusive transport rates, and not to residual buoyant convective flow. The fact that the flame tip is the last point of the flame to survive suggests that it is the location of maximum fuel reactivity; this is unlike normal gravity, where the location of maximum fuel reactivity is the flame base. The flame color, size, and shape behaved in a quasi-steady manner; the finite size of the glovebox, combined with the restricted passages of the candlebox, inhibited the observation of true steady-state burning. Nonetheless, through calculations, and inference from the series of shuttle tests, if is concluded that a candle can burn indefinitely in a large enough ambient of air in microgravity. After igniting one candle, a second candle in close pximity could

not be lit. This may be due to wax coating the wick and/or local oxygen depletion around the second, unlit candle. Post-mission testing suggests that simultaneous ignition may overcome these behaviors and enable both candles to be ignited.
Author
Microgravity; Flames; Fuel Combustion

20030079991 Defence Science and Technology Organisation, Edinburgh, Australia
Detonation Front Curvature Measurements and Aquarium Tests of Tritonal Variants
Dorsett, Helen; Cliff, Matthew D.; April 2003; 49 pp.; In English
Report No.(s): DSTO-TR-1411; DODA-AR-012-729; Copyright; Avail: Other Sources

Alex , an ultrafine aluminium powder, burns more rapidly than conventional aluminium powders in energetic materials. In TNT-based formulations, the increased rate of energy release leads to higher detonation pressures and velocities. In order to determine the rate of Alex combustion in solid explosives, and to further assess its effects on the detonation properties of TNT formulations, aquarium tests and detonation front curvature tests were performed on Tritonal variants. The aquarium tests definitively show that Alex combustion in detonating Tritonal is significantly faster than that of Cap45a, the conventional aluminium powder used for military explosives. Additional pressure and velocity measurements from the aquarium tests agree with previous experiments. The results of detonation front measurements were less conclusive, but show qualitive trends that support existing data.
Author
Detonation; Powdered Aluminum; Combustion

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*.

20030075796 NASA Marshall Space Flight Center, Huntsville, AL, USA
Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2
Ramachandran, N., Editor; Frazier, D. O., Editor; Lehoczky, S. L., Editor; Baugher, C. R., Editor; May 1994; 426 pp.; In English; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, 22-24 Sep. 1993, Huntsville, AL, USA; See also 20030075797 - 20030075822
Report No.(s): NASA-CP-3272-Vol-2; M-750-Vol-2; NAS 1.55:3272-Vol-2; No Copyright; Avail: CASI; A19, Hardcopy

On September 22-24, 1993, investigators from the First USA Microgravity Laboratory (USML-1) and the First USA Microgravity Payload (USMP-1) Missions met with the Microgravity Measurement Group (MGMG) in Huntsville, Alabama, to discuss science results and the microgravity environments from the respective missions. USML-1 was launched June 1992, and USMP-1 was launched October 1992. This document summarizes from the various investigations, the comprehensive results and highlights, and also serves as a combined mission report for the two missions. USML-1 was the first totally U.S.-sponsored mission dedicated to microgravity research and included 31 investigations in fluid dynamics, crystal growth, combustion, biotechnology, and technology demonstrations supported by 11 facilities. The papers in these proceedings attest to the wealth of information gleaned from the highly successful mission. On the USMP-1 mission, both the MEPHISTO and the Lambda Point experiments exceeded by over 100% their planned science objectives. The mission also marked the first time that acceleration data were down-linked and analyzed in real-time. The meeting, which concentrated on flight results, brought low-gravity investigators, accelerometer designers, and acceleration data analysis experts together. This format facilitated a tremendous amount of information exchange between these varied groups. Several of the experimenters showed results, sane for the very first time, of the effects of residual accelerations on their experiment. The proceedings which are published in two volumes also contain transcriptions of the discussion periods following talks and also submittals from a simultaneous poster session.
Author
Conferences; Microgravity; Space Processing; Spaceborne Experiments

20030075807 NASA Marshall Space Flight Center, Huntsville, AL, USA

Nucleation of Crystals From Solution in Microgravity (USML-1 Glovebox (GBX) Investigation)

Kroes, Roger L.; Reiss, Donald A.; Lehoczky, Sandor L.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 663-672; In English; See also 20030075796; No Copyright; Avail: CASI; A02, Hardcopy

A new method for initiating nucleation from solutions in microgravity which avoids nucleation on container walls and other surfaces is described. This method consists of injecting a small quantity of highly concentrated, heated solution into the interior of a lightly supersaturated, cooler host gowth solution. It was tested successfully on USML-I, producing a large number of LAP crystals whose longest dimension averaged 1 mm.

Author

Nucleation; Crystal Growth; Microgravity

20030075813 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Solid Surface Wetting and the Deployment of Drops in Microgravity

Trinh, E. H.; Depew, J.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 583-600; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The complete or partial deployment of liquid samples in low gravity is primarily influenced by the interfacial properties of the specific liquid and solid materials used because the overwhelming bias of the Earth gravitational acceleration is removed. This study addresses the engineering aspects of injecting and deploying drops of prescribed volume into an acoustic positioning chamber in microgravity. The specific problems of interest are the design, testing, and implementation of injector tips to be used in a simuttaneously retracting dual-injector system used in the Drop Physics Module microgravity experiment facility. Prior to release, the liquid to be deployed must be retained within a restricted area at the very end of the injectors even under dynamic stimuli due to continuous injection flow as well as to the stepped motion of the injectors, and the final released drop must have a well determined volume as well as negligible residual linear or angular momentum from the deployment process. The outcome of Earthbased short-duration low gravity experiments had been the selection of two types of injector tips which were flown as back-up parts and were successfully utilized during the USML-1 Spacelab mission. The combination of a larger contact surface, liquid pinning with a sharp edge, and selective coating of strategic tip surfaces with a non-wetting compound has allowed a significant increase in the success rate of deployment of simple and compound drops of aqueous solutions of glycerol and silicone oil. The diameter of the samples studied in the Drop Physics Module ranged between 0.3 and 2.7 cm. The tests conducted onsrbit with a manually operated small device have allowed the calibration of the volume deployed for a few drop sizes. The design for improved tips to be used during the next USML flight is based on these results.

Author

Microgravity; Wetting

20030075821 Alabama Univ., Huntsville, AL, USA

Marangoni Convection in Closed Containers (MCCC)

Naumann, Robert J.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravim Measurement Group; May 1994; 8 pp.; In English; See also 20030075796; No Copyright; Avail: CASI; A02, Hardcopy

The Marangoni Convection in Closed Containers experiment was designed to study the effects of a void space in a simulated Bridgman crystal gvwth configuration and to determine if sufface tension driven convective mws that may result from thermal gradients along any free surfaces could affect the solidification process. This study was motivated by some of the results of the early directional solidification experiments on Skylab in which the ingot was smaller than the ampoule and appeared to have been in only partial contact with the wall. The Soviets observed similar effects which they attributed to the possibility that the fluid may have been in only partial contact with the wall due to the lack of hydrostatic pressure. No evidence of partial wall contact was seen in either the case of wetting or nonwetting walls. A hemispherical bubble that was pinned to the wall formed in the case where the liquid did not wet the wall and a perfectly spherical bubble that did not touch the wall formed in the case where the liquid wet the wall. Marangoni convection was observed around the bubble which acted like a pump - driving a global flow throughout the chamber which was several orders of magnitude greater than the buoyancydnven flows from the residual acceleration.

Author

Crystal Growth; Marangoni Convection

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*.

20030068963

Final Range Wide Environmental Impact Statement

Botdorf, Charles; Bottone, Anthony; Epperley, Tracey; Kerns, Junior; Wullenjohn, Charles; Jul. 2001; 191 pp.; In English; Original contains color illustrations

Report No.(s): AD-A414686; No Copyright; Avail: CASI; A09, Hardcopy

This Final Range Wide Environmental Impact Statement presents the impacts associated with the direct, indirect, and cumulative effects of mission diversification and changes to land use for Yuma Proving Ground, Arizona. New Department of Defense management and operational concepts and programs require land use changes and the construction of new facilities and ranges. In accordance with Council of Environmental Quality and Army guidance, a range of alternatives has been assessed in the Draft Range Wide Environmental Impact Statement. The baseline activity levels (alternative A, the 'no action' alternative) are described for evaluation of environmental consequences of existing activities. Impacts and mitigation to impacts for each evaluated alternative and the preferred alternative are presented and compared in accordance with the National Environmental Policy Act. Situated in southwestern Arizona, the Yuma Proving Ground installation is a desert test and evaluation center with premier facilities for testing military materiel. Diversified operations will benefit Yuma Proving Ground, the City of Yuma, the State of Arizona, and the Nation. However, new mission elements, such as combat systems testing, troop training, and private partnership initiatives are likely to result in significant impacts to the natural and human environment. Further environmental documents addressing specific new mission elements will tier from this environmental impact statement. (23 tables, 17 figures, extensive refs.)

DTIC

Land Use; Environmental Tests

20030068965 Parsons Engineering Science, Inc., Austin, TX, USA

Environmental Baseline Survey for Three Sites at TRW Capistrano Test Site, California

McColloch, Craig; Nov. 1999; 122 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F41624-95-D-9018

Report No.(s): AD-A414687; No Copyright; Avail: CASI; A06, Hardcopy

Assets of the Space-Based Laser (SBL) program at Capistrano Test Site (CTS) , California, are being transferred from the Ballistic Missile Defense Organization (BMDO) to the USA Air Force (USAF). These assets are situated at three adjacent sites named the High Energy Propellant Test Stand (HEPTS), the Vertical Engine Test Stand (VETS), and the High Altitude Test Stand (HATS). The CTS is operated by TRW Corporation (TRW) under a long-term lease from the San Juan Company, which owns the Mission Viejo Ranch. The leased land is part of the Mission Viejo Ranch. This Phase I environmental baseline survey (EBS) is based on information obtained through a records search, interviews, and a visual site inspection (VSI) of the subject and adjacent properties. The records search included a review of all available Air Force and TRW records. These records include environmental restoration and compliance reports, audits, surveys, inspection reports, and a review of real estate documents for the subject property. Additionally, aerial photographs were analyzed, interviews were held with both civilian and military personnel, and a VSI of the sites and adjacent properties was conducted. This EBS includes an assessment of the environmental condition of the subject property as well as the properties immediately adjacent to or relatively near that could pose environmental concern or affect the subject property. Based on the categorization criteria presented in Section 1, the property is classified Category 1 and would be considered eligible for transfer of ownership. (28 tables, 13 figures, 25 refs.)

DTIC

Test Facilities; Environmental Surveys

20030069006 NASA Marshall Space Flight Center, Huntsville, AL, USA

Helium Cryo Testing of a SLMS(TM) (Silicon Lightweight Mirrors) Athermal Optical Assembly

Jacoby, Marc T.; Goodman, William A.; Stahl, H. Philip; Keys, Andrew S.; Reily, Jack C.; Eng, Ron; Hadaway, James B.; Hogue, William D.; Kegley, Jeffrey R.; Siler, Richard, et al.; [2003]; 1 pp.; In English; SPIE Annual Meeting 2003, 3-8 Aug. 2003, San Diego, CA, USA

Contract(s)/Grant(s): NAS8-01174; No Copyright; Avail: Other Sources; Abstract Only

SLMS (TM) a thermal technology has been demonstrated in the small 4-foot helium cryogenic test chamber located at

the NASA/MSFC X-Ray Calibration Facility (XRCF). A SLMS (TM) Ultraviolet Demonstrator Mirror (UVDM) produced by Schafer under a NASA/MSFC Phase I SBIR was helium cryo tested both free standing and bonded to a Schafer designed prototype carbon fiber reinforced silicon carbide (Cesic) mount. Surface figure data was obtained with a test measurement system that featured an Instantaneous Phase Interferometer (IPI) by ADE Phase Shift. The test measurement system s minimum resolvable differential figure deformation and possible contributions from test chamber ambient to cryo window deformation are under investigation. The free standing results showed differential figure deformation of 10.4 nm rms from 295K to 27K and 3.9 nm rms after one cryo cycle. The surface figure of the UVDM degraded by lambda/70 rms HeNe once it was bonded to the prototype Cesic mount. The change was due to a small astigmatic aberration in the rototype Cesic mount due to lack of finish machining and not the bonding technique. This effect was seen in SLMST (TM) optical assembly results, which showed differential figure deformation of 46.5 nm rms from 294K to 27K, 42.9 nm rms from 294K to 77K, 28.0 nm rms from 294K to 193K and 6.2 nm rms after one cryo cycle.
Author
Cryogenics; Helium; Mirrors; Silicon Carbides; Carbon Fiber Reinforced Plastics; Optical Equipment

20030071116 Defence Science and Technology Organisation, Fishermans Bend, Australia
Modelling Concentration Profiles of Chemical Warfare Agents to Assess the Usefulness of Airborne Chemical Detectors
Hill, Alexander; July 2003; 21 pp.; In English
Report No.(s): DSTO-TN-0506; DODA-AR-012-844; Copyright; Avail: CASI; A03, Hardcopy

The concept of airborne chemical point-detectors followed from the increasing availability of unmanned aerial vehicles (UAVs). The atmospheric hazard modelling program HPAC (Hazard Prediction and Assessment Capability) is used to examine the vertical concentration profiles that a UAV borne detector will be exposed to in military scale releases of chemical warfare agents. The airborne chemical detection capability obtained from a point-detector with a detection limit of 0.1 mg/cu m borne by a UAV operating at 50 metres above ground level is shown to have very limited application.
Author
Chemical Warfare; Detection; Hazards

20030071157 Civil Aerospace Medical Inst., Oklahoma City, OK, USA, Federal Aviation Administration, Oklahoma City, OK, USA
The Effects of Laser Illumination on Operational and Visual Performance of Pilots Conducting Terminal Operations
Nakagawara, Van B.; Montgomery, Ron W.; Dillard, Archie; McLin, Leon; Connor, C. William; August 2003; 13 pp.; In English
Contract(s)/Grant(s): AM-B-03-PRS-94
Report No.(s): DOT/FAA/AM-03-12; No Copyright; Avail: CASI; A03, Hardcopy

Several hundred incidents incidents involving the illumination of aircrew members by laser light have been reported in recent years. Consequently, FAA Order 7400.2 was revised to establish new guidelines for Flight Safe Exposure Limits (FSEL) in specific zones of navigable airspace. The purpose of this study was to evaluate the performance of test subject exposed to laser radiation while performing approach and departure maneuvers in the Critical Flight Zone (CFZ).
Author
Laser Beams; Illumination; Exposure; Flight Crews

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*.

20030071083 NASA Ames Research Center, Moffett Field, CA, USA
Monitoring and Modeling Performance of Communications in Computational Grids
Frumkin, Michael A.; Le, Thuy T.; June 02, 2003; 12 pp.; In English; Parallel and Distributed Computing and Systems, 3-5 Nov. 2003, Marina Del Ray, CA, USA; Copyright; Avail: CASI; A03, Hardcopy

Computational grids may include many machines located in a number of sites. For efficient use of the grid we need to have an ability to estimate the time it takes to communicate data between the machines. For dynamic distributed grids it is unrealistic to know exact parameters of the communication hardware and the current communication traffic and we should rely

on a model of the network performance to estimate the message delivery time. Our approach to a construction of such a model is based on observation of the messages delivery time with various message sizes and time scales. We record these observations in a database and use them to build a model of the message delivery time. Our experiments show presence of multiple bands in the logarithm of the message delivery times. These multiple bands represent multiple paths messages travel between the grid machines and are incorporated in our multiband model.
Author
Computational Grids; Mathematical Models; Communication Networks; Performance Tests; Message Processing

20030071097 Army War Coll., Carlisle Barracks, PA
The National Telecommunications Infrastructure: A 21st Century Organizational Paradox
Baines, Mark D.; Apr. 7, 2003; 37 pp.; In English
Report No.(s): AD-A414949; No Copyright; Avail: CASI; A03, Hardcopy

The telecommunications infrastructure of the USA is large, organizationally bureaucratic, and vulnerable. Yet, it is the means by which the U.S. facilitates its dominant forms of strategic power, specifically a thriving economy and an unparalleled military. It is literally the backbone of the Information Age. Is this critical infrastructure capable of meeting the demand being placed upon it? What organizations are responsible for it? What are the vulnerabilities? And do the answers to these questions have national security implications? This paper examines the national telecommunications infrastructure of the USA and argues that the size and bureaucratic nature of this infrastructure exposes the USA to vulnerabilities and inefficiencies that may impact national security. It evaluates efforts to establish an infrastructure capable of meeting the intent of Presidential Directives and legislation regarding a secure, robust, and interoperable national communications infrastructure. It looks specifically at Department of Defense organizations involved with this effort and examines recent shifts in oversight of the National Communications System (NCS) from the Department of Defense (DOD) to the newly established Office of Homeland Security.
DTIC
Telecommunication; Security

20030071132 Naval Postgraduate School, Monterey, CA
Voice Recognition Systems: Assessment of Implementation Aboard U.S. Naval Ships
Wilson, Shawn C.; Mar. 2003; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414993; No Copyright; Avail: CASI; A04, Hardcopy

Technological advances have had profound effects on the conduct no military operations in both peacetime and in war. One advance that has had a great impact outside the military by reducing human intervention is Voice Recognition (VR) technology. This thesis will examine the implementation of a Voice Recognition System as a ship-driving device and as a means of decreasing the occurrence of mishaps while reducing the level of fatigue of watchstanders on the bridge. Chapter I will discuss the need for the USA Navy to investigate the implementation of a Voice Recognition System to help reduce the probability of mishaps occurring. Chapter II will explain voice recognition technology, how it works, and how the proposed system can be fielded aboard U.S. Navy ships. Chapter III will examine the opinions (on the implementation of a Voice Recognition System) of officers charged with the safe navigation of naval ships. Chapter IV will review the concerns of officers, and will justify the implementation by answering these concerns. The conclusion will iterate the advances in voice recognition, and why a Voice Recognition system should be implemented on the bridges of U.S. Navy ships.
DTIC
Speech Recognition; Voice Communication

20030071166 Naval Postgraduate School, Monterey, CA
Performance Analysis of M-QAM With Viterbi Soft-Decision Decoding
Manso, Rogerio C.; Mar. 2003; 127 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415029; No Copyright; Avail: CASI; A07, Hardcopy

This thesis derives design tools for determining and improving performances of communication links that use M-QAM coherent demodulators associated with Viterbi soft-decision decoding (SDD) in Additive White Gaussian Noise (AWGN) and Nakagami-m channels. Performance analyses for 16-QAM, 64-QAM, QPSK and BPSK associated with up to three convolutional codes, including the one used by the IEEE 802.11 a standard and the dual-k code, are presented as practical applications. The main tools relate to the analytical derivation of upper bounds of the probability of bit error (Pb) for any M-ary coherent demodulator followed by SDD, a methodology for improving an upper bound of Pb tightening it to realistic

data, and the obtaining of the specific beta(d) spectrum for any convolutional code intended to operate with a certain M-symbol modulation. All derivations involve statistical considerations over the AWGN and Nakagami-m channels, as well as in-depth analyses of modulator constellations. The tools and models developed can provide great optimization to bandwidth limited system designs that require high data rates, especially the wireless ones. Consequently, they have great application to many fields of digital communications, such as cellular telephony, wireless networking, satellite links, ship-to-shore and ship-to-ship communications.
DTIC
Data Links; Communication Networks; Performance Tests; Decoding; Random Noise

20030071191 Newcastle-upon-Tyne Univ., Newcastle
Untraceability of Mobile Internet Users
Molina-Jimenez, C.; Marshall, L.; Sep. 2002; 22 pp.
Report No.(s): PB2003-105196; CS-TR-742; Copyright; Avail: National Technical Information Service (NTIS)

Current mobile telecommunications providers conceal the records gathered about their subscribers from other subscribers and non-subscribers but not from the mobile telecommunications providers themselves. Thanks to the availability of these records, mobile telecommunications providers can easily trace their subscribers and learn about their habits, movements and whereabouts. This means that the subscribers' right to individual privacy is not fully observed. We believe that this problem is caused by the use of a centralized billing system and the use of permanent personal and universal numbers which are used for incoming and outgoing calls and is hard-wired to the mobile internet devices. In this paper, we argue that a centralized single bill and the use of a universal personal number are not convenient for several applications. We suggest a flexible billing system and the use of mobile internet devices provided with the traditional personal and universal number, and with a mechanism for negotiating a random, impersonal, temporary number. The flexible billing system allows the user to pay locally for the services while the random, impersonal temporary number is used for outgoing, anonymous calls, whenever the user wishes to access a service without taking the risk of being traced and having his or her right to individual privacy compromised.
NTIS
Communication Networks; Mobile Communication Systems; Internets

20030071249
Adjusting Sensing Range to Maximize Throughput on Ad-Hoc Multi-Hop Wireless Networks
Roberts, Christopher K.; Mar. 2003; 99 pp.; In English
Report No.(s): AD-A415136; AFIT/GCS/ENG/03-17; No Copyright; Avail: CASI; A05, Hardcopy

The use of ad-hoc wireless networks is becoming common within the USA Air Force. Such networks are able to be implemented where traditional wired networks are either impractical or too expensive. As the miniaturization of communication devices continues, it is becoming increasingly common for mobile devices to communicate directly with each other, eliminating the need for center access points. Such a network is referred to as a multi-hop ad-hoc network, or simply a multi-hop network. Most multi-hop network protocols use some form of carrier sensing to determine if the wireless channel is in use. A large sensing range can reduce packet collisions. However, it can also decrease spatial reuse. Conversely, a smaller sensing range can lead to higher spatial reuse but increase packet collisions. This study examines a variety of multi-hop network topologies, sizes and traffic loads and determines the sensing range twice as large as the node's communication range yields maximum or near maximum network throughput. However, results indicate a shorter sensing range can be better if it provides a significant increase in spatial reuse.
DTIC
Communication Networks; Detection

20030071694 Arizona State Univ., Tempe, AZ, USA
Radar Attenuation by Sand: Laboratory Measurement of Radar Transmission
Williams, Kevin K.; Greeley, Ronald; IEEE Transactions on Geoscience and Remote Sensing; November 2001; ISSN 0196-2892; Volume 39, No. 11, pp. 2521; In English
Contract(s)/Grant(s): NAG5-8948; Copyright; Avail: Other Sources; Abstract Only

Under certain conditions, radar is able to penetrate loose sand to reveal subsurface geology in arid areas. However, backscatter from the subsurface is modified by signal attenuation by the sand, To quantify the amount of radar transmission as a function of radar frequency and sand moisture. The frequency range covers P-through X-bands (0.5 - 12.6 GHz), and the

moisture contents of the sand were 0.3, 4.7, and 10.7% by volume. Results show that addition of the sand causes a small decrease in transmission at low frequencies for all three moisture levels, but the sand causes a large decrease in transmission at higher frequencies. The transmission measurements were also used to calculate values for attenuation, The dry sand resulted in attenuations of less than 6 dB/m over the entire frequency range. Sand with moisture contents of 4.7 and 10.7% volume caused by attenuations greater than 150 dB/m at the highest frequencies, but the attenuation values calculated for P-and L-band frequencies were less than 10 dB/m even at these relatively high moisture levels. THese results challenge previous restrictions that sand must be extremely dry for radar penetration to occur.
Author
Radar Attenuation; Sands; Radar Transmission; Frequency Ranges

20030082046 Geological Survey, Anchorage, AK, USA
Testing Pop-up Satellite Tags as a Tool for Identifying Critical Habitat for Pacific Halibut ('Hippoglossus stenolepis') in the Gulf of Mexico. Restoration Project 01478. EXXON VALDEZ Oil Spill. Final Report
Seitz, A.; Wilson, D.; Nielsen, J. L.; Sep. 2002; In English
Report No.(s): PB2003-107071; No Copyright; Avail: National Technical Information Service (NTIS)

To maintain healthy commercial and sport fisheries for Pacific halibut (Hippoglossus stenolepis), critical habitat must be defined by determining life history patterns on a daily and seasonal basis. Pop-up satellite archival transmitting (PSAT) tags provide a fisheries-independent method of collecting environmental preference data (depth and ambient water temperature) as well as daily geolocation estimates based on ambient light conditions. In this study, 14 adult halibut (107-165 cm FL) were tagged and released with PSAT tags in and around Resurrection Bay, Alaska. Commercial fishermen recovered two tags, while five tags transmitted data to ARGOS satellites. Horizontal migration was not consistent among fish as three halibut remained in the vicinity of release while four traveled up to 358 km from the release site. Vertical migration was not consistent among fish and over time, but they spent most their time between 150-350 m. The minimum and maximum depths reached by any of the halibut were 2m and 502m, respectively. The fish preferred water temperatures of roughly 6 degrees C while experiencing ambient temperatures between 4.3 degrees C and 12.2 degrees C. Light attenuation with depth prevented existing geolocation software and light sensing hardware from accurately estimating geoposition, however, information from temperature, depth, ocean bathymetry, and pop-off locations provided inference on fish movement in the study area. PSAT tags were a viable tool for determining daily and seasonal behavior and identifying critical halibut habitat, which will aid fisheries managers in future decisions regarding commercial and sport fishing regulations.
NTIS
Satellite Observation; Wildlife Radiolocation; Fishes; Oil Pollution

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*.

20030068960 Materials Research Society, Warrendale, PA
Symposium P: Novel Aspects of Spintronic Materials and Devices
Molenkamp, Laurens W.; Munekata, Hiro; Palmstrom, Christopher J.; Zutic, Igor; Jun. 9, 2003; 20 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0816
Report No.(s): AD-A414657; No Copyright; Avail: CASI; A03, Hardcopy

Symposium P, Novel Aspects of Spintronic Materials and Devices, provided an overview of challenges and recent progress in controlling the spin degrees of freedom in solid-state systems. It is instructive to think of a spintronics scheme as consisting of three different stages: generation of spin polarization, spin manipulation, and spin detection. Spin polarization can be defined as the ratio of the sum and the difference of spin-resolved components (spin-up and spin-down) of a particular quantity such as charge current, carrier density, or the density of states. While many materials in their ferromagnetic state can have a substantial degree of equilibrium carrier spin polarization, this alone is not sufficient for spintronic applications that typically require current flow and/or manipulation of the nonequilibrium spin (polarization). A large part of the symposium focused on the issues related to spin injection where, by driving electrical current across the interface between magnetic and nonmagnetic material, nonequilibrium spin polarization is introduced in a nonmagnetic material. Detailed theoretical considerations were presented by R.H. Silsbee (Cornell) and E.L Rashba (SUNY-Buffalo). Experimental reports on spin

injection spanned a wide range of materials, from organic semiconductors (C. Taliani, ISM, Bologna, Italy) to HTSs (J. Wei, Univ. of Toronto). It was shown that metallic ferromagnets combined with a tunneling barrier can provide efficient room-temperature spin injection into common semiconductors such as GaAs (B.T. Jonker, NRL and V.I. Safarov, Univ. Aix-Marseille II, Marseille, France). An alternative method to inject spin into GaAs was discussed by S.S.P. Parkin (IBM Almaden Research Center). His technique employed a magnetic tunneling transistor, which is a three-terminal device combining a magnetic tunnel junction with a semiconductor collector. However, many materials challenges remain.
DTIC
Degrees Of Freedom; Ferromagnetic Materials; Semiconductors (Materials)

20030068986 Maine Univ., Orono, ME, USA
Development of a Prototype Chemical Agent Detector System Based on Semiconducting Metal Oxide (SMO) Thin Film Technology
Lad, Robert J.; Tripp, Carl J.; Frederick, Brian G.; DeSisto, William; Mar. 15, 2003; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0921
Report No.(s): AD-A414915; Rept-13; No Copyright; Avail: CASI; A03, Hardcopy

This research grant focused on carrying out 6.1 research activities to advance the development a next generation chemical agent detector system based on semiconducting metal oxide (SMO) technology. The tasks and the resulting findings described in detail in this report, emphasize strategies to improve the selectivity, sensitivity, and miniaturization of the SMO detector system. Experiments were performed using organophosphonates and various alcohols as target gases Results are reported concerning (i) selective concentration of organophosphonates on nano-sized WO3 powders (ii) selective filtering and detection of decomposition products using catalyst-modified silica membranes (iii) kinetic signatures and decomposition reaction products associated with reactions of organophosphonates, alcohols and ethers on WO3 surfaces (iv) heteroepitaxial WO3 sensing films grown on BaF2/Si(100) substrates and (vi) a dosiometer sensor based on poisoning of dispersed copper oxide nanoparticles on WO3 films.
DTIC
Thin Films; Metal Oxide Semiconductors; Chemical Composition

20030069033 Sandia National Labs., Albuquerque, NM
High Efficiency Optical MEMS by the Integration of Photonic Lattices with Surface MEMS
Fleming, J. G.; Lin, S. Y.; Mani, S. S.; Sniegowski, J.; Rodgers, S.; Nov. 2002; In English
Report No.(s): DE2003-807056; SAND-2002-3694; No Copyright; Avail: National Technical Information Service (NTIS)

This report outlines our work on the integration of high efficiency photonic lattice structures with MEMS (MicroElectroMechanical Systems). The simplest of these structures were based on l-D mirror structures. These were integrated into a variety of devices, movable mirrors, switchable cavities and finally into Bragg fiber structures which enable the control of light in at least 2 dimensions. Of these devices, the most complex were the Bragg fibers. Bragg fibers consist of hollow tubes in which light is guided in a low index media (air) and confined by surrounding Bragg mirror stacks. In this work, structures with internal diameters from 5 to 30 microns have been fabricated and much larger structures should also be possible. We have demonstrated the fabrication of these structures with short wavelength band edges ranging from 400 to 1600nm. There may be potential applications for such structures in the fields of integrated optics and BioMEMS. We have also looked at the possibility of waveguiding in 3 dimensions by integrating defects into 3- dimensional photonic lattice structures. Eventually it may be possible to tune such structures by mechanically modulating the defects.
NTIS
Microelectromechanical Systems; Fabrication; Integrated Optics; Optical Filters

20030071080 Air Force Research Lab., Kirkland AFB, NM, USA
Cathode Research and the Threshold Cathode Test Facility
Umstattd, Ryan J.; Spencer, Thomas A.; Sep. 2002; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2304
Report No.(s): AD-A414924; AFRL-DE-TR-2003-1076; No Copyright; Avail: CASI; A03, Hardcopy

This technical report discusses the parameters of the Threshold Cathode Test Facility (TCTF) and the use of the TCTF

to perform cathode research. Experimental and simulation results are documented, as well as references to additional, more detailed, cathode results.
DTIC
Cathodes; Simulation

20030071152 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Modeling of Carbon Nanotube Schottky Barrier Reduction for Holes in Air
Yamada, Toshishige; [2003]; 4 pp.; In English; IEEE Nano-2003 Conference, 12-14 Aug. 2003, San Francisco, CA, USA
Contract(s)/Grant(s): DTTS59-99-D-00437; No Copyright; Avail: CASI; A01, Hardcopy

A model is proposed for the previously reported lower Schottky barrier for holes Phi(sub Bh) in air than in vacuum at a metallic electrode - semiconducting carbon nanotube (CNT) junction. We consider that there is a transition region between the electrode and the CNT, and an appreciable potential can drop there. The role of the oxidation is to increase this potential drop with negatively charged oxygen molecules on the CNT, leading to lower Phi(sub Bh) after oxidation. The mechanism prevails in both p- and n-CNTs, and the model consistently explains the key experimental findings.
Author
Models; Carbon Nanotubes; Holes (Electron Deficiencies); Air

20030071188 Newcastle-upon-Tyne Univ., Newcastle
Synthesis of Asynchronous Circuits with Predictable Latency
Bystrov, A.; Yakovlev, A.; Sep. 2002; 16 pp.
Report No.(s): PB2003-105161; CS-TR-754; Copyright; Avail: National Technical Information Service (NTIS)

A new method for low-latency asynchronous circuit design uses a two-level architecture. It consists of the explicit context logic and output flip-flops. Explicit context logic computes a single context signal for each output concurrently to the environment operation. Every flip-flop generates an output from the corresponding context and trigger signals. The flip-flop latency for every transition is defined by the number of corresponding trigger transitions and can be predicted at an early stage of the design. Explicit context logic is generated by a logic synthesis tool, which produces a near logarithmic state encoding. This is especially beneficial for the designs from specifications having implicit (hidden) counters.
NTIS
Logic Circuits; Synthesis

20030071251
Mechanical Computing in Microelectromechanical Systems (MEMS)
Bradley, Kenneth C.; Mar. 2003; 172 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415137; AFIT/GE/ENG/03-04; No Copyright; Avail: CASI; A08, Hardcopy

Mechanical computing devices in polysilicon-based microelectromechanical systems (MEMS) were designed with the goal of developing computing devices for harsh environments, such as those with high dose radiation and high temperatures, as well as devices that may be able to interface with molecular or biological computer systems. The devices that were designed include both analog and digital computing devices. The analog devices include integrators, differentials (summers), multipliers, and those that perform trigonometric functions. The digital devices that were designed are inverters, NAND, NOR, and XOR logic gates. Analog-to-digital (A-to-D) and digital-to-analog (D-to-A) converters were also designed. The designs were submitted to a commercial surface micromachining foundry to be fabricated. The completed MEMS devices were then released and tested to determine proper operation. Of the mechanical devices that have been fabricated and tested, a functioning inverter, sine function device, cosine function device, and digital-to-analog converter have been demonstrated.
DTIC
Microelectromechanical Systems; Logic Circuits; Integrators

20030071259 Kansas Univ. Center for Research, Inc., Lawrence, KS
Material Issues in Uncooled Ferroelectric Infrared Detectors
Wu, Judy; Mar. 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0689
Report No.(s): AD-A415178; ARO-42807.1-EL; No Copyright; Avail: CASI; A02, Hardcopy

The overall goal of this 12-month project was to explore ion beam assisted growth of uncooled ferroelectric thin film infrared detectors so as to improve the material properties and thus device performance of thin film ferroelectric (TFFE)

infrared imaging components/systems. Two issues were addressed. One is to optimize physical properties of the ferroelectric layer, aiming at Improving sensitivity and reducing noise of these devices. The other is to grow the whole multilayered TFFE at a low thermal budget below 500 C, which is required for a monolithic TFFE on Si-based readout integrated circuits. ion beam assisted deposition (IBAD) was employed in this research as it can preferentially generate a textured growth pattern, and provide atoms with extra kinetic energies, promoting formation of high-quality oriented ferroelectric films at low substrate temperature. During the project period, two vacuum systems were constructed/modified for the proposed research. One was addition of ion beam to our existing pulsed laser deposition system for ion beam assisted deposition (IBAD-PLD) and the other was the new thermal/e-beam co-evaporator equipped with IBAD and high-resolution electron diffraction capabilities (IBAD-TEC). Growth of samples was conducted on both systems and the experimental results are summarized in the report.
DTIC
Thin Films; Infrared Detectors; Ferroelectric Materials

20030073505 Global Solar Energy, LLC, Tucson, AZ, USA
Process Development for CIGS Based Thin Film Photovoltaic Modules
Britt, J.; Wiedeman, S.; Beck, M.; Albright, S.; Apr. 2003; In English
Report No.(s): DE2003-15003729; No Copyright; Avail: National Technical Information Service (NTIS)

Global Solar Energy initiated an extensive and systematic plan to accelerate the commercialization of thin-film photovoltaics (PV) based on copper indium gallium diselenide (CIGS). The distinguishing feature of the GSE manufacturing process is the exclusive use of lightweight, flexible substrates. GSE developed the technology to fabricate CIGS photovoltaics on both stainless-steel and polymer substrates; over the course of the Thin Film PV Partnership program, however, stainless steel showed significant advantages. CIGS deposited on flexible substrates can be fabricated into either flexible or rigid modules. Low-cost, rigid PV panels for remote power, bulk/utility, telecommunication, and rooftop applications have been produced by affixing the flexible substrate to an inexpensive rigid panel by lamination or adhesive. There have been numerous challenges in developing the technology for manufacturing flexible CIGS photovoltaic modules. Three major areas deemed exceptionally challenging were selected by GSE for focused development under the Thin Film PV Partnership Program: (1) CIGS absorber improvement, (2) monolithic integration, and (3) encapsulation. Most conventional techniques for monolithic integration of thin film PV devices on glass substrates cannot be applied to integrate devices on a polyimide substrate. Novel interconnect schemes and processes had to be developed. The encapsulation of a flexible module also presented special problems to solve, and unique advantages to employ.
NTIS
Photovoltaic Cells; Thin Films; Electrodeposition; Manufacturing

20030075649
Advanced CIGS Photovoltaic Technology. Annual Technical Report 15 November 2001-14 November 2002
Delahoy, A. E.; Chen, L.; May 2003; 52 pp.; In English
Report No.(s): DE2003-15003960; No Copyright; Avail: Department of Energy Information Bridge

As part of the Thin Film Photovoltaics Partnership Program, Energy Photovoltaics, Inc. has conducted research to help generate and support a technology base for production of CIGS PV modules based on vacuum deposition onto glass. To prepare CIGS on large glass substrates (currently 0.43m2, with a projected further scale up to 0.79m2), EPV has developed novel technology to deliver materials from stationary line sources to moving substrates. This strategy was chosen after observing that, despite there being several methods of forming device quality CIGS (e.g. vacuum deposition, atmospheric pressure selenization of metallic precursors, rapid thermal processing, and electrodeposition), vacuum deposition has repeatedly achieved the world record for the highest efficiency CIGS device. Thus, in 1998, a record thinfilm solar cell efficiency (18.8% for 0.44 cm2) was achieved by NREL using vacuum-deposited CIGS (R3). The deposition employs four point sources and flux integration for process control. In November 2002, this record was broken again by NREL with the announcement of a 19.2% device. In an attempt to overcome barriers to manufacturing CIGS by vacuum deposition, EPV has developed vacuum equipment incorporating novel linear evaporation sources designed for uniform coating of large substrates (2). The use of elemental selenium avoids the need for gaseous H2Se and makes for a safe manufacturing environment. There are many objectives of this R&D program. One is to develop CIGS and junction formation recipes capable of producing small area devices with efficiencies in the range 14-16%. In this activity, the CIGS component of the cell will be prepared only by methods capable of immediate implementation on EPV's large scale processing equipment. Objectives related to the large-scale equipment include improvement of the uniformity of thickness and composition of layers produced by the linear sources, deposition control, and fabrication of large area modules with efficiencies up to 10%. The method of junction formation is of particular interest, and desirably should replace the traditional CBD CdS step. Two further major operations

in which advances are sought are high rate deposition of high quality doped ZnO, and patterning operations that exhibit low area and electrical losses. Other objectives relate to module reliability testing, and improved materials utilization. These goals were chosen to provide a foundation for manufacturing of CIGS modules using wholly or mostly vacuum processing for layer deposition.
NTIS
Photovoltaic Cells; Thin Films

20030075801 NASA Langley Research Center, Hampton, VA, USA
Preliminary Calibration Report of an Apparatus to Measure Vibration Characteristics of Low Frequency Disturbance Source Devices
Russell, James W.; Marshall, Robert A.; Finley, Tom D.; Lawrence, George F.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 921-933; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

This report presents a description of the test apparatus and the method of testing the low frequency disturbance source characteristics of small pumps, fans, camera motors, and recorders that are typical of those used in microgravity science facilities. The test apparatus will allow both force and acceleration spectra of these disturbance devices to be obtained from acceleration measurements over the frequency range from 2 to 300 Hz. Some preliminary calibration results are presented. Author
Calibrating; Low Frequencies; Vibration Measurement; Test Facilities; Measuring Instruments

20030079947 National Inst. of Standards and Technology, Gaithersburg, MD
MSEL (Materials Science and Engineering Laboratory) FY 2002 Programs and Accomplishments: MSEL Materials for Micro- and Optoelectronics
Gayle, F. W.; Mar. 2003; In English
Report No.(s): PB2003-105771; NISTIR-6971; No Copyright; Avail: National Technical Information Service (NTIS)

U.S. microelectronics and related industries are in fierce international competition to design and produce smaller, lighter, faster, more functional, and more reliable electronic products more quickly and economically than ever before. At the same time, there has been a revolution in recent years in new materials used in all aspects of microelectronics fabrication. Since 1994, the NIST Materials Science and Engineering Laboratory (MSEL) has worked closely with the U.S. semiconductor, component, packaging, and assembly industries. These efforts led to the development of an interdivisional MSEL program committed to addressing industry's most pressing materials measurement and standards issues central to the development and utilization of advanced materials and material processes.
NTIS
Microelectronics; Semiconductors (Materials); Electro-Optics

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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*.

20030068985 NASA Langley Research Center, Hampton, VA, USA
Computational Study of Porous Treatment for Altering Flap Side-Edge Flowfield
Choudhari, Meelan; Khorrami, Mehdi R.; [2003]; 15 pp.; In English; 9th AIAA/CEAS Aeroacoustics Conference, 12-14 May 2003, Hilton Head, SC, USA
Report No.(s): AIAA Paper 2003-3113; No Copyright; Avail: CASI; A03, Hardcopy

Reynolds-averaged Navier-Stokes calculations are used to investigate porous side-edge treatment as a passive means for flap noise reduction. Steady-state simulations are used to infer effects of the treatment on acoustically relevant features of the mean flow near the flap side edge. Application of the porous treatment over a miniscule fraction of the wetted flap area (scaling with the flap thickness) results in significantly weaker side-edge vortex structures via modification of the vortex initiation and roll-up processes. At high flap deflections, the region of axial flow reversal associated with the breakdown of the side-edge vortex is also eliminated, indicating an absence of vortex bursting in the presence of the treatment. Potential ramifications of the mean-flow modifications for flap-noise reduction are examined in the light of lessons learned from recent studies on flap noise. Computations confirm that any noise reduction benefit via the porous treatment would be achieved without

compromising the aerodynamic effectiveness of the flap. Results of the parameter study contribute additional insight into the measured data from the 7x10 wind tunnel at NASA Ames and provide preliminary guidance for specifying optimal treatment characteristics in terms of treatment location, spatial extent, and flow resistance of the porous skin.
Author
Computer Programs; Porosity; Flow Distribution; Vortex Breakdown; Flaps (Control Surfaces)

20030068999 NASA Ames Research Center, Moffett Field, CA, USA
Efficient Low Dissipative High Order Schemes for Multiscale MHD Flows, II, Minimization of Delta * B Numerical Error
Sjoegreen, Bjoern; Yee, H. C.; June 29, 2003; 45 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The generalization of a class of low-dissipative high order filter finite difference schemes for long time wave propagation of shock/turbulence/combustion compressible viscous gas dynamic flows to compressible MHD equations for structured curvilinear grids has been developed. The new scheme consists of a divergence free preserving high order spatial base scheme with a filter approach which can be divergence-free preserving depending on the type of filter operator being used, the method of applying the filter step, and the type of flow problem to be considered. Several variants of the filter approach that cater to different flow types are proposed. These filters provide a natural and efficient way for the minimization of the divergence of the magnetic field (Delta * B) numerical error in the sense that no standard divergence cleaning is required. Performance evaluation of these variants, and the key role that the proper treatment of their corresponding numerical boundary conditions can play will be illustrated. Many levels of grid refinement and detailed comparison with several commonly used compressible MHD shock-capturing schemes will be sought. For certain MHD 2-D test problems, divergence free preservation of the magnetic fields of these filter schemes has been achieved.
Author
Magnetohydrodynamic Flow; Errors; Numerical Analysis; Finite Difference Theory; Optimization

20030069001 NASA Marshall Space Flight Center, Huntsville, AL, USA
CFD-Based Design of Turbopump Inlet Duct for Reduced Dynamic Loads
Rothermel, Jeffry; Dorney, Suzanne M.; Dorney, Daniel J.; July 07, 2003; 16 pp.; In English; Thermal and Fluids Analysis Workshop, 18-22 Aug. 2003, Norfolk, VA, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Numerical simulations have been completed for a variety of designs for a 90 deg elbow duct. The objective is to identify a design that minimizes the dynamic load entering a LOX turbopump located at the elbow exit. Designs simulated to date indicate that simpler duct geometries result in lower losses. Benchmark simulations have verified that the compressible flow codes used in this study are applicable to these incompressible flow simulations.
Author
Computational Fluid Dynamics; Duct Geometry; Dynamic Loads; Turbine Pumps; Engine Inlets; Numerical Analysis

20030069004 BAE Systems, Huntsville, AL, USA
Step Bunching and Solution Flow
Chernov, A. A.; [2003]; 1 pp.; In English
Contract(s)/Grant(s): NAS8-02096; No Copyright; Avail: Other Sources; Abstract Only

Imagine a sequence of equidistant steps parallel to one another on a crystal face growing from solution. Steps may be one or part of a lattice spacing high. With such ideal morphology, the most perfect material is expected to be produced. Sometimes this happens. Much more often, however, steps form bunches, acquire wavy shapes and interlace. With time, these spontaneous perturbations may be increased in amplitude, i.e. the stepped surface becomes morphologically unstable. Interferometric studies of Y.G. Kuznetsov, L.N. Rashkovich, P.G. Vekilov and N.A. Booth and the author demonstrated that the step bunching depends at least on direction and rate of solution flow over the interface, supersaturation and presence of impurities. In particular, if solution and step flow are parallel to one another, the steps convene into bunches. If these flows are antiparallel, the bunches disappear. As the step train propagates, the overall bunch height often increases infinitely. However, we have found recently that if the flow rate is large enough, (approximately 1 meter per second), the bunch height may be limited. All these phenomena come from interaction between steps. The interaction mechanisms are still not fully understood. I plan to overview major approaches to the still unresolved problem on how these dissipative structures on growing crystal face appear and evolve.
Author
Bunching; Crystal Morphology; Solutions; Flow Characteristics

20030069055 NASA Marshall Space Flight Center, Huntsville, AL, USA
Numerical Modeling of Unsteady Thermofluid Dynamics in Cryogenic Systems
Majumdar, Alok; [2003]; 5 pp.; In English; Thermal and Fluids Analysis Workshop 2003, 18-22 Aug. 2003, Hampton, VA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A finite volume based network analysis procedure has been applied to model unsteady flow without and with heat transfer. Liquid has been modeled as compressible fluid where the compressibility factor is computed from the equation of state for a real fluid. The modeling approach recognizes that the pressure oscillation is linked with the variation of the compressibility factor; therefore, the speed of sound does not explicitly appear in the governing equations. The numerical results of chilldown process also suggest that the flow and heat transfer are strongly coupled. This is evident by observing that the mass flow rate during 90-second chilldown process increases by factor of ten.
Derived from text
Cryogenics; Mathematical Models; Unsteady Flow; Finite Volume Method; Thermodynamics

20030071150 NASA Ames Research Center, Moffett Field, CA, USA
Trailing Vortex Measurements in the Wake of a Hovering Rotor Blade with Various Tip Shapes
Martin, Preston B.; Leishman, J. Gordon; [2003]; 23 pp.; In English; 58th AHS International Annual Forum, 11-13 Jun. 2002, Montreal, Canada; Copyright; Avail: CASI; A03, Hardcopy

This work examined the wake aerodynamics of a single helicopter rotor blade with several tip shapes operating on a hover test stand. Velocity field measurements were conducted using three-component laser Doppler velocimetry (LDV). The objective of these measurements was to document the vortex velocity profiles and then extract the core properties, such as the core radius, peak swirl velocity, and axial velocity. The measured test cases covered a wide range of wake-ages and several tip shapes, including rectangular, tapered, swept, and a subwing tip. One of the primary differences shown by the change in tip shape was the wake geometry. The effect of blade taper reduced the initial peak swirl velocity by a significant fraction. It appears that this is accomplished by decreasing the vortex strength for a given blade loading. The subwing measurements showed that the interaction and merging of the subwing and primary vortices created a less coherent vortical structure. A source of vortex core instability is shown to be the ratio of the peak swirl velocity to the axial velocity deficit. The results show that if there is a turbulence producing region of the vortex structure, it will be outside of the core boundary. The LDV measurements were supported by laser light-sheet flow visualization. The results provide several benchmark test cases for future validation of theoretical vortex models, numerical free-wake models, and computational fluid dynamics results.
Author
Computational Fluid Dynamics; Mathematical Models; Rotary Wings; Vortices; Blade-Vortex Interaction

20030071161 Naval Postgraduate School, Monterey, CA
Design and Testing of a Combustor for a Turbo-Ramjet Engine for UAV and Missile Applications
Piper, Ross H., III; Mar. 2003; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415019; No Copyright; Avail: CASI; A05, Hardcopy

An existing freejet facility was upgraded and its range of operation extended into the high subsonic regime for operation as a test rig for the development of a combined-cycle turbo-ramjet engine. A combustor was designed developed and tested as the afterburner for the turbo-ramjet engine. At subsonic speeds with the afterburner running an increase in thrust of 40% was measured over the baseline turbojet running at 80% spool speed. A Computational Fluid Dynamics model of the flow through the shrouded turbojet engine was developed and successfully used to assist in predicting the bypass ratio of the engine at different Mach numbers. Numerous recommendations were made to improve the operation of the test rig to improve the performance of the turbo-ramjet engine and refine the numerical models. These recommended improvements will extend the present capabilities to design and analyze small combined cycle engines which have an application in unmanned aerial vehicles and missiles.
DTIC
Combustion Chambers; Missiles; Pilotless Aircraft; Ramjet Engines; Turbojet Engines; Engine Design

20030071169 Naval Postgraduate School, Monterey, CA
Experimental Investigation of Vortex Shedding in High Reynolds Number Flow Over Compressor Blades in Cascade
Lim, Choon P.; Mar. 2003; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415032; No Copyright; Avail: CASI; A05, Hardcopy

An investigation of vortex shedding downstream of a cascade of compressor stator blades, at off-design inlet-flow angles

of 35, 33 and 31 degrees and Reynolds numbers, based on chord length, of 625,000, 750,000 and 800, 000 is reported. The objective of the study was to characterize the flow and vortex shedding through blade surface pressure measurements and hot-wire anemometry. Vortex shedding was determined to be a leading edge phenomenon as periodic shedding was only detected on the pressure side of the wake, The relationship between vortex shedding frequency and Reynolds number was nearly linear. The vortex shedding frequency at three incidence angles was observed to be quite similar at lower Reynolds number (i.e. 450,000 and below) but developed into a larger scatter at higher Reynolds number. Similarly, the Strouhal numbers were observed to be fairly consistent (0.22 to 0.24) at low Reynolds number and more scattered (0.18 to 0.25) with increasing Reynolds number. The result obtained was comparable to the experimental results obtained by Roshko Ref. 14, for vortex shedding behind a circular cylinder.
DTIC
Compressor Blades; High Reynolds Number; Vortex Shedding; Cascade Flow; Flow Distribution

20030071258 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
Calculation of Turbulent Expansion Processes
Tollmien, Walter; Zeitschrift fuer angewandte Mathematik und Mechanik; September 1945; Volume 6, pp. 1-12; In English
Report No.(s): NACA-TM-1085; No Copyright; Avail: CASI; A03, Hardcopy

On the basis of certain formulas recently established by L. Prandtl for the turbulent interchange of momentum in stationary flows, various cases of 'free turbulence' - that is, of flows without boundary walls - are treated in the present report. Prandtl puts the apparent shearing stress introduced by the turbulent momentum interchange. This present report deals first with the mixing of an air stream of uniform velocity with the adjacent still air, than with the expansion or diffusion of an air jet in the surrounding air space.
Derived from text
Computation; Turbulent Flow; Air Flow; Boundaries; Velocity Distribution

20030071691 Defence Science and Technology Organisation, Edinburgh, Australia
The Effect of Water Mist and Water Spray on Radiative Heat Transfer for Stored Ordnance
Doolan, Con; July 2003; 22 pp.; In English
Report No.(s): DSTO-TN-0501; DODA-AR-012-823; Copyright; Avail: Other Sources

Water sprays and mists are a common method of suppressing fires within compartments and magazines and extensive studies have been performed to determine their extinguishing capabilities. However, limited information is available on the ability of water sprays and mists to mitigate thermal radiation. Such a situation may occur when there is a fire in a compartment adjacent to a weapons magazine. This technical note describes a technique for assessing the attenuating effects of water sprays and mists on thermal radiation in such a situation. The method applies Mie theory and an analytical technique to calculate the transmissivity of water sprays. Results show that, for a given water droplet mass loading, smaller water droplets have a much higher attenuating effect than larger droplets. The water droplet radiation attenuation model was also embedded into a combustion and heat transfer code developed previously for ordnance heat transfer studies. Quantitative results for a worst-case scenario on the ANZAC air weapons magazine are presented and indicate the reduction in radiative heat transfer to ordnance cylinders for various water droplet sizes and mass loadings. Convective heat transfer is not considered in this study and it is suggested that follow-on work be performed to assess this contribution to the heat transfer to ordnance.
Author
Radiative Heat Transfer; Attenuation; Thermal Radiation

20030075644
Final Report for 'Numerical Methods and Studies of High-Speed Reactive and Non-Reactive Flows'
Schwendeman, D. W.; Feb. 10, 2003; In English
Report No.(s): DE2003-15003390; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available
NTIS
Numerical Analysis; High Speed; Flow Equations

20030075808 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Oscillatory Dynamics of Single Bubbles and Agglomeration in a Sound Field in Microgravity
Marston, Philip L.; Trinh, Eugene H.; Depew, Jon; Asaki, Thomas J.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 673-690; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

A dual-frequency acoustic levitator containing water was developed for studying bubble and drop dynamics in low gravity. It was flown on USML-1 where it was used in the Glovebox facility. High frequency (21 or 63 kHz) ultrasonic waves were modulated by low frequencies to excite shape oscillations on bubbles and oil drops ultrasonically trapped in the water. Bubble diameters were typically close to 1 cm or larger. When such large bubbles are acoustically trapped on the Earth, the acoustic radiation pressure needed to overcome buoyancy tends to shift the natural frequency for quadrupole (n = 2) oscillations above the prediction of Lamb's equation. In low gravity, a much weaker trapping force was used and measurements of n = 2 and 3 mode frequencies were closer to the ideal case. Other video observations in low gravity include: (i) the transient reappearance of a bulge where a small bubble has coalesced with a large one, (ii) observations of the dynamics of bubbles coated by oil indicating that shape oscillations can shift a coated bubble away from the oil-water interface of the coating giving a centering of the core, and (iii) the agglomeration of bubbles induced by the sound field.
Author
Oscillations; Fluid Dynamics; Bubbles; Agglomeration; Sound Fields; Microgravity

20030075809 NASA Lewis Research Center, Cleveland, OH, USA
Interface Configuration Experiment: Preliminary Results
Concus, Paul; Finn, Robert; Weislogel, Mark; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 525-539; In English; See also 20030075796
Contract(s)/Grant(s): DE-AC03-76SF-00098; NAG3-1143; NSF DMS-89-02831; No Copyright; Avail: CASI; A03, Hardcopy

The Interface Configuration Experiment (ICE) was carried out on USML-1 to investigate liquid-gas interfaces in certain rotationally-symmetric containers having prescribed, mathematically derived shapes. These containers have the property that they admit an entire continuum of distinct equilibrium rotationally-symmetric interfaces for a given liquid volume and contact angle. Furthermore, it can be shown that none of these interfaces can be stable. It was found, after the containers were filled in orbit, that an initial equilibrium interface from the symmetric continuum re-oriented, when perturbed, to a stable interface that was not rotationally symmetric, in accordance with the mathematical theory.
Author
Liquid-Vapor Interfaces; Interface Stability; Spaceborne Experiments; Gravitational Effects; Fluid Flow

20030075816 NASA Lewis Research Center, Cleveland, OH, USA
Oscillatory Thermocapillary Flow Experiment (OTFE)
Kamotani, Y.; Ostrach, S.; Pline, A.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 701-715; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

An experiment was performed on oscillatory thermocapillary flow in the Glovebox aboard the USML-1 Spacelab which was launched in July, 1992. Cylindrical containers of 1 and 3 em in diameter were used. Silicone oils of 2 and 5 cSt viscosity were the test fluids. The fluid was heated by a cylindrical heater placed along the centerline of the container. The diameter of the heater was 10% of the container diameter. The fluid motion was studied by flow visualization. Although oscillations were observed briefly, bubbles generated in the fluid during the experiment disturbed the flow substantially so that the critical temperature differences could not be determined.
Author
Thermocapillary Migration; Cylindrical Bodies; Flow Visualization; Critical Temperature

20030075817 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
ESA Activities on Microgravity and Microdynamics
Stark, H. R.; Stavrinidis, C.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 733-760; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The utilization of the low gravity environment of Earth orbiting spacecraft provides new opportunities for experiment performance and applications in the field of fluid physics, material, life and biological sciences. However, the environment is

not quiescent onboard of Earth orbiting spacecraft as well as scientific satellites with very high pointing stability requirements. It is affected by various acceleration sources and constituents that arise under typical orbital and operational conditions. Microvibrations affect microgravity experiments during their performance in space and they affect the line-of-sight stability of instruments. Such effects need to be taken into account during the spacecraff development, mission planning and operation, and post mission analysis. The paper provides an overview on the ESA microgravity and microdynamics activities in the field and applications of ongoing projects and programs. A review is given on microgravity payload sensitivities, disturbance sources, micropointing stability requirements of satellites and scientific experiments. Microdynamics control approaches, plans and philosophies are presented which are employed in various project and programs. Supporting technology tasks are presented which are performed in the framework of ESA R&D activities which shall provide the scientific projects and programs with adequate solutions.
Author
Microgravity; Gravitational Effects; Earth Orbits; Life Sciences; Fluid Dynamics

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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*.

20030069020 NASA Marshall Space Flight Center, Huntsville, AL, USA
Recent Advances in Video Meteor Photometry
Swift, Wesley R.; Suggs, Robert M.; Meachem, Terry; Cooke, William J.; August 1, 20003; 1 pp.; In English; 2003 Leonid MAC Conference, 27-30 Aug. 2003, Moffett Field, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

One of the most common (and obvious) problems with video meteor data involves the saturation of the output signal produced by bright meteors, resulting in the elimination of such meteors from photometric determinations. It is important to realize that a 'bright' meteor recorded by intensified meteor camera is not what would be considered 'bright' by a visual observer - indeed, many Generation II or III camera systems are saturated by meteors with a visual magnitude of 3, barely even noticeable to the untrained eye. As the relatively small fields of view (approx.30) of the camera systems captures at best modest numbers of meteors, even during storm peaks, the loss of meteors brighter than +3 renders the determination of shower population indices from video observations even more difficult. Considerable effort has been devoted by the authors to the study of the meteor camera systems employed during the Marshall Space Flight Center s Leonid ground-based campaigns, and a calibration scheme has been devised which can extend the useful dynamic range of such systems by approximately 4 magnitudes. The calibration setup involves only simple equipment, available to amateur and professional, and it is hoped that use of this technique will make for better meteor photometry, and move video meteor analysis beyond the realm of simple counts.
Author
Photometry; Video Data; Meteoroids

20030069037 NASA Marshall Space Flight Center, Huntsville, AL, USA
Detection of Upward Air Showers with the EUSO Experiments
Takahashi, Y.; Hillman, L.; Zuccaro, Al; Adams, J.; Cline, D.; 2003; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: Other Sources; Abstract Only

Upward-going showers in the atmosphere can be detected by an orbiting satellite with appropriate instrumentation. If the method only uses directional Cherenkov radiation, it is difficult to discriminate the red shower events from the background noises of very short pulse. A spectroscopic polychromatic optical design can intentionally blur the focusing of photons at shorter wavelengths (300 - 330 nm), spreading the image size to 2 x 2 or 3 x 3 pixels. False triggers due to random chance coincidence of noises can be drastically reduced with a spectroscopic polychromatic, refractive telescope.
Author
Satellite-Borne Instruments; Cosmic Ray Showers; Cerenkov Radiation; Spectroscopic Telescopes

20030069053 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Light of the Night Sky in EUSO: Duty Cycle and Background
Adams, J.; Berat, C.; Lebrun, D.; Montanet, F.; [2003]; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: CASI; A01, Hardcopy

The EUSO detector, which will be installed on the International Space Station, will detect the light produced by the EAS generated by the UHECR when entering the Earth's atmosphere. The EUSO telescope will operate only during dark night. The light background in the EUSO detector is of outmost importance. To determine the detector duty cycle, it is necessary to know the periods in which it will be in the obscurity, taking into account both sun and moon precise ephemerides and the ISS trajectory. For signal to background determination and trigger efficiency study, the photon background has to be evaluated, taking into account the various UV light sources at night: natural sources as airglow, stars and diffuse light of the night sky, and artificial sources.
Author
Night Sky; Light (Visible Radiation); Nightglow; Ultraviolet Radiation; Ultraviolet Detectors

20030071090
Investigation of Radiation Resistant Polymer Photodetectors for Space Applications
Taylor, Edward W.; Sep. 11, 2002; 73 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F29601-01-C-0261; Proj-4846
Report No.(s): AD-A414925; AFRL-VS-TR-2002-1105; No Copyright; Avail: CASI; A04, Hardcopy

Polymeric materials will play apivitol role in advancing next-generation ultra-miniature high bandwidth cost effective photonic optoelectronic and electrooptic systems for space applications. Polymer photodetectors (PPDs) may play a pivitol role for rapid development of robust efficient and radiation resistant space sensor systems. Several photovoltaic detector types composed of Ruthenium Complex and of poly (pohenylene vinylene)-sulfonated polystyrene were fabricated using electrostatic self-assembly processing. ThePPDs were characterized and studied for their resistance to gamma-ray-ionizing radiation. A comparison of the pre- and post- irradiation responses of the two classes of PPDs resulted in ionization-induced changes to quantum efficiencies response times material conductivities output photovoltages short circuit currents and short circuit voltages. The data and results of the preliminary investigation strongly indicated that the use of molecular self-assembly processing can be used to develop space-radiation resistant PPDs with improved quantum efficiencies at near-IR wavelengths.
DTIC
Photometers; Radiation Tolerance

20030071122 Army Environmental Center, Aberdeen Proving Ground, MD
Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 37, Site Location: Aberdeen Proving Ground
Overbay, Larry; May 2003; 73 pp.; In English
Contract(s)/Grant(s): Proj-8-CO-160-UXO-021
Report No.(s): AD-A414976; ATC-8642; No Copyright; Avail: CASI; A04, Hardcopy

This firing record documents the efforts of Zonge Engineering utilizing the APG Standardized UXO Technology Demonstration Site Blind Grid. The firing record was coordinated by Larry Overbay and was coordinated by the Standardized UXO technology Demonstration Site Program Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center. The objective in the standardized UXO Technology Demonstration Site Program is to evaluate the detection and discrimination capabilities of a given technology under various field and soil conditions. Inert munitions and clutter items are positioned in various orientations and depths in the ground. Data is being developed for the scoring committee through demonstration activities at the standardized test sites to assess the following performance matrices: a. Detection and discrimination under realistic scenarios that vary targets, geology, clutter, topography, and vegetation. b. Cost, time and manpower requirements. c. Ability to analyze survey data in a timely manner and provide prioritized 'Target Lists' with associated confidence levels. d. Collection of high quality, ground-truth, geo-referenced data for post-demonstration analysis.
DTIC
Ground Truth; Geology

20030071124 Army War Coll., Carlisle Barracks, PA
Battlefield Radars in the 21st Century Army
Barber, Jesse L.; Apr. 7, 2003; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414979; No Copyright; Avail: CASI; A03, Hardcopy

Technological advances in the computing power of microprocessors will allow weapons locating and air defense radar capabilities to be integrated into a single platform. This innovation will have a synergistic effect by allowing the commander the ability to easily network air defense and weapons locating sensors into the intelligence sensor grid, and concurrently reduce the logistics footprint. The purpose of this research project is to examine the feasibility of developing a radar network architecture on a future battlefield that would reduce the force structure, lower acquisition cost, and improve logistics. In determining the feasibility of developing a cost effective networked radar architecture, material developers must take four factors into consideration: system requirements for the radar, application of network centric warfare, formulation of an integrated intelligence sensor grid, and the tactical employment of the radars within the battle space.
DTIC
Air Defense; Radar Networks; Warfare

20030071225 Air Force Inst. of Tech., Wright-Patterson AFB, OH, USA
Classification of Radar Targets Using Invariant Features
Meyer, Gregory J.; Apr. 11, 2003; 104 pp.; In English
Report No.(s): AD-A415121; AFIT/DS/ENG/03-04; No Copyright; Avail: CASI; A06, Hardcopy

Automatic target recognition (ATR) using radar commonly relies on modeling a target as a collection of point scattering centers, Features extracted from these scattering centers for input to a target classifier may be constructed that are invariant to translation and rotation, i.e., they are independent of the position and aspect angle of the target in the radar scene. Here an iterative approach for building effective scattering center models is developed, and the shape space of these models is investigated. Experimental results are obtained for three-dimensional scattering centers compressed to nineteen-dimensional feature sets, each consisting of the singular values of the matrix of scattering center locations augmented with the singular values of its second and third order monomial expansions. These feature sets are invariant to translation and rotation and permit%it the comparison of targets modeled by different numbers of scattering centers. A metric distance metric is used that effectively identifies targets under 'real world' conditions that include noise and obscuration.
DTIC
Target Recognition; Invariance; Radar Targets

20030071269 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
ISO Guest Observer Data Analysis and LWS Instrument Team Activities
Oliversen, Ronald J., Technical Monitor; Smith, Howard A.; September 2003; 5 pp.; In English
Contract(s)/Grant(s): NAG5-7394; No Copyright; Avail: Other Sources; Abstract Only

We have designed and fabricated infrared filters for use at wavelengths greater than or equal to 15 microns. Unlike conventional dielectric filters used at the short wavelengths, ours are made from stacked metal grids, spaced at a very small fraction of the performance wavelengths. The individual lattice layers are gold, the spacers are polyimide, and they are assembled using integrated circuit processing techniques; they resemble some metallic photonic band-gap structures. We simulate the filter performance accurately, including the coupling of the propagating, near-field electromagnetic modes, using computer aided design codes. We find no anomalous absorption. The geometrical parameters of the grids are easily altered in practice, allowing for the production of tuned filters with predictable useful transmission characteristics. Although developed for astronomical instrumentation, the filters are broadly applicable in systems across infrared and terahertz bands.
Author
Fabrication; Infrared Filters; Computerized Simulation; Infrared Instruments; Wavelengths; Data Processing

20030071658 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Calibration of the Oscillating Screen Viscometer
Berg, Robert F.; Moldover, Michael R.; December 07, 1993; 33 pp.; In English
Report No.(s): Document-60009-DOC-006; No Copyright; Avail: CASI; A03, Hardcopy

We have devised a calibration procedure for the oscillating screen viscometer which can provide the accuracy needed for the flight measurement of viscosity near the liquid-vapor critical point of xenon. The procedure, which makes use of the viscometer's wide bandwidth and hydrodynamic similarity, allows the viscometer to be self-calibrating. To demonstrate the validity of this procedure we measured the oscillator's transfer function under a wide variety of conditions. We obtained data using CO2 at temperatures spanning a temperature range of 35 K and densities varying by a factor of 165, thereby encountering viscosity variations as great as 50%. In contrast the flight experiment will be performed over a temperature range of 29 K and at only a single density, and the viscosity is expected to change by less than 40%. The measurements show that,

after excluding data above 10 Hz (where frequency-dependent corrections are poorly modeled) and making a plausible adjustment to the viscosity value used at high density, the viscometer's behavior is fully consistent with the use of hydrodynamic similarity for calibration. Achieving this agreement required understanding a 1% anelastic effect present in the oscillator's torsion fiber.
Author
Calibrating; Viscometers; Transfer Functions; Carbon Dioxide

20030071686 National Inst. of Standards and Technology, USA
Effect of Bulk Viscosity on the Oscillating Screen Viscometer
Berg, Robert F.; Moldover, Michael R.; December 07, 1993; 5 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
Close to the critical temperature, the bulk viscosity of the xenon sample will exceed the shear viscosity by more than a factor of a billion. Nevertheless, the viscometer's low operating frequency ensures that the only significant force on the oscillating screen will be due to the shear viscosity.
Author
Viscometers; Gas Viscosity; Xenon

20030071687 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Nonhydrodynamic Characteristics of the Oscillating Screen Viscometer
Berg, Robert F.; Moldover, Michael R.; December 07, 1993; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
Extraction of the viscosity from the oscillating screen's response function requires knowledge of it resonance frequency omega(sub 0) and of the prefactor k(sub tr)/k(theta), where k(sub tr) is a transducer coefficient and k(sub theta) is the torsion spring constant. The determination of these parameters is described. The effect of a possible anomaly in the dielectric constant near the critical point of xenon will be negligible.
Author
Viscometers; Oscillations

20030071690 Defence Science and Technology Organisation, Fishermans Bend, Australia
An Experimental Facility for Imaging of Medium Scale Underwater Explosions
Brett, John M.; Buckland, Michael; Turner, Terry; Killoh, Charles G.; Kiernan, Peter; May 2003; 29 pp.; In English
Report No.(s): DSTO-TR-1432; DODA-AR-012-767; Copyright; Avail: Other Sources
Assessing the lethality of underwater weapons and the vulnerability of warships to their effects is of vital importance to the maintenance of a naval warfighting capability. These assessments must be based on a sound knowledge of underwater explosive (UNDEX) effects and the fluid-structure interaction associated with target response. DSTO has conducted research in this field, employing a variety of instrumentation such as pressure gauges, velocity meters, accelerometers and strain gauges. Much has been learnt from these studies but there can be no substitute for the powerful insight into UNDEX phenomena afforded by direct optical imaging. Accordingly, DSTO has developed a new experimental capability for the optical study of underwater explosions at the PSL Underwater Explosion Test Facility, Melbourne, Victoria. Successful imaging of underwater explosions, particularly at medium scale in a field environment, is technically challenging. A number of difficulties must be overcome, including the protection of containment structures and equipment from high shock loading, attainment of high water clarity, high speed imaging with low light levels and experimental operation at significant water depth. The techniques used to successfully meet these challenges are described in this report. The potential of this new capability is demonstrated by imaging and analysis of the underwater explosive bubble generated by the detonation of a 0.5 kg explosive charge of Composition B. This facility will be applied to meet a number of defence goals. It has already been employed to assess the underwater efficiency of a novel explosive mix of interest to the Australian Defence Force and further studies of this type are likely. Studies of target response to UNDEX effects are in progress with the key objectives of expanding our understanding of the phenomena of explosively driven fluid-structure interaction and providing experimental data for validation of predictive computer codes. The experimental capability that Australia now possesses will permit it to make a valuable contribution to important new TTCP (The Technical Cooperation Program) activities in this area.
Author
Underwater Explosions; Imaging Techniques

20030073494 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Characterization of a Thermal Infrared Line Scanner Through Its Spatial and Radiometric Resolutions

Derenne, Mauricio; 2003; 131 pp.; In Portuguese; CD-ROM contains full text document in PDF format and color illustrations. PDF also has many blank pages.

Report No.(s): INPE-9695-TDI/855; Copyright; Avail: CASI; C01, CD-ROM; A07, Hardcopy

The thermal infrared spectral bands in airborne sensors are still little explored in Brazil. The Institute of Advanced Studies (IEAv) at the Aerospace Technical Center (CTA) developed the Thermal Infrared Imaging System (SISIMI), an aerial surveillance prototype sensor operating in the 8 to 12.5 micron band with a rotating imaging scanner of 720 lines/s. The objective of this dissertation is to characterize the SISIMI through its spatial and radiometric resolutions. The Effective Instantaneous Field of View (EIFOV) was calculated with the Modulation Transfer Function (MTF), while the radiometric resolution was determined with the estimate of the Noise Equivalent Temperature Difference (NETD). The experiments were conducted at INPE's Optical Sensors Laboratory and in the field with image acquisition flights. For the MTF determination in the laboratory, a collimator with slits was used to simulate the inpulse function and to obtain the output Point Spread Function (PSF). The PSF Fourier Transform determined the sensor MTF. In the NETD estimate, the SISIMI was placed at a bench to image three contiguous recipients with clean water, thus simulating a black body. The peak-to-peak signal tension was measured by the application of a temperature difference between the target (central recipient) and the background (side recipients) and the 'rms' noise tension was measured after the sealing of the optical aperture of the sensor,. The field MTF curve was obtained through the impulse function simulation in an airplane pass, when polished aluminum stripes were placed over a thick black plastic sheet, and the emissivity properties were also investigated. To obtain the NETD in the field, the plastic canvas became the target and the airfield concrete parking lot was the constant background. Based on the results found at three levels (theoretical, laboratory and field) an analysis of the consistency of the values obtained was made and the resolutions of the SISIMI prototype were determined: EIFOV = 12.6 +/- 0.4 mrad, NETD = 1.2 +/- 0.2 K. These values indicate limitations in the imager but are compatible with a prototype from the 80's. Modifications are proposed in the sensor to improve the performance and quality of the images, such as an alignment of the optical system, reinforcement of the metallic shield of the prism's motor and in the cabling that conducts the electric signals. The use of the SISIMI is suggested in military applications as well as in environmental research.

Author

Infrared Scanners; Infrared Imagery; Remote Sensors; Aerial Reconnaissance

20030073601 Muenster Univ., Germany

TOF-SIMS - A Powerful Tool for the Analysis of Stardust

Stephan, T.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 71; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Introduction: During the last two and a half decades, the analysis of small samples has become more and more important in cosmochemistry. With the collection of interplanetary dust particles (IDPs) and the isolation of presolar grains from primitive meteorites, the necessity for new techniques with high sensitivity and high lateral resolution has increased. For many years now, secondary ion mass spectrometry (SIMS) has played an important role in the analysis of such samples. Two major trends in the development of new SIMS instruments emerged during the last years, NanoSIMS and time-of-flight - SIMS (TOF-SIMS). Both will be instrumental in the analysis of samples from the Stardust mission.

Derived from text

Cosmochemistry; Interplanetary Dust; Secondary Ion Mass Spectrometry

20030075646

Actinic Mask Inspection at the ALS Initial Design Review

Barty, A.; Chapman, H.; Sweeney, D.; Levesque, R.; Ayers, J.; Apr. 03, 2003; 46 pp.; In English

Report No.(s): DE2003-15003862; UCRL-CR-152460; No Copyright; Avail: Department of Energy Information Bridge

The goal of this project is to design an actinic mask inspection tool capable of operating in two modes: high-speed scanning for the detection of multilayer defects (inspection mode), and a high-resolution aerial image mode in which the image emulates the imaging illumination conditions of a stepper system (aerial image or AIM mode). The purpose and objective of these two modes is as follows: defect inspection mode and aerial image microscope (AIM) mode.

NTIS

Masks; Inspection; Extreme Ultraviolet Radiation; Microscopes

20030075799 Alabama Univ., Huntsville, AL, USA

Passive Accelerometer System: Measurements on STS-50 (USML-1)

Alexander, J. Iwan D.; Rogers, Melissa J. B.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 569-581; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The passive accelerometer system (PAS) is a simple moving ball accelerometer capable of measuring the small magnitude steady relative acceleration that occurs in a low Earth orbit spacecraft due to atmospheric drag and the Earth's gravity gradient. The accelerometer can be used when the spacecraft continuously rotates during the orbit such that some line of reference in the craft always points along the vector connecting the Earth's mass center with the spacecraft mass center. PAS was used successfully on the first USA Microgravity Laboratory (USML-1).

Author

Accelerometers; Microgravity; Gravitational Effects; Acceleration Measurement

20030075820

NASA Ultra-Sensitive Miniature Accelerometer

Zavracky, Paul M.; Hartley, Frank T.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravim Measurement Group, Volume 2; May 1994, pp. 813-825; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

Using micro-machined silicon technology, an ultra-sensitive miniature acce.,rometer can be constructed which meets the requirements for microgravity experiments in the space environment.Such an accelerometer will have a full scale sensitivity of 1C2 g a resolution of lC8 g, low cross axis sensitivity, and low temperature sensitivity. Mass of the device is approximately five grams and its footprint is 2 cm x 2 cm. Innovative features of the accelerometer, which are patented, are: electrostatic caging to withstand handling shock up to 150 g, in-situ calibration, in situ performance characterization, and both static and dynamic compensation. The transducer operates on a force balance principle wherein the displacement of the proof mass is monitored by measuring tunneling electron current flow between a conductive tip, and a fixed platen. The four major parts of the accelerometer are tip die, incorporating the tunneling tip and four field plates for controlling pitch and roll of the proof mass; two proof mass dies, attached to the surrounding frame by sets of four leg' springs; and a force plate die. The four parts are fuse-bonded into a complete assembly. External electrical connections are made at bond pads on the front surface of the force plate die. Materials and processes used in the construction of the transducer are compatible with volume production.

Author

Accelerometers; Microgravity

20030080013 Tokyo Univ., Sagamihara, Japan

Velocity Distributions of Fragments in Oblique Impact Cratering on Gypsum

Onose, N.; Fujiwara, A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; See also 20030079993; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

In order to understand the behavior of the impact-induced fragments on the small s=asteroid, oblique impact cratering experiments were produced using gypsum targets, which were used as one of porous and low density materials. The fragment size and velocity were measured for fragments larger than 1 mm in diameter, and slower than 200 m/sec. A high speed CCD video camera was used to see the fragments in flight, and secondary collisions with a window of the target chamber were also employed to measure fragment velocity. Especially, we focused to measure the behaviors of very low velocity fragments, which have special meaning for the ejecta on very small asteroids.

Derived from text

Velocity Distribution; Asteroids; Targets; Gypsum; High Speed Cameras; Cratering

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*.

20030077823 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Enhanced Mass Removal due to Phase Explosion during High Irradiance Nanosecond Laser Ablation of Silicon
Yoo, J. H.; May 2000; 148 pp.; In English
Report No.(s): DE2003-764401; LBNL-46174; No Copyright; Avail: Department of Energy Information Bridge

The morphology of craters resulting from high irradiance laser ablation of silicon was measured using a white light interferometry microscope. The craters show a dramatic increase in their depth and volume at a certain irradiance, indicating a change in the primary mechanism for mass removal. Laser shadowgraph imaging was used to characterize and differentiate the mass ejection processes for laser irradiances above and below the threshold value. Time-resolved images show distinct features of the mass ejected at irradiances above the threshold value including the presence of micron-sized particulates; this begins at approximately 300(approx) 400 ns after the start of laser heating.
NTIS
Superconductors (Materials); Ablation; Lasers

20030077850 Naval Research Lab., Washington, DC
High-Performance Photonic Analog-to-Digital Converter and Low-Noise Mode-Locked Fiber Lasers
Currie, Marc; May 26, 2003; 86 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415094; NRL/MR/5650--03-8679; No Copyright; Avail: CASI; A05, Hardcopy

This project demonstrates three photonic analog-digital converters (ADCs) for high-speed, real-time digitization of microwave signals. The methods consist of a highly parallel photonic ADC, a time-division multiplexed system based on electro-optical Sagnac interferometry, and an alloptical quantizer based upon distributed phase modulation. The core of many photonic ADC designs relies upon a low-noise, actively modelocked fiber laser that has been developed at NRL. Photonic sampling of microwave signals is investigated especially concerning development of a low-noise optical clock. Optimization and system post-processing is simulated and compared with experimental data. Finally, the low-noise optical clock was used in a four-way collaborative research effort where NRL excited and characterized high-speed, high-current photoconductive switches.
DTIC
Analog To Digital Converters; Laser Mode Locking

37
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*.

20030071631 Texas Univ., El Paso, TX, USA
Tool Forces Developed During Friction Stir Welding
Melendez, M.; Tang, W.; Schmidt, C.; McClure, J. C.; Nunes, A. C.; Murr, L. E.; [2003]; 34 pp.; In English; Original document is missing pages and contains black and white illustrations
Contract(s)/Grant(s): NCC8-137; No Copyright; Avail: CASI; A03, Hardcopy

This paper will describe a technique for measuring the various forces and the torque that exist on the Friction Stir Welding pin tool. Results for various plunge depths, weld speeds, rotational speed, and tool configurations will be presented. Welds made on 6061 aluminum with typical welding conditions require a downward force of 2800 lbs. (12.5 kN) a longitudinal force in the direction of motion of 300 lbs (1.33 kN), a transverse force in the omega x v direction of 30 lbs (135 N). Aluminum 2195 under typical weld conditions requires a downward force of 3100 lbs. (1.38 kN), a longitudinal force of 920 lbs. (4.1 kN), and a transverse force of 45 lbs. (200 N) in the omega x v direction.
Author
Friction Stir Welding; Pins; Force; Torque

20030075681 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Vibration Isolation Systems and Antenna-Transducers Coupling for the Prototype of the Gravitational Wave Detector
Melo, Jose Luiz; 2003; 200 pp.; In Portuguese; CD-ROM contains full text document in PDF format and color illustrations. PDF also has blank pages.
Report No.(s): INPE-9693-TDI/854; Copyright; Avail: CASI; C01, CD-ROM; A09, Hardcopy

The GRAVITON group is building the first Brazilian gravitational wave detector prototype. This detector, which will be named MARIO SCHENBERG, will be composed by a 65 cm diameter CuAl(6%) resonant spherical mass. This mass will weigh 1.15 ton and will have a high mechanical Q (approx. 20 million). This detector will be sensitive from 3100 Hz to 3300 Hz. In this work, the vibration isolation system, the thermal link and the transducer mechanical structure were conceived and numerical analyzed. To the numerical analyses the conceived systems were represented by finite element models and the corresponding dynamical equations were solved using the Msc/Nastran software. This software was validated using measurements of the normal modes made at room temperature for an Al5056 25cm diameter resonant mass. The validation results showed a 4,26% maximum difference between the normal modes measurements and calculations. The methodology used consists basically on evaluate all the structure elements separately and after that integrate them in such a manner to obey a mechanical behaviour optimization. In the case of the vibration isolation system the optimization consists to increase the window free of resonances around the detector characteristics frequencies. With this procedure we obtained a window free of resonances from 2625 Hz to 3768 Hz, with a 280 dB attenuation (Melo, Velloso & Aguiar, 2001). An analogous methodology was used to design the thermal link, which will be used to cool down all the structure to milikelvins. A prototype of this thermal link was constructed and tested using a cryogenic test facility in the AURIGA laboratories in the National Institute for Nuclear Research (INFN) at Padova (Italia). We obtained a 30 dB attenuation to this prototype. It was also made a study about the sphere transducer coupling. In this case, the analysis was made in a way to sintonize the sphere and the transducers. The transducer frequency obtained was at 3190 Hz (Frajuca, Melo et al.; 2001). At last, it was made the integration of the several systems analysed: vibration isolation system, thermal link and the coupling transducer-resonant mass in order to study the overall system behavior and the noise influence over it. It continued to occur the 280 dB attenuation.
Author
Gravitational Waves; Vibration Isolators; Transducers; Antennas; Coupling; Detectors

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*.

20030068956 Texas Univ., Austin, TX, USA
Evaluation and Rehabilitation of Historic Metal Truss Bridges: A Case Study of an Off-System Historic Metal Truss Bridge in Shackelford County, Texas
Manier, D. R.; Engelhardt, M. D.; Leary, D. E.; Mar. 2003; 256 pp.; In English
Report No.(s): PB2003-106081; No Copyright; Avail: CASI; A12, Hardcopy

This report documents the results of a case study of an off-system historic metal truss bridge in Texas. Off-system bridges are not on the state highway system and are typically located on country roads or city streets. There are a large number of older off-system metal truss bridges still in vehicular service in Texas, many of which are of significant historical interest due to their age and other unique features. The primary objective of the study reported herein was to address structural issues involved with historic off-system metal truss bridges. More specifically, the objective was to examine methods that can be used to develop an accurate and realistic load rating for an old metal truss bridge, and methods that can be used to strengthen a bridge if needed. The case study bridge is located in Shackelford County, Texas on County Road 188 near Fort Griffin, crosses the North Fork of the Brazos River and was originally constructed in 1885. The study of the Shackelford County Bridge was divided into five major tasks: (1) collection of data on the bridge; (2) evaluation of materials; (3) structural analysis and load rating; (4) field load testing; and (5) development of rehabilitation options. Each of these tasks is described in detail in this report.
NTIS
Texas; Trusses; Metals; Structural Analysis; Bridges (Structures)

20030068990 NASA Marshall Space Flight Center, Huntsville, AL, USA

Performance Testing of Thermal Interface Filler Materials in a Bolted Aluminum Interface Under Thermal/Vacuum Conditions

Glasgow, Shaun; Kittredge, Ken; [2003]; 11 pp.; In English; Thermal and Fluids Analysis Workshop 2003, 18-22 Aug. 2003, Hampton, VA, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

A thermal interface material is one of the many tools that are often used as part of the thermal control scheme for space-based applications. These materials are placed between, for example, an avionics box and a cold plate, in order to improve the conduction heat transfer so that proper temperatures can be maintained. Historically at Marshall Space Flight Center, CHO-THERM@ 1671 has primarily been used for applications where an interface material was deemed necessary. However, there have been numerous alternatives come on the market in recent years. It was decided that a number of these materials should be tested against each other to see if there were better performing alternatives. The tests were done strictly to compare the thermal performance of the materials relative to each other under repeatable conditions and they do not take into consideration other design issues such as off-gassing, electrical conduction or isolation, etc. This paper details the materials tested, test apparatus, procedures, and results of these tests.

Author

Aluminum; Fillers; Temperature Control; Materials Tests

20030069035 Texas Univ., Austin, TX, USA

UTrAp: Finite-Element-Based Software for the Analysis of Curved Trapezoidal Girders under Construction Loads

Topkaya, C.; Yura, J. A.; Williamson, E. B.; Frank, K. H.; Oct. 2002; 52 pp.; In English

Report No.(s): PB2003-106082; No Copyright; Avail: CASI; A04, Hardcopy

Due to advances in fabrication technology, the use of steel trapezoidal box girders for curved interchange structures has become popular. The rapid erection, long span capability, economics, and aesthetics of these girders make them more favorable than other structural systems. The response of composite box girders with live loading, as well as the behavior of quasi-closed box girders during construction, must be considered during the design process. Considering both cases, the design for construction loading is the least understood and is the most important. Stresses due to construction loading can reach up to 60-70 percent of the total design stress for a given cross section. In this report, the authors document the development and usage of the software package UTrAp. This program allows for the analysis of curved girder bridge systems in a more rigorous manner than traditional grid analysis approaches. UTrAp utilizes a finite element methodology to determine stresses and strains throughout the cross-section of a bridge girder. In addition, internal and external brace members are modeled explicitly so that no assumptions are required (e.g., equivalent plate method) for determining member forces. Unlike currently available software, UTrAp has the capability of modeling the effects of semi-cured concrete. The developed software has been designed to be computationally efficient and easy to use for bridge designers. A graphical user interface (GUI) has been developed along with the finite element analysis routines to aid in entering data and visualizing analysis results. A comparison to measured field data shows that UTrAp provides an accurate characterization of girder response under construction loads.

NTIS

Finite Element Method; Applications Programs (Computers); Computer Programming; Loads (Forces)

20030071062 Technische Univ., Delft

Investigation of the Lead-Lag Instability of the Micon 1500/600 Wind Turbine

Pavel, M. D.; Nov. 1999; 41 pp.

Report No.(s): PB2003-104834; M-878; ST-LR-1006; No Copyright; Avail: CASI; A03, Hardcopy

This report represents the Micon 1500/600 lead-lag instability. This instability was met during high wind speed runs when the blades were operating in the stall region and it was described as ‘divergent lead-lag vibration wherein the flap and also the tower degrees of freedom were also participating in’ (Aerpac manufacturer). The coupled flap-lag equations of motion are first developed presuming rigid blades and only axial wind at the rotor hub. Three cases are investigated: (1) The flapping and lagging motion of the blade is modeled through rigid blades with hinge offsets and spring restraints; (2) The equations of motion are extended and the blade flexibility is introduced in the model in the form of a flap-lag structural parameter R; (3) A stall model is introduced in the coupled flap-lag equations of motion which contain the flap-lag structural coupling parameter R. The variation with pitch angle of the coupled flapping and lagging eigenvalues are represented in the complex plane, at different wind velocities.

NTIS

Wind Turbines; Stability

20030071093

Condition Assessment of William Beaumont General Hospital Historic Buildings at Fort Bliss, Texas. Appendix A: Building Condition Matrix

Napier, Thomas R.; McCarthy, Sheila A.; Sep. 2002; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): MIPR-2042-96

Report No.(s): AD-A414939; ERDC/CERL-TR-02-26-APP-A; No Copyright; Avail: CASI; A03, Hardcopy

The facilities and landscape features in the William Beaumont Hospital Historic District at Fort Bliss, Texas, are eligible for inclusion in the National Register of Historic Places. Therefore, redevelopment of this area must preserve its character and history. The Fort Bliss Directorate of Environment has developed an Environmental Assessment for the District. A Memorandum of Agreement developed between Fort Bliss and the Texas State Historic Preservation Officer includes a requirement to develop a rehabilitation and reuse plan for selected buildings. Among other things, this plan must include a condition assessment and a structure rehabilitation plan. The objective of this project was to assess the present condition of the Bandstand, Chapel, Theater, Gymnasium, three barracks, a Bachelor Officers Quarters, and a Conference Center in the District. Researchers conducted onsite inspections of all major building elements in all locations within the buildings. Photographs are included to illustrate the condition of selected building elements. Appendix A provides an 'at-a-glance' display of each building's condition, described by major system and components.

DTIC

Hospitals; Buildings

20030071688 National Inst. of Standards and Technology, Gaithersburg, MD, USA

The Shuttle's Vibration Environment is Compatible with the Oscillating Screen Viscometer

Berg, Robert F.; Moldover, Michael R.; December 07, 1993; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The oscillating screen viscometer is designed for useful operation in the vibration environment of the Space Shuttle. The following analysis compares recently analyzed on-orbit vibration data against the viscometer's measured vibration sensitivity. During routine crew activities the effect of the resulting vibration on the precision of the viscosity measurement will be tolerable. However, there is a possible problem if the astronauts use unisolated exercise equipment for extended periods of time.

Author

Astronauts; Physical Exercise; Space Shuttles; Structural Vibration; Vibration Effects; Viscometers

20030073447 California Univ., Los Angeles, CA, USA

Damage Tolerance and Durability of Selectively Stitched, Stiffened Panels

Hahn, H. T.; Yang, J. M.; Suh, S.; Yi, T.; Wu, G.; Jun. 2003; In English

Report No.(s): PB2003-106630; No Copyright; Avail: National Technical Information Service (NTIS)

The goal of this project was to investigate the effectiveness of selective stitching on the damage tolerance and durability of a stiffened structural element applicable to air transportation systems. Specifically, this report compares the experimental results of selectively stitched, fully stitched, and unstitched, stiffened panels. Fundamental questions concerning the effect of low-velocity impact on strength and constant-amplitude fatigue are addressed. The specific areas addressed are as follows: effect of selective stitching on the manufacture of a stiffened panel; effect of selective stitching on static compression properties of a stiffened panel; effect of selective stitching on constant-amplitude fatigue properties of a stiffened panel, and effect of selective stitching on flange and stiffener impact of a stiffened panel. A primary concern with using composite laminates is the weakness in the out-of-plane direction. A cost-effective, out-of-plane reinforcement method may be selective stitching. However, the effect of selective stitching on the manufacture and performance of a stiffened panel is uncertain. Through this investigation, the effects of selective stitching on compressive strength, manufacture, and fatigue strength are determined.

NTIS

Composite Structures; Aircraft Construction Materials

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*.

20030075811 Alabama Univ., Huntsville, AL, USA
Double Float Zone (DFZ)
Naumann, Robert J.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 691-699; In English; See also 20030075796; No Copyright; Avail: CASI; A02, Hardcopy

The Double Float Zone experiment explored the feasibility of a quasi-containerless process in which a solidifying material is suspended by two liquid bridges of its own melt. One of the issues that must be considered is how far the liquid bridges could be extended before instabilities set in. The concept was tested using a mechanical model in which lexan rods represented the solid and the melt was simulated by water. The double float zone proved to be quite stable for modest lengths of the liquid bridges; however, an unexpected asymmetry in the position of the float piece was observed. It was possible to extend one bridge to nearly the Rayleigh limit (length equal circumference), but not both. There seems to be an instability imposed by the differential capillary pressure in the two liquid regions.
Author
Liquid Bridges; Solidification; Float Zones

20030075819 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne, Germany
QSAM: An Approach to Detect Low Frequency Acceleration in Spacelab
Hamacher, H.; Jilg, R.; Richter, H. E.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 857-867; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

Most of the microgravity experiments show highest sensitivity to residual acceleration in the low frequency range, typically below 0.01 Hz, where atmospheric drag, gravity gradient and centrifugal forces are predominant. QSAM is an instrument especially developed to detect this range where conventional methods are hampered by instrument bias and high amplitude noise problems entailing additional error contributions of detecting devices. Bias is generally varying in time due to unpredictable dependence on temperature, aging and other effects what precludes pre-mission calibration. In QSA M, signal modulation is applied by turning the sensor's sensitive axis. This allows the detection of accelerations in a frequency range between 0 and 0.02 Hz with a resolution better than l0(exp -7) go.
Author
Microgravity; Gravitational Effects; Temperature Dependence; Low Frequencies

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*.

20030071078 NASA Marshall Space Flight Center, Huntsville, AL, USA
Archetypal TRMM Radar Profiles Identified Through Cluster Analysis
Boccippio, Dennis J.; [2003]; 1 pp.; In English; 31st Conference on Radar Meteorology, 6-12 Aug. 2003, Seattle, WA, USA; No Copyright; Avail: CASI; A01, Hardcopy

It is widely held that identifiable 'convective regimes' exist in nature, although precise definitions of these are elusive. Examples include land / Ocean distinctions, break / monsoon beahvior, seasonal differences in the Amazon (SON vs DJF), etc. These regimes are often described by differences in the realized local convective spectra, and measured by various metrics of convective intensity, depth, areal coverage and rainfall amount. Objective regime identification may be valuable in several ways: regimes may serve as natural 'branch points' in satellite retrieval algorithms or data assimilation efforts; one example might be objective identification of regions that 'should' share a similar 2-R relationship. Similarly, objectively defined regimes may provide guidance on optimal siting of ground validation efforts. Objectively defined regimes could also serve as natural (rather than arbitrary geographic) domain 'controls' in studies of convective response to environmental forcing. Quantification of convective vertical structure has traditionally involved parametric study of prescribed quantities thought to

be important to convective dynamics: maximum radar reflectivity, cloud top height, 30-35 dBZ echo top height, rain rate, etc. Individually, these parameters are somewhat deficient as their interpretation is often nonunique (the same metric value may signify different physics in different storm realizations). Individual metrics also fail to capture the coherence and interrelationships between vertical levels available in full 3-D radar datasets. An alternative approach is discovery of natural partitions of vertical structure in a globally representative dataset, or 'archetypal' reflectivity profiles. In this study, this is accomplished through cluster analysis of a very large sample (0[107) of TRMM-PR reflectivity columns. Once achieved, the rainconditional and unconditional 'mix' of archetypal profile types in a given location and/or season provides a description of the local convective spectrum which retains vertical structure information. A further cluster analysis of these 'mixes' can identify recurrent convective spectra. These are a first step towards objective identification of convective regimes, and towards answering the question: 'What are the most convectively similar locations in the world?'
Author
Trmm Satellite; Cluster Analysis; Profiles; Radar Imagery; Satellite Observation; Reflectance

20030071115 National Information Display Lab., Princeton, NJ, USA
Evaluation of the Data-Ray DR96L 4 x 3 Aspect Ratio, 22-Inch Diagonal Flat Screen Monochrome CRT Monitor
Oct. 17, 2001; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414967; NIDL-750810801-124; No Copyright; Avail: CASI; A03, Hardcopy

NIDL sequentially evaluated three samples of this monitor over a one-year period. It is the only commercially available monochrome monitor that has a perfectly flat face and other features that make it a potential candidate display device for NIMA Imagery Exploitation Capability workstations. Based on results of our evaluation of the third sample NIDL cannot certify the Data-Ray DR96L monochrome monitor as being suitable for suitable monoscopic or stereoscopic operation in IEC workstations. NIDL rates this monochrome monitor as a C' for monoscopic mode and C' for stereo mode for the Image Analyst and Ceo spatial Information applications. Data-Ray engineers in Japan agreed with the results presented in the DR96L monitor evaluation report and have no plans to further improve the performance of the DR96L.
DTIC
Optical Properties; Monitors

20030071257 NASA Langley Research Center, Hampton, VA, USA
Satellite and Surface Data Synergy for Developing a 3D Cloud Structure and Properties Characterization Over the ARM SGP. Stage 1: Cloud Amounts, Optical Depths, and Cloud Heights Reconciliation
Genkova, I.; Long, C. N.; Heck, P. W.; Minnis, P.; [2003]; 11 pp.; In English; Thirteenth ARM Science Team Meeting, 31 Mar. - 4 Apr. 2003, Broomfield, CO, USA; Copyright; Avail: CASI; A03, Hardcopy

One of the primary Atmospheric Radiation Measurement (ARM) Program objectives is to obtain measurements applicable to the development of models for better understanding of radiative processes in the atmosphere. We address this goal by building a three-dimensional (3D) characterization of the cloud structure and properties over the ARM Southern Great Plains (SGP). We take the approach of juxtaposing the cloud properties as retrieved from independent satellite and ground-based retrievals, and looking at the statistics of the cloud field properties. Once these retrievals are well understood, they will be used to populate the 3D characterization database. As a first step we determine the relationship between surface fractional sky cover and satellite viewing angle dependent cloud fraction (CF). We elaborate on the agreement intercomparing optical depth (OD) datasets from satellite and ground using available retrieval algorithms with relation to the CF, cloud height, multi-layer cloud presence, and solar zenith angle (SZA). For the SGP Central Facility, where output from the active remote sensing cloud layer (ARSCL) valueadded product (VAP) is available, we study the uncertainty of satellite estimated cloud heights and evaluate the impact of this uncertainty for radiative studies.
Author
Great Plains Corridor (North America); Satellite Observation; Atmospheric Models; Three Dimensional Models; Clouds (Meteorology)

20030071647 Ohio Aerospace Inst., Cleveland, OH, USA
NASA Glenn OHIOVIEW FY01/02 Project
[2003]; 47 pp.; In English
Contract(s)/Grant(s): NAG3-2629; No Copyright; Avail: CASI; A03, Hardcopy

The results of the research performed by the university principal investigators are herein compiled. OhioView's general goals were: 1) To increase remote sensing education for Ohio s undergraduate and graduate students, and also enhancing

curriculum in the mathematics and science for K-12 students using the capabilities of remote sensing; 2) To conduct advanced research to develop novel remote sensing applications, i.e. to turn data into information for more applications; 3) To maximize the use of remote sensing technology by the general public through outreach and the development of tools for more user-friendly access to remote sensing data.
Author
University Program; Education; Remote Sensing; Schools

20030073511 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
South Brazil Satellite Sea Surface Temperature Accuracy Assessment
SallesdeAraujo, Carlos Eduardo; 2003; 146 pp.; In Portuguese; CD-ROM contains full text document in PDF form and color illustrations. PDF also has many blank pages.
Report No.(s): INPE-9751-TDI/857; Copyright; Avail: CASI; C01, CD-ROM; A07, Hardcopy

The accuracies of the global Advanced Very High Resolution Radiometer (AVHRR) split-window Sea Surface Temperature (SST) algorithms, derived from NOAA 11 and 12 satellites, were determined from comparisons with a match-up data set of COROAS project drifting buoy measurements for the southeast coast of Brazil, in the western part of the South Atlantic Ocean. The match-ups were screened from the HRPT scenes recorded by the INPE station in Cachoeira Paulista -SP, from February 1993 to June 1994. The temporal and the spatial coincidences are within 12 hours and between 2 Km and 12 Km. The NOAA 11 split-window global algorithm had a RMSD of 0.87 C with a computed bias of 0.24 C, providing better results than the NOAA 12 algorithm, wich presented. a RMSD of 0.94 C and a bias of 0.32 C. Seasonal comparisons showed that the algorithms for both satellites had best accuracies in the summer. In order to eliminate the bias and reduce the RMSDs, new regional algorithms were derived for the southeast coast of Brazil, with two different approaches. In the first, simple regression lines are used to correct the SST values, generated by the global algorithm. In the second, new split-window equations were derived by multiple regression models. When compared with the global algorithms, the first method equations showed an improvement of 0.18 C for NOAA 11 (RMSD = 0.69 C) and 0.06 C for NOAA 12 (RMSD = 0,88 C). The second method leads to a 0.09 C improvement for NOAA 11 (RMSD = 0,78) and 0.05 C for NOAA 12 (RMSD = 0,89). Those news RMSD's values are slightly greater than the RMSD value claimed for the global algorithm (0,07 C). This is probably due to a data concentration in the Brazil Current west wall region, where eddies and meanders are present in variable spatial scales, and high SST gradients. For more accurate regional SST estimation, a match-up data set with a wide temporal distribution is recommended for the split-window functions.
Author
Advanced Very High Resolution Radiometer; Noaa 11 Satellite; Noaa 12 Satellite; Sea Surface Temperature; Algorithms

20030073520 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Geoenvironmental Zoning of Casa Branca Region/SP
Stefani, Fausto Luis; 2003; 172 pp.; In Portuguese; CD-ROM contains full text document in PDF format and color illustrations. PDF also has blank pages.
Report No.(s): INPE-9666-TDI/851; Copyright; Avail: CASI; C01, CD-ROM; A08, Hardcopy

The present study took place in the region of Casa Branca, located northeastern of Sao Paulo State, settled mainly over sedimentary rocks of Bacia do Parana and where the land is mainly used for agriculture. The aim of this study was to make a integration of physical environment data based upon physiographics and geological features (structure, morphostructure and lithology) and pedological characteristics in order to divide the area in geoenvironmental zones and subzones. Images of the Landsat-5/TM satellite were used to analyse the textural elements of relief and drainage, to divide the region in areas with relatively homogeneous characteristics. Field works were carried out to verify the photointerpreted maps and to collect soils samples for physical and chemical analysis, which allowed to classify the weathering alteration products. The integration and evaluation of results allowed the distinction of different geoenvironmental zones and subzones, to furnish technical support to the definition and priorities to engineering works, water resources, environmental protection measures, among others. The final aim of this study was to make possible the execution and planning of land use policies that enhance the use and exploitation of natural resources.
Author
Remote Sensing; Earth Resources; Land Use

20030073534 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

A Temporal Behaviour Analysis of the Land Cover L Band Backscatter in the Tapajos National Forest, State of Para, By Using JERS-1 Images

FredericodeAngelis, Carlos; 2003; 154 pp.; In Portuguese; CD-ROM contains full text document in PDF form and color illustrations. PDF also has many blank pages.

Report No.(s): INPE-9678-TDI/853; Copyright; Avail: CASI; C01, CD-ROM; A08, Hardcopy

The temporal evolution of the backscatter for several land cover types in the Tapajos National Forest, Brazilian Amazonia is analyzed using JERS-1 images. Five JERS-1 images were acquired in the dry season from 1993 to 1997. Samples of the studied land cover types were identified after the analysis of a Landsat5/TM data set of 12 images obtained from 1984 to 1999. The following land cover types were investigated: bare soil, agriculture, pastures, forest regrowth from one to 23 years old and primary forest. The results show that the behavior of the regrowths stands is influenced by the previous land use and by human impacts as fires and selective logging. It was observed that the backscatter behavior of young regrowth stands originated from abandoned slashed and burned areas differs from those originated from abandoned agriculture activities. The backscatter of the former increases in a faster rate than that of the latter. The backscatter of old regrowth stands also behaves differently depending on the occurrence or absence of selective logging. The first case presents an oscillating pattern, while the second presents either a progressive trend or a stable pattern depending on the age of the stand. This assignment had an investigating feature, whose goal was to verify the possibility of using the backscatter temporal evolution as data source in studies that focus the land cover changes in tropical areas. The results of this research can be applied to the inference of the states and transition rates of the vegetation cover in Tropical Rainfall Forests areas, which may improve biomass production models of tropical regions and refine the assessment of regional Carbon balance. Besides, with the results, may be possible to make a radar image classifier algorithm, that observes the backscatter temporal evolution to take the right decision in the classification. To improve the results it is suggested a higher number of samples and radar images.

Author

Amazon Region (South America); Forests; Vegetation; Backscattering; Radar Imagery; Land Use

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*.

20030071267 NASA Ames Research Center, Moffett Field, CA, USA

Reactive Resonances in N+N2 Exchange Reaction

Wang, Dunyou; Huo, Winifred M.; Dateo, Christopher E.; Schwenke, David W.; Stallcop, James R.; May 15, 2003; 11 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Rich reactive resonances are found in a 3D quantum dynamics study of the N + N2 exchange reaction using a recently developed ab initio potential energy surface. This surface is characterized by a feature in the interaction region called Lake Eyring , that is, two symmetric transition states with a shallow minimum between them. An L2 analysis of the quasibound states associated with the shallow minimum confirms that the quasibound states associated with oscillations in all three degrees of freedom in Lake Eyring are responsible for the reactive resonances in the state-to-state reaction probabilities. The quasibound states, mostly the bending motions, give rise to strong reasonance peaks, whereas other motions contribute to the bumps and shoulders in the resonance structure. The initial state reaction probability further proves that the bending motions are the dominating factors of the reaction probability and have longer life times than the stretching motions. This is the first observation of reactive resonances from a 'Lake Eyring' feature in a potential energy surface.

Author

Nitrogen; Potential Energy; Reactivity; Oscillations

20030071328 Air Force Research Lab., Edwards AFB, CA, USA

Thruster Imaging Analysis for Control of a Solar Concentrator

Beasley, Joe; Apr. 21, 2003; 14 pp.; In English

Contract(s)/Grant(s): Proj-1011

Report No.(s): AD-A415049; AFRL-PR-ED-TP-2003-094; No Copyright; Avail: CASI; A03, Hardcopy

This paper discusses results of image processing of solar thruster images for use in controlling a solar concentrator. Video

capture images of an SRS solar thruster are analyzed to determine focal spot parameters and the best method of determining placement of the solar focal spot to provide maximum power transfer to the thruster. Since the intensity of the light is distorted by shadows and specular reflection, location of the focal spot is non-trivial with absorber information obscured in the specular reflection, that focal spot information needs to be de-convolved using Digital Signal Processing (DSP) from the scattering distribution of the thruster absorber. The paper discusses characterizing the specular reflection of the thruster secondary concentrator and discusses its effect on the determination of focal spot location.
DTIC
Image Processing; Solar Collectors; Signal Processing; Thrust; Control Theory

20030073487
High Throughput Manufacturing of Thin-Film CdTe Photovoltaic Modules. Final Subcontract Report 16 November 1993-31 December 1998
Sandwisch, D. A.; Aug. 1999; 80 pp.; In English
Report No.(s): DE2003-14427; No Copyright; Avail: Department of Energy Information Bridge
This report describes work performed by Solar Cells, Inc. (SCI), during this Photovoltaic Manufacturing Technology (PVMaT) subcontract. Cadmium telluride (CdTe) is recognized as one of the leading materials for low-cost photovoltaic modules. SCI has developed this technology and is preparing to scale its pilot production capabilities to a multi-megawatt level. This four-phase PVMaT subcontract supports these efforts. The work was related to product definition, process definition, equipment engineering, and support programs development. In the area of product definition and demonstration, two products were specified and demonstrated a grid connected, frameless, high-voltage product that incorporates a pigtail potting design and a remote low-voltage product that may be framed and may incorporate a junction box. SCI produced a 60.3-W thin-film CdTe module with total-area efficiency of 8. 4%; SCI also improved module pass rate on the interim qualification test protocol from less than 20% to 100% as a result of work related to the subcontract. In the manufacturing process definition area, the multi-megawatt manufacturing process was defined, several of the key processes were demonstrated, and the process was refined and proven on a 100-kW pilot line that now operates as a 250-kW line. In the area of multimegawatt manufacturing-line conceptual design review, SCI completed a conceptual layout of the multi-megawatt lines. The layout models the manufacturing line and predicts manufacturing costs. SCI projected an optimized capacity, two-shift/day operation of greater than 25 MW at a manufacturing cost of below $1.00/W.
NTIS
Photovoltaic Cells; Thin Films; Cadmium Tellurides; Product Development

20030073501 Syracuse Univ., NY
Electroabsorption and Transport Measurements and Modeling Research in Amorphous Silicon Based Solar Cells
Schiff, E. A.; Middya, A. R.; Lyou, J.; Kopidakis, N.; Rane, S.; Dec. 2002; 52 pp.; In English
Report No.(s): DE2003-15003605; NREL/SR-520-33164; No Copyright; Avail: Department of Energy Information Bridge
The contributions of this research project to amorphous silicon solar cells are in the following areas: (1) Improved understanding of the open-circuit voltage; (2) Improved knowledge of the built-in potential; (3) Variations in hole drift-mobilities for differing forms of a-Si:H; (4) Infrared spectroscopy of interfaces in a-Si:H cells; (5) Polymer p-layers; and (6) Hydrogen-based models for defects and metastability.
NTIS
Solar Cells; Amorphous Materials; Transport Theory

20030075800 Teledyne Brown Engineering, Huntsville, AL, USA
Positive Energy Growth Effects on USML-1
Matisak, Brian P.; Rogers, Melissa J. B.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 785-796; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy
The successful execution of the STS-50 mission established a number of milestones for Space Shuttle flights. The STS-50 flight, which carried the USML-1 payload, set a record for the longest Shuttle flight to date as well as the longest time in maintaining one fixed LVLH attitude. Maintaining this LVLH attitude resulted in positive energy growth contributions which impacted EOM landing opportunities. The attitude deadband also provided a significant effect to the altitude gain over the 14-day flight. The saturation of VRCS jet firings may have had an impact to the steady-state acceleration environment. No

formal evidence linking VRCS jet firings with post-flight accelerometer data exists at the time of this writing.
Author
Space Transportation System Flights; Space Shuttles; Attitude (Inclination); Impact Acceleration

20030079948 Idaho Univ., Moscow, ID, USA
Catalytic Ignition of Aquanol
Steciak, J.; Beyerlein, S.; Clarke, E.; Cordon, D.; Patel, A.; Feb. 2003; In English
Report No.(s): PB2003-106884; NIATT-N03-04; No Copyright; Avail: National Technical Information Service (NTIS)

The research and development of the catalytic ignition of ethanol-water-air mixtures is organized into three parallel paths: (1) demonstration vehicles; (2) igniter performance in engines; and (3) and fundamental understanding of the ethanol-water-air-Pt system. 1. Demonstration vehicles: Redundant measurements with two special purpose detectors were used for emission comparisons. A van supplied by Valley Transit of Lewiston, Idaho was converted to catalytic ignition. Modifications to the fuel handling, engine management, and ignition system were necessary to make the vehicle operate on either gasoline or Aquanol. A three-part vehicle test plan is currently underway to compare performance, fuel economy, and emissions between Aquanol and gasoline fuels. 2. Igniter development in engines: In the catalytically ignited ethanol-water system, ignition timing can be adjusted by changing the length of the catalytic core element, the length of the pre-chamber, the diameter of the pre-chamber, and the electrical power supplied to the catalytic core element. A multi-zone energy balance model has been developed to understand ignition timing of ethanol-water mixtures. Model predictions agree with pressure versus crank angle data obtained from a 15 kW Yanmar diesel engine converted for catalytic operation on ethanol-water fuel. Comparing the converted Yanmar to the stock engine shows an increase in torque and power, with improvements in CO and NOx emissions. 3. Combustion kinetics: A catalytic plug flow reactor is being built to better understand the heterogeneous combustion of ethanol-water-air mixtures. A key feature is the reactors ability to rapidly mix fuel vapor and air streams. A prototype mixing nozzle, designed and built last year, was evaluated using gas streams of two different compositions.
NTIS
Diesel Engines; Catalytic Activity; Ethyl Alcohol; Fuels; Ignition; Combustion Efficiency

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20030068946, National Inst. of Standards and Technology, Gaithersburg, MD, Syracuse Univ., NY
Energy-Related Indoor Environmental Quality Research: A Priority Agenda
Fisk, W. J.; Brager, G.; Burge, H.; Cummings, J.; Levin, H.; Aug. 12, 2002; 98 pp.; In English
Report No.(s): DE2003-803861; LBNL-51328; No Copyright; Avail: Department of Energy Information Bridge

A multidisciplinary team of indoor environmental quality (IEQ) and energy researchers has defined a program of priority energy-related IEQ research. This paper describes the methods employed to develop the agenda, and 35 high priority research and development (R&D) project areas related to four broad goals: identifying IEQ problems and opportunities; developing and evaluating energy-efficient technologies for improving IEQ; developing and evaluating energy-efficient practices for improving IEQ; and encouraging or assisting the implementation of technologies or practices for improving IEQ.
NTIS
Energy Technology; Environmental Quality

20030068955 Texas Southern Univ., Houston, TX, USA
Forecasting Traffic Characteristics for Air Quality Analyses
Yu, L.; Qiao, F.; Li, G.; Oey, H.; Aug. 2002; 124 pp.; In English
Report No.(s): PB2003-106079; No Copyright; Avail: CASI; A06, Hardcopy

This research intends to develop techniques for estimating and forecasting three critical mobile source emission related travel indicators: vehicle age distribution, mileage accumulation rates by vehicle type, and VMT & mix. As for modeling the vehicle age distribution, two model types were used; each of which contains the linear model, nonlinear model and time series model. Age distributions for the 8 counties in HGAC area and in El Paso in Texas were used to validate the model structures and parameters. As for modeling the mileage accumulation rate, a practical algorithm for adjusting the default mileage accumulation rate for site-specific application based on a small sample field survey was developed. Applications in two Texas cities (Houston and El Paso) were conducted and the whole operation process and its impacts on the estimates of emission

factors were presented. As for VMT & mix, extensive efforts were made on collecting information on VMT & mix estimation. A national-wide survey through e-mail was conducted to ascertain what kinds of methodologies were used by other states. Accordingly, a practical improvement to the VMT & mix estimation methodologies was developed. Link volume estimates were modeled as the function of both the traffic count data and the link attributes.
NTIS
Air Quality; Forecasting; Traffic; Texas

20030068961 Air Force Space Command, Peterson AFB, CO
Environmental Impact Statement: Peacekeeper Missile System Deactivation and Dismantlement
Dalton, Andrew; Frank, Mark A.; Milligan, Joseph E.; Schuler, Charles B.; Smith, Thomas S.; Dec. 2000; 464 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414685; No Copyright; Avail: CASI; A20, Hardcopy

The USA Air Force proposes to deactivate and dismantle up to 50 Peacekeeper Intercontinental Missile (ICBM) Launch Facilities (LF) and 5 Missile Alert Facilities (MAF) located within the deployment area north and east of Francis F. Warren Air Force Base (AFB), Wyoming. The need for deactivation and dismantlement of the Peacekeeper missile system is to comply with the Strategic Arms Reduction Treaty (START) II, as modified by the Helsinki Agreement of September 1997. The treaty ratification process is ongoing; the need to implement the Proposed Action would depend upon final ratification of the Treaty. This Environmental Impact Statement (EIS) was prepared in accordance with the National Environmental Policy Act (NEPA) to analyze the potential environmental consequences of the Proposed Action, two Implementation Alternatives, and the No Action Alternative. The Implementation Alternatives involve two other options in the dismantlement process of the Proposed Action: Removal of the Hardened Intersite Cable System, and Mechanical Demolition of the Headworks. The No Action Alternative is to continue operation of the Peacekeeper missile system. This EIS addresses the potential environmental impacts that could result from activities that would occur under the proposed and alternative actions. Environmental resources evaluated include the local community (socioeconomics, environmental justice, transportation, and land use), hazardous materials and waste management (health and safety, hazardous materials, hazardous wastes, above ground and underground storage tanks, solid waste, and wastewater), and the natural environment (geological resources, water resources, air resources, noise, biological resources, and cultural resources). The potential cumulative effects of the Proposed Action on each of these resources also were evaluated. (46 tables, 30 figures, extensive refs.)
DTIC
Deactivation; Launching Sites

20030069060 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Work-Related Lung Disease Surveillance Report, 2002
Dec. 2002; In English
Report No.(s): PB2003-106824; DHHS/PUB/NIOSH-2003-111; No Copyright; Avail: National Technical Information Service (NTIS)

This is the sixth in a series of occupational respiratory disease surveillance reports produced by the National Institute for Occupational Safety and Health (NIOSH). It presents summary tables and figures of occupational respiratory disease surveillance data focusing on various occupationally-relevant respiratory diseases, including pneumoconioses, occupational asthma and other airways diseases, and several other respiratory conditions. For many of these diseases, selected data on related exposures are also presented. The report has three major sections: (1) a section that provides data highlights and data usage limitations; (2) a section comprised of 15 sub-sections, each concerning a major disease category and (were available) related occupational exposures; and (3) a section of appendices that provide descriptions of data sources, methods, and other supplementary information.
NTIS
Lungs; Occupational Diseases; Respiratory Diseases

20030069062 National Inst. for Occupational Safety and Health, Pittsburgh, PA, USA
Handbook for Dust Control in Mining
Kissell, F. N.; Jun. 2003; 142 pp.; In English
Report No.(s): PB2003-106834; NIOSH-IC-9465; DHHS/NIOSH/PUB-2003-147; No Copyright; Avail: CASI; A07, Hardcopy

This handbook describes effective methods for the control of mineral dusts in mines and tunnels. It assumes the reader

is familiar with mining. The first chapter deals solely with dust control methods, regardless of the application. It is a brief tutorial on mining dust control and will be of help to the reader whose dust control problem does not conveniently fit any of the mining equipment niches described in later chapters. The subsequent chapters describe dust control methods for different kinds of mines and mining equipment. This includes underground coal and hard-rock mines, as well as surface mines, stone mines, and hard-rock tunnels. Because dust sampling has so many pitfalls, a chapter on methods used to sample dust is included. For those occasions when there is no practical engineering control, a chapter on respirators is also included. Except for those listed as future possibilities in the longwall chapter, the dust control methods described are practical and cost-effective for most mine operators.
NTIS
Dust Collectors; Handbooks; Mining; Indoor Air Pollution

20030071087 NASA Ames Research Center, Moffett Field, CA, USA
Comparing Model Ozone Loss during the SOLVE and SOLVE-2 Winters
Drdla, K.; [2003]; 1 pp.; In English; SOLVE2/VINTERSOL Joint Science Team meeting, 21-24 Oct. 2003, Kissimee, FL, USA; No Copyright; Avail: Other Sources; Abstract Only

Model simulations have been used to analyze the factors influencing ozone loss during the 1999-2000 and 2002-2003 js. For both winters, the evolution of the Arctic vortex from November to April has been simulated using a trajectory-based microphysical and photochemical model. Extensive PSC formation and strong ozone depletion are evident in both winters. However, the ozone loss begins earlier in the 2002-2003 winter, with significant ozone depletion by early January. Analysis of the model results shows that during December 2002 not only cold temperatures but also the vortex structure was critical, allowing PSC-processed air parcels to experience significant solar exposure. The resultant ozone loss can be differentiated from ozone loss that occurs in the springtime, in particular because of the continued exposure to PSCs. For example, chlorine reactivation by the PSCs causes ozone loss to be insensitive to denitrification. Therefore, diagnosing the extent of ozone loss early in the winter is critical In understanding the overall winter-long ozone depletion.
Author
Ozone Depletion; Simulation; Winter; Mathematical Models

20030071679 Envair, Albany, CA, USA
Trends in Ambient NOx and Particulate Nitrate Concentrations in California, 1980-2000
Blanchard, C. L.; Tannebaum, S.; Jun. 2003; In English
Report No.(s): PB2003-106437; No Copyright; Avail: National Technical Information Service (NTIS)

Trends in monthly-average oxides of nitrogen (NO(x)), particulate matter less than 10 micrometer (mm) aerodynamic diameter (PM10) mass, PM10 nitrate, total suspended particulate (TSP) mass, and TSP nitrate concentrations were analyzed for each monitoring location in the South Coast, South Central Coast, and Mojave Desert air basins for the period 1980-2000. In addition, trends in monthly-average NOx, PM10 mass, TSP mass, PM10 nitrate, and TSP nitrate concentrations were studied in relation to trends in temperature, precipitation, and primary pollutant levels at seven long-term (10 years or more) monitoring sites in the South Coast, San Joaquin Valley, and San Francisco Bay Area air basins for the period 1980-2000 using stepwise multiple regression. The sites were Azusa, Fremont, Livermore, Napa, Riverside, San Bernardino, and Visalia. Since the time resolution and frequency of sampling varied among compounds, measurements were recompiled as monthly averages prior to analyzing for trends. Measurement biases associated with the available monitoring data limit the reliability of some of the trend assessments, as discussed in the report.
NTIS
Air Pollution; Nitrogen Oxides; Nitrates; Contaminants

20030075647 ENVIRON International Corp., Novato, CA
Impact of Biodiesel Fuels on Air Quality and Human Health: Task 2 Report. The Impact Biodiesel Fuels Data on Ozone Concentrations
Morris, R. E.; Mansell, G. E.; Jia, Y.; Wilson, G.; May 2003; In English
Report No.(s): DE2003-15003892; No Copyright; Avail: National Technical Information Service (NTIS)

This report evaluates the ozone air quality impacts from the use of biodiesel fuel in the South Coast (Los Angeles) Air Basin (SoCAB), lower Lake Michigan, Northeast Corridor, and other cities in the Eastern USA (US). The largest impacts on ambient ozone concentrations due to the use of biodiesel are expected to be due to changes in NOx emissions from diesel vehicles. Studies, such as the Ozone Transport Assessment Group (OTAG), have concluded that regional NOx controls are one

of the most effective control strategies for reducing regional ozone concentrations in the eastern US. However, in some cases, NOx controls result in increased ozone levels, particularly in the urban cores of large cities. The assessment of ozone impacts due to biodiesel fuel use must therefore include the effects of the fuel on regional ozone and ozone transport as well as the effects within urban areas. The ozone air quality modeling conducted as part of this study therefore takes into account both urban-scale and regional-scale ozone formation through the use of high-resolution urban-scale modeling domains of the cities under study as well as coarser-scale regional-scale modeling. This report documents Task 2 of the NREL study Impact of Biodiesel Fuels on Air Quality and Hyman Health. Under Task 1, engine test data using biodiesel and standard diesel fuels were analyzed to estimate the effects biodiesel fuel has on heavy duty diesel vehicle tailpipe emissions. The effects of biodiesel fuel use on Carbon Monoxide (CO) and Particulate Matter (PM) air quality and Exposure and Human Health Effects are addressed in the Task 3, 4, and 5 reports, respectively, of the NREL study.
NTIS
Diesel Fuels; Air Quality; Ozone; Environment Effects; Biological Effects; Synthetic Fuels

20030079964 Harris, Miller, Miller and Hanson, Inc., Burlington, MA, USA
Development of Noise Control Regulations for National Park Service Enforcement
Miller, N.; Donnelly, K.; Baus, K.; Jul. 2003; 104 pp.; In English
Report No.(s): PB2003-106478; HMMH-295860.27; No Copyright; Avail: CASI; A06, Hardcopy

This is a survey study of current National Park Service, state and local laws and regulations that are directed at limiting the types of human produced noises that may be encountered in national parks. The study also presents a process that could be used to modify or develop noise control regulations that would be designed to achieve specific national park objectives. The report summarizes the current noise laws and regulations of the National Park Service, presents summaries of some relevant state and local noise laws, and reviews Society of Automotive Engineers (SAE) noise measurement standards that are frequently used to quantify the noise of vehicles that might be encountered in parks, namely motorboats, snowmobiles and motorcycles. The report then discusses a process for noise regulation development that is designed to produce laws that are (1) feasible (can be complied with), (2) effective (will produce the desired limitations of noise), and (3) workable (can be enforced).
NTIS
Noise Pollution; Regulations; Noise Tolerance

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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*.

20030069039 NASA Marshall Space Flight Center, Huntsville, AL, USA
The ATIC Science Flight in 2002-03: Description and Preliminary Results
Wefel, J. P.; Adams, J. H.; Ahn, H. S.; Bashindzhagyan, G. L.; Batkov, K. E.; Chang, J.; Christl, M.; Cox, M.; Ellison, S. B.; Fazley, A. R., et al.; [2003]; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: Other Sources

The Advanced Thin Ionization Calorimeter (ATIC) balloon experiment completed a 19.7 day science flight, 29 Dec. 02 to 18 Jan. 03, from McMurdo, Antarctica, yielding 65 Gbytes of science data. The instrument was fully recovered just over the trans-Antarctic mountain range. ATIC is designed to make new measurements of the composition and energy spectra of cosmic rays in the region up to 100 TeV total energy. The flight and the instrument performance are described and compared to the ATIC-1 flight from 2000-01. Although the data from this new flight will not be fully processed and analyzed, some preliminary results are discussed.
Author
Balloon Sounding; Balloon-Borne Instruments; Antarctic Regions; Calorimeters; Ionization

20030071096
Application of and Enhancement to Arctic Infrastructure for the Study of Long-Term Change in the Earth's Polar Mesosphere
Kelley, Michael C.; May 20, 2003; 4 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0658; Proj-01PR03751-00
Report No.(s): AD-A414944; No Copyright; Avail: CASI; A01, Hardcopy

Our Summer 2000 preliminary study of HF-PMSE is published in Geophysical Research Letters. We carried out a full climatological study at HIPAS and a long campaign at HAARP in Summer 2001. Our work in 2002 included preliminary 139-MHz studies and collection of MF data from Poker Flat corresponding to the HIPAS observations. Our goal in 2003 is to complete the data collection for C. Ramos' thesis, hopefully with multiple radar observations at HAARP. Finally, we have submitted a paper dealing with new rocket observations in the Arecibo heater beam to the Journal of Geophysical Research.
DTIC
Mesosphere; Climatology

20030071230 NASA Ames Research Center, Moffett Field, CA, USA
Spectral Characteristic of Tholin Produced from Possible Early Earth Atmospheres and its Role in Antigreenhouse Effect on Early Earth
Khare, B. N.; Imanaka, H.; Wilhite, P.; McKay, C.; Bakes, E.; Cruikshank, D. P.; Arakawa, E. T.; [2003]; 1 pp.; In English; Exobiology Conference, 21-25 Aug. 2003, Moffett Field, CA, USA
Contract(s)/Grant(s): RTOP 344-58-22-07; Copyright; Avail: Other Sources; Abstract Only

We have produced organic material simulating a methane photochemical haze in a CO2- rich atmosphere of the early Earth by irradiating gas mixtures in an inductively coupled cold plasma chamber with pressure approx. 0.25 mbar at 100 W total power. The flow rate was 24 cm3 min. We added progressively higher levels of CH, by combining gas mixtures of N2/CH4 (9/1) and N2/CO2 (9/1) to change the ratio of CH4/CO2. Tholin was accumulated for 5 hours in each experiment; the onset of tholin formation is in the range CH4/CO2 = 0.5 to 1. As the mixing ratio of CH, is increased, the production rate of the brownish tholin film increases. IR spectra showed the C-H and N-H bands similar to that of Titan tholin and closely resemble Titan tholin made at 0.13 mbar pressure. A decrease in the CH bonds on decreasing CH4/CO2 is noted. Ether bands (-(2-O-C) were tentatively detected, but no detectable carbonyl (C=O) band was found. The absorption in the UV region for the early Earth tholin is found to be substantially greater than the Titan tholin. Quantitative values of the optical constants of early Earth tholin are currently being measured.
Author
Greenhouse Effect; Earth Atmosphere

20030071696 Arizona State Univ., Tempe, AZ, USA
Factors Influencing Lava-Substrate Heat Transfer and Implications for Thermomechanical Erosion
Fagents, S. A.; Greeley, R.; Lenat, J. F., Editor; Bull Volcanol; January 24, 2001; Volume 62, pp. 519-532; In English
Contract(s)/Grant(s): NAG5-11787; Copyright; Avail: Other Sources; Abstract Only

We develop numerical simulations of basaltic lava flowing laminarly over a basalt substrate in order to examine the details of the lava dynamics and thermal boundary layers and to understand the implications for substrate heating. As the initial stage of a larger study of thermomechanical erosion in different planetary environments, we aim to understand why erosion occurs on Earth, why erosion features are not ubiquitous given the high temperatures involved, and whether it is a plausible mechanism for the formation of planetary channels such as lunar sinuous rilles and Venusian canali. Here we confine our attention to terrestrial lavas with well-known properties and eruption parameters. With relatively simple computational fluid dynamic simulations, most closely representing tube-fed hawaiian basalts (for which erosion has been documented), we demonstrate the importance of incorporating several key factors in models of lava flow/ substrate heat transfer, which have commonly been neglected in previous treatments. By addressing the interaction of the flow dynamics and heat transfer in the lava, our work suggests that the development of a temperature gradient in the base of the lava, even for undeveloped flow, has a significant influence on substrate temperature. The sensitivity of the lava-substrate interface temperature to the thermophysical properties of the lava and substrate suggests that a delicate balance is required for partial melting to occur. Thus, it might take weeks of continuous flow to initiate partial melting of the substrate at distances of several kilometers from the vent. These durations exceed the periods of stability typical of lava flowing in tubes; pauses, blockages, surges, and break-outs frequently disrupt the flow. However, natural irregularities in the flow dynamics or substrate topography might help to initiate and maintain substrate melting on shorter timescales by disturbing the intimately coupled dynamic and thermal boundary layers. Although a purely thermal mechanism cannot be ruled out, our findings support the premise that mechanical erosion may play a key role in reports of erosion based on field evidence.
Author
Lunar Topography; Heat Transfer; Thermal Boundary Layer; Erosion; Numerical Integration; Basalt; Lava

20030071703 NASA Marshall Space Flight Center, Huntsville, AL, USA

Self-Consistent Model of Magnetospheric Ring Current and Electromagnetic Ion Cyclotron Waves: The May 2-7, 1998, Storm

Khazanov, G. V.; Gamayunov, K. V.; Jordanova, V. K.; [2003]; 2 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Complete description of a self-consistent model for magnetospheric ring current interacting with electromagnetic ion cyclotron waves is presented. The model is based on the system of two kinetic equations; one equation describes the ring current ion dynamics, and another equation describes the wave evolution. The effects on ring current ions interacting with electromagnetic ion cyclotron waves, and back on waves, are considered self-consistently by solving both equations on a global magnetospheric scale under non steady-state conditions. In the paper by Khazanov et al. [2002] this self-consistent model has only been shortly outlined, and discussions of many the model related details have been omitted. For example, in present study for the first time a new algorithm for numerical finding of the resonant numbers for quasilinear wave-particle interaction is described, or it is demonstrated that in order to describe quasilinear interaction in a multi-ion thermal plasma correctly, both e and He(+) modes of electromagnetic ion cyclotron waves should be employed. The developed model is used to simulate the entire May 2-7, 1998 storm period. Trapped number fluxes of the ring current protons are calculated and presented along with their comparison with the data measured by the 3D hot plasma instrument Polar/HYDRA. Examining of the wave (MLT, L shell) distributions produced during the storm progress reveals an essential intensification of the wave emissions in about two days after main phase of storm. This result is well consistent with the earlier ground-based observations. Also the theoretical shapes and the occurrence rates for power spectral densities of electromagnetic ion cyclotron waves are studied. It is found that in about 2 days after the storm main phase on May 4, mainly non Gaussian shapes of power spectral densities are produced.

Author

Electromagnetic Radiation; Ion Cyclotron Radiation; Self Consistent Fields; Mathematical Models; Ring Currents

20030073525 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

On the Analysis of the Time Variation in Trimpi Event Occurrence and of the Correlation Between this Event and Geomagnetic Activity

Fernandez, Jose Henrique; 2003; 210 pp.; In Portuguese; CD-ROM contains full text document in PDF format and color illustrations. PDF also has blank pages.

Report No.(s): INPE-9667-TDI/852; Copyright; Avail: CASI; C01, CD-ROM; A10, Hardcopy

The ephemeral disturbing events in the Very Low Frequency signals due to localized ionospheric disturbances near to the propagation paths are being extensively studied since their discovery and the first publication that have established their phenomenology. With the efforts intensification in order to better understand the involved mechanisms in all the generation phases of the Trimpi effect, new and intriguing informations about different phenomenon circumstances are now being discovered. This work studies the disturbances profile as detected by two different stations on the Antarctic Peninsula region, Comandante Ferraz, Brazil [CF: 62 deg 34 min S; 58 deg 23.5 min W; L=2.24] and Palmer, USA [PA: 64 deg 03 min S; 64 deg 46 min W; L=2.34] under the comprehension supplied by a new mathematical modeling. The fact of these two stations be privileged positioned in a very active area in Trimpi events occurrence and to form an important array site detection presenting paralaxe in a correspondent events detection, has permitted the resolution, in terms of the time detection, of the disturbed area. The results confirmed the theoretical prevision that have inferred, for the new class of the disturbance, an area of one magnitude order bigger than it was supposed for the ancient events, being the new disturbance increasing in magnetic latitude and active in sequentially increasing time instants. The experimental evidence of such phenomenon would be the discrepancy on the onset time of correspondent events (and sometimes also different onset durations) detected by displaced stations in magnetic latitude, what was verified to occur between Comandante Ferraz and Palmer through the results of analysis from the NPM 21.4 kHz, Hawaiian transmitter [21 deg 26 min N; 158 deg 10 min W; L=1,17] data for the year 1998. This new phenomenology, induced by oblique whistlermode waves, has just become known due to the simultaneous detection technique of correspondent events observed by an array (with two or more stations) of reception. The joint analysis of the CF and PA Trimpi data and the sferic and whistler spectrum data from PA have shown that even for oblique events, induced by oblique whistler waves, sonograms associated to ducted whistlers were detected, confirming the hypothesis of the mixed events formed by combined precipitation - classical (induced by ducted whistlers) and oblique (induced by non-ducted waves) displaying sometimes a more classical, sometimes a more oblique character. It was also verified, firstly for the period April/1996- March/1997, and after extended to August 1999, for CF data, the intrinsic relationship between Trimpi events occurrence and geomagnetic activity being visible a strong cause-effect relation between the phenomena, that was explored in details in this work. Finally, in association with two intense auroral phenomena (that have extrapolated the edges of the

known austral auroral oval zone, disturbing even the upper atmosphere over CF) in March/April 2001 it was verified a strong increasing in the number of the Trimpi events detected at same period what could indicate a new class of the phenomenon being produced by the direct solar wind precipitation. The annual occurrence rate of the Trimpi effect in CF has shown an average growth in accordance with the increasing in the solar activity. The effects of the 1998, August 27th, gamma-ray burst in the ionosphere are also discussed.
Author
Geomagnetism; Ionospheric Disturbances; Very Low Frequencies; Whistlers

20030073595 Chicago Univ., Chicago, IL, USA
STARDUST and Stardust: Isotopic Compositions of Trace Elements in Single Circumstellar Grains
Davis, A. M.; Pellin, M. J.; Savina, M. R.; Tripa, C. E.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 24; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Presolar SiC and graphite grains recovered from primitive meteorites have large isotope anomalies in major, minor and trace elements. The isotopic compositions of heavy trace elements (Kr and heavier) in single grains provide a particularly rich record of nucleosynthesis infrared giant stars and supernovae. Most presolar grains are carbon-rich and form around stars with C/O less than 1. However, most stars (including the Sun) have C/O less than 1 and their rocks made of oxides, and silicates and sometimes, water. Along-standing question in the presolar grain studies is whither this is simple a selection effect, because SiC and graphite are able to survive the harsh chemical treatment of meteorites needed to extract them, ot that oxides and silicates are so highly processed in the solar nebula that their presolar record is obscured. We review the heavy element isotopic compositions of known presolar grains and speculate on the isotopic compositions of the oxides and silicates that must be more abundant among the interstellar grain population.
Derived from text
Composition (Property); Isotopic Labeling; Stardust Mission; Trace Elements; Stellar Envelopes; Granular Materials; Interplanetary Dust

20030075705
A Feasibility Study of Optical Imaging through Atmospheric Obscurants
Alfano, Robert R.; Cai, W.; Gayen, S. K.; Mar. 19, 2003; 8 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0668
Report No.(s): AD-A415040; ARO-42717.1-PH; No Copyright; Avail: CASI; A02, Hardcopy

IMAGES PROCESS Optical imaging of objects through atmospheric obscurants is an area of active research driven by national defense, commercial, and scientific interests. Multiple scattering of light by particles in the intervening medium (such as, cloud, aerosol, fog, smoke in the atmosphere) reduces signal intensity and signal-to-noise ratio, contributes to the blurring of image. Using pulsed lasers, time-gated detectors, and other techniques to sort out the ballistic and early snake photons from the diffusive photons it is possible to extract information about objects embedded in turbid media. The objective of the research is to carry out a theoretical investigation for photon starvation and image resolution, associated with imaging of a distant object through a scattering and obscuring medium. In this research, we estimate the feasibility of ballistic and snake light imaging at different distances computed using our analytical cumulant expansion method and compare it with results of the Monte Carlo simulation.
DTIC
Image Processing; Atmospheric Physics; Feasibility Analysis; Radiative Transfer

20030077856 Naval Postgraduate School, Monterey, CA
Precision Air Data Support for Chem/Bio Attack Response
Tan, Kwang L.; Mar. 2003; 122 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415209; No Copyright; Avail: CASI; A06, Hardcopy

The defense response against chemical and biological (Chem/bio) weapons has gained a renewed focus in light of the September 11, 2001 terrorist attack. A successful response to a Chem/bio attack would involve measuring and predicting the dispersion of a toxic cloud in the atmosphere. The Naval Postgraduate School Aeronautics and Astronautics Department is working together with the Meteorology Department on a technique to make toxic cloud measurements using an Unmanned Air Vehicle (UAV). In support of this mission, the UAV will require precise and accurate air data (airspeed, angle of attack ALPHA, and sideslip angle BETA) so that wind data extraction can be carried out from air and inertial data for use in plume dispersion modeling. The efforts behind this thesis concentrate on developing an air data system that will produce precise and

accurate air data in support of the UAV flights. The primary concerns are the choice and design of the air data system, the calibration of the system using flow fields from computer simulation, and the processing of air data. The air data extracted will be used for wind determination so that the movement of the Chem/bio dispersed agent in the atmosphere can be predicted. (3 tables, 63 figures, 12 refs.)
DTIC
Flow Distribution; Meteorological Parameters

20030079997 New Brunswick Univ., Fredericton, New Brunswick, Canada
Complex Crater Formation and Collapse: Observations at the Haughton Impact Structure, Arctic Canada
Osinski, G. R.; Spray, J. G.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

It is generally believed that the processes involved in the formation of an initial transient crater and its subsequent excavation, are common for all craters, regardless of their size. A critical assumption is that the depth/diameter ratio of a transient crater remains constant for any given crater size. The morphological diversity of impact structures is, therefore, attributed to the modification or collapse of an initial simple hemispherical transient crater. The mechanisms of impact crater collapse remain one of the least understood stages in the impact cratering process. Indeed, standard strength models used in conventional hydrocode modeling techniques are not successful in describing crater collapse. Numerical models have also rarely been constrained by field data from terrestrial impact structures. This is, however, a catch-22 situation because very few detailed field investigations of the tectonics of complex impact structures have been made. Here, we present new constraints on the formation of complex impact craters based on detailed field studies of Haughton impact structure, Arctic Canada.
Derived from text
Cratering; Collapse; Impact Damage; Excavation; Depth

20030080002 California Inst. of Tech., Pasadena, CA, USA
Impact Induced Target Thermo-Mechanical States and Particle Motion Histories
OKeefe, John D.; Ahrens, Thomas J.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The first objective of this effort is to determine how the post impact measurable crater features relate to the processes that take place during impact and the second is to the determine from a given suite of measurements the uncertainty in estimating the impactor s parameters.
Derived from text
Impactors; Thermodynamics; Particle Motion

20030080011 California Inst. of Tech., Pasadena, CA, USA
Amelia Creek, Northern Territory: A 20 x 12 km Oblique Impact Structure with No Central Uplift
MacDonald, F. A.; Mitchell, K.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Amelia Creek Structure is located in the Davenport Ranges of the Northern Territory, Australia at lat. 20 deg 55 min S, long. 134 deg 50 min E. Shock metamorphic features are developed on the southern, down-range side of the structure. No central uplift is developed and the dimensions of the impact structure are at least 20 x 12 km.
Author
Meteorite Craters; Angles (Geometry); Obliqueness

20030080014 Instituto Nacional de Tecnica Aeroespacial, Torrejon de Ardoz, Spain
Next Step in Marine Impact Studies: Combining Geological Data with Numerical Simulations for Applications in Planetary Research
Ormo, J.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Baltoscandia is favourable for geological studies of marine-target (M-T) craters. One reason is the relatively dense population of craters of different diameters, of approximately the same age, and with different target water depths. This allows

comparative studies of the effects of a target water layer on the lithologies and morphologies of the resulting craters. Baltoscandian craters like Kardla and Lockne are well documented. Today, a considerable number of the documented craters and impact sites on Earth are known to have formed at sea. All but one, the Eltanin impact site west of Chile, have formed in epicontinental seas. This circumstance is mainly a result of higher probability of both formation and preservation in such areas. Famous craters as Chicxulub, Chesapeake Bay, and Mjolnir were also formed at sea. Marine impact cratering is an important topic within impact research. The fact that our planet is mostly covered by water must be taken into consideration when evaluating consequences and hazards from impact events. In addition, M-T craters may have applications in the exploration of our Solar System.
Derived from text
Numerical Analysis; Marine Chemistry; Impact; Geology; Data Acquisition; Craters

20030080037 Tokyo Univ., Japan
Velocity Distributions of Fragments and Its Time Dependence
Onose, N.; Fujiwara, A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Oblique impact cratering experiments were done, and the fragment size and velocity were measured for fragments larger than 1 mm in diameter, and slower than 200 m/sec. A high speed CCD video camera was used to see the fragments in flight, and secondary collisions with a window of the target chamber. The purpose of this paper is to provide a database of fragments velocity, which is essential to deeper understanding of the surface evolution of small asteroids.
Derived from text
Velocity Distribution; Fragments; Time Dependence; Cratering; Impact; Craters

20030080039 Geological Survey, Flagstaff, AZ, USA
Application of Gravity Data to Understanding Impact Mechanics
Plescia, J. B.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Gravity data provide important constraints on morphometry of impact structures and on the crustal response to the impact process. Such data can provide insight that may not be obtainable from surface geologic mapping and may not be quickly or cheaply obtained by other geophysical means. The gravity data can be used to constrain the dimensions of a completely to partly buried structure (e.g., diameter, central uplift, etc.) and can provide information on the subsurface character of both exposed and buried structures. Gravity data can also be used to reject some structures as being of impact origin.
Derived from text
Gravitation; Data Acquisition; Impact; Craters

20030080040 Alaska Univ., Fairbanks, AK, USA
Excavation Flow and Central Peak Rings: Is There a Connection?
Sharpton, V. L.; Dressler, B. O.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

To approximate the conditions associated with the excavation stage of the impact process, many numerical simulations rely on some form of the Z-model, where the radial velocity of particles below the ground surface is given by: U(sub R) = alpha(t)/R(supZ) and R is the radial distance from the flow origin, alpha is a strength parameter, and Z determines the velocity change with radial distance. While inherited from studies of explosion cratering, the Z-model has been shown to provide a first order approximation of excavation flow in simple craters as long as some appropriate effective depth of Z-model flow (EDOZ) is provided. EDOZ is usually assumed to be equivalent to one projectile diameter. The most-often applied form of this model is the steady-flow version where a, Z (approx. 3) and EDOZ are assumed to be time constants. This practice, however, seems to be based on convenience rather than on sound theoretical grounds as: (1) the steady flow assumption allows the flow field to be explicitly evaluated at all times but (2) violates conservation of energy. Furthermore, studies of laboratory-scale impacts indicate a time-dependence to the Z-model parameters. Despite these limitations, the Z-model's ability to provide qualitative insights into the dominant spatial features of the early-time impact flow field has been emphasized. While this may be true for laboratory scale craters and even simple craters on planetary surfaces, observations

from a well-studied terrestrial complex crater indicate that neither excavation flow nor the shape of the excavation cavity are well approximated by the Z-model.
Derived from text
Cavities; Craters; Explosions; Flow Distribution; Radial Flow; Radial Velocity; Impact

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20030069002 University Corp. for Atmospheric Research, Boulder, CO, USA
Microphysical Characteristics of Clouds During the TRMM Field Campaign
Stith, Jeffrey L.; [2003]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-9715; No Copyright; Avail: CASI; A01, Hardcopy

Further analysis of the TRMM field campaign data was conducted to examine the growth of precipitation in updraft regions of the TRMM field campaign tropical clouds and to extend the earlier results to cover the whole TRMM data set collected by the University of North Dakota (UND). The results have been submitted for publication. In this paper, composite vertical profiles of liquid water, small particle concentration, and updraft/downdraft magnitudes were presented from each of the campaigns. They exhibited similar peak values for the two TRMM regions of LBA and Kwajalein. Updrafts were found to be favored locations for precipitation embryos in the form of liquid or frozen drizzle-sized droplets. Although liquid water concentrations decreased to undetectable levels between -5 and -18 C in most glaciating updrafts, occasional traces of liquid water were found in updrafts at colder temperatures, probably due to the persistence of liquid drizzle droplets. The updraft magnitudes where the traces of liquid water were observed at cold temperatures do not appear to be stronger than updrafts without liquid water at similar temperatures, however.
Derived from text
Micrometeorology; Clouds (Meteorology); Trmm Satellite

20030069022 NASA Ames Research Center, Moffett Field, CA, USA
Evidence for Limited Indirect Aerosol Forcing in Stratocumulus
Ackerman, Andrew S.; Toon, O. B.; Stevens, D. E.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Increases in cloud cover and condensed water contribute more than half of the indirect aerosol effect in an ensemble of general circulation model (GCM) simulations estimating the global radiative forcing of anthropogenic aerosols. We use detailed simulations of marine stratocumulus clouds and airborne observations of ship tracks to show that increases in cloud cover and condensed water in reality are far less than represented by the GCM ensemble. Our results offer an explanation for recent simplified inverse climate calculations indicating that indirect aerosol effects are greatly exaggerated in GCMs.
Author
Aerosols; Stratocumulus Clouds; Cloud Cover; Climate

20030071114 Florida State Univ., Tallahassee, FL, USA
Numerical Simulations and Diagnostic Studies Relating Meteorology To Atmospheric Chemistry during TRACE-P
Fuelberg, Henry E.; September 14, 2003; 9 pp.; In English
Contract(s)/Grant(s): NCC1-412
Report No.(s): FSU-1338-835-26; No Copyright; Avail: CASI; A02, Hardcopy

The Florida State University (FSU) team participated extensively in the pre-mission planning for TRACE-P through meetings, telephone calls, and e-mails. During Spring 2001, Prof. Fuelberg served as DC-8 Mission Meteorologist during the field campaign. He prepared meteorological guidance for each flight of the DC-8 and flew on each mission. After the field phase, FSU prepared various meteorological products, included backward air trajectories, for each flight of the DC-8 and P-3B. These were posted on the FSU and NASA-GTE web sites for use by all the Science Team. During the two-year post mission period, FSU conducted research relating meteorology to atmospheric chemistry during TRACE-P. This led to three journal articles in the Journal of Geophysical Research. FSU personnel were the lead authors on each of these articles. Abstracts of these articles are attached. In addition, the FSU team collaborated with other members of the TRACE-P Science

Team to incorporate meteorological factors into their research. A list of publications resulting from these interactions is included.
Author
Atmospheric Chemistry; Meteorology; Mission Planning; NASA Space Programs; Geophysics; Pacific Ocean

20030071229 NASA Langley Research Center, Hampton, VA, USA
Estimation of Cirrus Cloud Effective Ice Crystal Shapes using Visible Reflectances from Dual-Satellite Measurements
Chepfer, Helene; Minnis, Patrick; Young, David; Nguyen, Louis; Arduini, Robert F.; Journal of Geophysical Research; 2002; ISSN 0148-0227; Volume 107, No. D23, pp. 21-1 - 21-16; In English; Copyright; Avail: Other Sources

This study develops and examines a multiangle, multisatellite method for determining effective cloud particle shapes from reflectances observed at visible wavelengths. The technique exploits the significant differences in the various cloud particle shape phase functions near the backscatter direction to infer particle shape from a combination of views from a near-backscatter angle and a side scattering angle. Adding-doubling calculations confirm that the optimal viewing combinations include one near-backscatter angle and another between 60' and 150'. Sensitivity to shape increases with solar zenith angle. A total of 28 collocated, visible images from pairs of currently operating meteorological satellites with the desired viewing combinations were analyzed for particle shape. Matching reflectances from images with optimal viewing angles clearly separates water droplet from ice crystal clouds. Reflectance pairs from matched pixels containing ice crystals can be explained by the range of selected microphysical models. The most common retrieved shapes correspond to combinations of hexagonal compacts (aspect ratio of unity), hexagonal columns, and bullet rosettes. Although no single microphysical model can account for the observed variability, taken together, the models used for retrieving cloud particle size by the Clouds and the Earth's Radiant Energy System and the Moderate Resolution Imaging Spectroradiometer Projects can account for most of the reflectance variability observed in this limited data set. Additional studies are needed to assess the uncertainties in retrieved shapes due to temporal and spatial mismatches, anisotropic and bright background reflectances, and calibration errors and to validate the retrieved shapes. While applicable to a limited number of dual-satellite viewing combinations for current research and operational meteorological satellites, this approach could be used most extensively to derive effective particle size, shape, and optical depth from a combination of an imaging satellite in an L1 orbit, like Triana, and any other lower Earth orbiting Satellites.
Author
Atmospheric Composition; Cloud Physics; Ice Clouds; Remote Sensing

20030071682 Arizona State Univ., Tempe, AZ, USA
Windblown Dust on Mars: Laboratory Simulations of Flux as a Function of Surface Roughness
Greeley, Robert; Wilson, Gregory; Coquilla, Rachel; White, Bruce; Haberle, Robert; Planetary and Space Science; 2000; ISSN 0032-0633; Volume 48, pp. 1349-1355; In English
Contract(s)/Grant(s): NAG5-8948; Copyright; Avail: Other Sources; Abstract Only

Experiments were conducted to determine the flux of dust (particles less than few microns in diameter) under Martian atmospheric conditions for surface of three aerodynamic roughness (z(sub 0)). For smooth surface on Mars (z(sub 0) = 0.00125 cm corresponding to 0.0125 cm on Mars) suspension threshold was not achieved at the highest velocities run (u(sub 0) = 322 cm/s); for a moderately rough surface (z(sub 0) = 0.010 cm corresponding to 0.01 cm on Mars), flux averaged 1.5 x 10(exp -7)g/sq cm/s; for a rough surface (z(sub 0) = 0.015 cm corresponding to 0.15 cm on Mars), flux averaged 5 x 10(exp -7) g/sq cm/s. Although the results are preliminary, flux varied widely as a function of wind speed and roughness, suggesting that raising dust into suspension on Mars is complex. Nonetheless, using these results as a guide, 9000 Mt of dust could be raised into the atmosphere of Mars per second from only 5% of the surface.
Author
Dust; Wind Effects; Mars Atmosphere; Surface Roughness

20030071714 Rutherford Appleton Lab., Chilton
Exploring the Linearity of the Climate Response to External Forcing
Booth, B.; Allen, M. R.; Kettleborough, J. A.; Mar. 2002; 38 pp.; In English
Report No.(s): PB2003-104837; RAL-TR-2002-005; Copyright; Avail: National Technical Information Service (NTIS)

We investigate the linearity of the response of an energy balance model of the climate system to changes in model parameters for various radiative forcing scenarios. On 50 year timescales the model response is largely linear. The response is non linear in the small region of parameter space covering low climate sensitivities and ocean heat uptake rates. The non

linearity is most noticeable under stabilization scenarios. The linearity of the response of this simple model supports a fundamental assumption used in making predictions of climate during the response of the climate change: the response of the climate system is of low dimension.
NTIS
Climate; Linearity

20030073510 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Performance of the CPTEC/COLA Global Model During SACZ Episodes using KUO and Relaxed Arakawa-Schubert Deep Convection Schemes
Mendonca, Antonio Marcos; 2003; 154 pp.; In Portuguese; CD-ROM contains full text document in PDF format and color illustrations. PDF also has blank pages.
Report No.(s): INPE-9660-TDI/850; Copyright; Avail: CASI; C01, CD-ROM; A08, Hardcopy

One of the most important meteorological phenomena during summer in South America is the South Atlantic Convergence Zone (SACZ). Several studies have been accomplished in order to understand the atmospheric dynamics involved in its formation. In this work, the performance of the Center for Weather Forecast and Climate Studies (CPTEC) global model is evaluated during three episodes of SACZ. The evaluation of the model is accomplished based on statistical indexes, such as mean errors (BIAS), root mean square errors and anomaly correlation of geopotential height, virtual temperature, moisture convergence, specific humidity, zonal and meridional winds and precipitable water. The evaluation of the precipitation forecast is achieved by using threat score for rain-no rain, weak rain, moderate rain and heavy rain categories. Two versions of the global model are used, one with the Kuo parameterization for the deep convection scheme, and the other with relaxed Arakawa-Schubert (RAS) scheme. The performance of the two versions is compared for the selected SACZ episodes over the regions: South America (AS), Tropics (TR), Extratropics (EX), Continent (CON) and Oceans (OCE). It is observed that the formation, the intensification and the dissipation of SACZ affect the forecasts quality, determining in some cases, the end of the useful forecast. The version of the model with Arakawa-Schubert parameterization shows better performance in forecasting the geopotential height (500 hPa), moisture convergence (850 hPa), zonal and meridional winds (850 hPa) in all the regions; at 250 hPa, the zonal wind on the regions AS, TR and CON, and the meridional wind on the region TR; the virtual temperature (1000 hPa) on the regions AS, TR, EX and CON, and the precipitable water on the regions AS, TR and CON. The version with Kuo parameterization shows better performance for the specific humidity in all the regions, for the zonal wind (250 hPa) and precipitable water on the regions EX and OCE, and meridional wind on the regions AS, EX, CON and OCE. The analysis of the threat score index indicates that both versions shows good performance in forecasting occurrence/not ocurrence of precipitation and deficiency in forecasting heavy rain. In general, forecasts based on the Arakawa-Schubert scheme produces better results.
Author
Atmospheric Models; Statistical Analysis; Parameterization; Convection; Weather Forecasting; Precipitation (Meteorology)

20030073540 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Analysis of Oscillations Intraseasonal The South America and Adjacent Oceans using the Wavelet Analysis
Vitorino, Maria Isabel; 2003; 346 pp.; In Portuguese; CD-ROM contains full text document in PDF format and color illustrations. PDF also has blank pages.
Report No.(s): INPE-9822-TDI/865; Copyright; Avail: CASI; C01, CD-ROM; A15, Hardcopy

This work deals with the intrasesonal variability of outgoing longwave radiation (OLR), sea level pressure (SLP) and 250 hPa relative vorticity (RV) for the 1979-1996 period. The analyses were done using the National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) reanalysis and one dimensional wavelets transform to detect intraseasonal oscillations (IO) and time scales related to the most energetic signals. Two different approaches were defined to analyze the 30-90, 20-30, 10-20 and 2-10 days spectral bands: the first one focuses on climatological and regional IO features, and the second one is intended for long term forecast applications, aiming to establish empirical relationships between OLR at several locations and time scales. Due to its efficiency for locating time frequency oscillations of OLR, SLP and RV in intraseasonal bands. In a regional basis, for each studied subregion, the results show distinct features for the intraseasonal oscillation of OLR and SLP, including a 30-60 days time lag involving OLR and SLP over the northeastern Brazil, southern Amazonia and southeastern Brazil subregions. Among the studied subregions, it stands out the presence of in phase 30-90 days oscillations of OLR and SLP in the Indonesia region, during the austral summer and fall. Also, it was observed in the southern Brazil the presence of SLP oscillations in the 30-90 days band during the austral winter. This feature was associated with cold air outbreaks and the presence of 2-10 and 10-20 days band oscillations associated with blocking events. During the studied period it was observed the presence of RV oscillations of 25 and 45 days scales in the eastern

Pacific. Episodes of El Nino Southern Oscillation were characterized by large spatial changes of OLR, but with different patterns. On the other hand, in the approach defined to analyze the spectral bands, several spatial patterns of OLR oscillations in the 25 and 45 days were related to the prevailing summer weather systems in the South America and neighboring oceans. Regarding the potential for prediction applications, the forecast of 45 days OLR oscillations at the South Atlantic Convergence Zone location trough an artificial neural network shows a better performance than the one by multiple linear regression model. The current study has revealed interesting atmospheric features associated with the IO over South America and vicinities, but they still deserve further investigations.
Author
Intraseasonal Variations; Spectral Bands; Climatology; Amazon Region (South America); Wavelet Analysis

20030077854 Congressional Budget Office, Washington, DC, USA
A CBO Study: The Economics of Climate Change: A Primer
Apr. 2003; 70 pp.; In English
Report No.(s): AD-A415072; No Copyright; Avail: CASI; A04, Hardcopy

This Congressional Budget Office (CBO) study-prepared at the request of the Ranking Member of the House Committee on Science-presents an overview of issues related to climate change, focusing primarily on its economic aspects. The study draws from numerous published sources to summarize the current state of climate science and provide a conceptual framework for addressing climate change as an economic problem. It also examines public policy options and discusses the potential complications and benefits of international coordination. In keeping with CBO's mandate to provide impartial analysis, the study makes no recommendations.
DTIC
Economics; Climate; Climate Change

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*.

20030071107 NASA Ames Research Center, Moffett Field, CA, USA
The Zebrafish G12 Gene is required for Nuclear Positioning and Cell Migrations during Early Development
Reinsch, S. S.; Conway, G. C.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

After fertilization Zebrafish embryos undergo synchronous cleavage to form a blastula of cells sitting upon a single multinucleate yolk cell. At the beginning of gastrulation these cells undergo extensive cell migrations to form the major body axes. We have discovered a gene, G12, which is required for cell migrations and positioning of nuclei in the large syncytial yolk cell. Overexpression of a G12-GFP fusion protein is not toxic and shows that the protein localizes inside the yolk cell to the yolk nuclei, microtubules, and to the margin between the blastomeres and the large yolk cell. Morpholino (MO) injection into the 1-cell embryo or into just the yolk syncytium conipletely inhibits cell migrations, doming of the yolk cell, and positioning of nuclei around the margin. This effect can be partially rescued by injection of G12-GFP encoding RNA. Given the known role of microtubules in nuclear positioning of yolk nuclei in Zebrafish, we investigated the microtubules in morpholiiio injected and rescued embryos. We find that microtubules are sparse and disorganized in MO-injected embryos and are restored to normal organization upon G12-GFP rescue. G12 plays a pivotal role in organization of inicrotubules during early development. G12 is highly conserved in vertebrates and two homologues exist in the human genome. One of the human hoinologues is amplified in aggressive breast tumors.
Author
Vertebrates; Tumors; Ribonucleic Acids; Proteins; Eggs; Embryos; Fishes

20030071676 Lunar and Planetary Inst., Houston, TX, USA
Investigating a 65-Ma-Old Smoking Gun: Deep Drilling of the Chicxulub Impact Structure
Dressler, B.; Sharpton, V. L.; Morgan, J.; Buffler, R.; Moran, D.; Smit, J.; Stoeffler, D.; Urrutia, J.; Eos, Transactions, American Geophysical Union; April 08, 2003; ISSN 0096-3941; Volume 84, No. 14, pp. 125, 130; In English
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1159; Copyright; Avail: CASI; A01, Hardcopy

The Phanerozoic paleontological record is marked by several biological extinction events. One of them,at the Cretaceous/Tertiary (K/T) boundary was responsible for the demise of about 50% of genera and 75% of species, including the dinosaurs.These drastic and abrupt changes in the development of life on Earth puzzled paleontologists in the past. Many a cause was put forward to account for them, amongst them climate changes, disease, or overspecialization.
Derived from text
Cretaceous-Tertiary Boundary; Life Sciences; Paleontology

20030073592 NASA Ames Research Center, Moffett Field, CA, USA
The AstroBiology Explorer (ABE) Mission
Sandford, S. A.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 62; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Introduction: Infrared spectroscopy in the 2.5- 16 micron range is a principle means by which organic compounds can be detected and identified in space via their vibrational transitions. Ground-based, airborne, and spaceborne IR spectral studies have already demonstrated that a significant fraction of the carbon in the interstellar medium (ISM) resides in the form of complex organic molecular species. Furthermore, the presence of D-enriched organics in meteorites suggests that a portion of these materials survives incorporation into protosolar nebulae. Unfortunately, neither the distribution of these materials in space nor their genetic and evolutionary relationships with each other or their environments are currently well understood. The Astrobiology Explorer (ABE) is a MIDEX mission concept designed to use infrared spectroscopy to address outstanding problems in Astrochemistry which are particularly relevant to Astrobiology and are amenable to astronomical observation. ABE is currently under study at NASA's Ames Research Center in collaboration with Ball Aerospace and Technologies Corporation and the Jet Propulsion Laboratory. ABE was selected for Phase A study during the last MIDEX AO round, but has yet to be selected for flight.
Derived from text
Astronomy; Atmospheric Chemistry; Genetics; Exobiology; Organic Compounds

20030075722 NASA Johnson Space Center, Houston, TX, USA
Physiological and Molecular Genetic Effects of Time-Varying Electromagnetic Fields on Human Neuronal Cells
Goodwin, Thomas J.; September 2003; 38 pp.; In English
Report No.(s): NASA/TP-2003-212054; S-906; NAS 1.60:212054; No Copyright; Avail: CASI; A03, Hardcopy

The present investigation details the development of model systems for growing two- and three-dimensional human neural progenitor cells within a culture medium facilitated by a time-varying electromagnetic field (TVEMF). The cells and culture medium are contained within a two- or three-dimensional culture vessel, and the electromagnetic field is emitted from an electrode or coil. These studies further provide methods to promote neural tissue regeneration by means of culturing the neural cells in either configuration. Grown in two dimensions, neuronal cells extended longitudinally, forming tissue strands extending axially along and within electrodes comprising electrically conductive channels or guides through which a time-varying electrical current was conducted. In the three-dimensional aspect, exposure to TVEMF resulted in the development of three-dimensional aggregates, which emulated organized neural tissues. In both experimental configurations, the proliferation rate of the TVEMF cells was 2.5 to 4.0 times the rate of the non-waveform cells. Each of the experimental embodiments resulted in similar molecular genetic changes regarding the growth potential of the tissues as measured by gene chip analyses, which measured more than 10,000 human genes simultaneously.
Author
Physiological Effects; Electromagnetic Fields; Genes; Neurons

20030075784 Central Inst. for the Deaf, Saint Louis, MO, USA
Immunological Influences on the Vestibular System
Warchol, Mark E.; [2003]; 7 pp.; In English
Contract(s)/Grant(s): NAG2-1364; No Copyright; Avail: CASI; A02, Hardcopy

The goals of this project were to examine the influence of immune signaling molecules on the survival and replacement of sensory hair cells in the vestibular organs. We have made considerable progress toward that goal, particularly in the characterization of mechanisms that underlie hair cell death.
Author
Apoptosis; Cells (Biology); Hair; Vestibules; Immune Systems

20030075786 Maryland Univ., College Park, MD, USA
Mechanosensitive Ion Channels in Bacteria: Functional Domains and Mechanisms of Gating
Sukharev, Sergei; [2003]; 8 pp.; In English
Contract(s)/Grant(s): NAG2-1352; No Copyright; Avail: CASI; A02, Hardcopy

The past funding period was productive for the group. The progress in the mechanosensitive channel field was critically affected in the end of 1998 by the solution of the crystal structure of the mycobacterial homolog of MscL by our colleagues from Caltech. Having the structure of TbMscL in the closed state, we developed a detailed homology model of EcoMscL, and related the structural model with the wealth of functional phenomenology available for the E. coli version of the channel (EcoMscL). The biophysical properties of the open MscL helped to model the open conformation and infer the pathway for the entire gating transition. The following experiments provided strong support to the atomic model of the gating process, and allowed to make further predictions. The work has advanced our understanding of tension-driven conformational transitions in membrane-embedded mechanosensory proteins, determine major energetic contributions and set the stage for further exploration of the whole family of mechanosensitive channels. The results have been published in seven experimental and theoretical papers, with three other papers currently in press or in preparation.
Author
Escherichia; Membranes; Ions

20030077901
Microsatellites in the Eukaryotic DNA Mismatch Repair Genes as Modulators of Evolutionary Mutation Rate
Genome Research; January 2003; 8 pp.; In English; Copyright; Avail: Other Sources

All 'minor' components of the human DNA mismatch repair (MMR) system-MSH3, MSH6, PMS2, and the recently discovered MLH3-contain mononucleotide microsatellites in their coding sequences. This intriguing finding contrasts with the situation found in the major components of the DNA MMR system-MSH2 and MLH1-and, in fact, most human genes. Although eukaryotic genomes are rich in microsatellites, non-triplet microsatellites are rare in coding regions. The recurring presence of exonal mononucleotide repeat sequences within a single family of human genes would therefore be considered exceptional.
Derived from text
Microsatellites; Coding; Deoxyribonucleic Acid; Genes

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*.

20030071204 Armed Forces Radiobiology Research Inst., Bethesda, MD, USA
Medical Management of Radiological Casualties Handbook. Second Edition
Apr. 2003; 170 pp.; In English
Report No.(s): PB2003-106179; AFRRI-SP-03-1; No Copyright; Avail: CASI; A08, Hardcopy

This handbook provides concise supplemental reading material for the Medical Effects of Ionizing Radiation Course, which is presented by the Armed Forces Radiobiology Research Institute several times each year and is the only graduate-level course in the Department of Defense for training health care professionals in the management of uncontrolled ionizing radiation exposure. Mention of specific commercial equipment or therapeutic agents does not constitute endorsement by the Defense Department; trade names are used only for clarity of purpose. No therapeutic agents or regimens have been approved by the federal Food and Drug Administration (FDA) for the specific treatment of ionizing radiation injury. Ethical constraints bar the human-efficacy research protocols necessary to obtain this certification. Therapeutic agents described here have been FDA-approved for other purposes unless otherwise specified. It is the responsibility of the licensed medical provider to decide how best to use available therapy in the best interests of the patient. Every effort has been made to make this handbook consistent with official policy and doctrine. However, the information contained in this handbook is not official Defense Department policy or doctrine, and it should not be construed as such unless it is supported by other documents.
NTIS
Radiobiology; Radiation Protection; Medical Services; Casualties; Radiation Effects

20030071233 NASA Ames Research Center, Moffett Field, CA, USA
Simulation of Local Blood Flow in Human Brain under Altered Gravity
Kim, Chang Sung; Kiris, Cetin; Kwak, Dochan; [2003]; 2 pp.; In English; ASME International Mechanical Engineering Congress, 16-21 Nov. 2003, Washington, DC, USA
Report No.(s): ASME-IMECE-2003-44065; No Copyright; Avail: CASI; A01, Hardcopy

In addition to the altered gravitational forces, specific shapes and connections of arteries in the brain vary in the human population (Cebral et al., 2000; Ferrandez et al., 2002). Considering the geometric variations, pulsatile unsteadiness, and moving walls, computational approach in analyzing altered blood circulation will offer an economical alternative to experiments. This paper presents a computational approach for modeling the local blood flow through the human brain under altered gravity. This computational approach has been verified through steady and unsteady experimental measurements and then applied to the unsteady blood flows through a carotid bifurcation model and an idealized Circle of Willis (COW) configuration under altered gravity conditions.
Author
Blood Flow; Gravitational Fields; Brain Circulation

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*.

20030068957 Occupational Safety and Health Administration, Washington, DC, USA
Guidelines for Nursing Homes: Ergonomics for the Prevention of Musculoskeletal Disorders
2003; 42 pp.
Report No.(s): PB2003-106784; No Copyright; Avail: CASI; A03, Hardcopy

These guidelines provide recommendations for nursing home employers to help reduce the number and severity of work-related musculoskeletal disorders (MSDs) in their facilities. MSDs include conditions such as low back pain, sciatica, rotator cuff injuries, epicondylitis, and carpal tunnel syndrome. The recommendations in these guidelines are based on a review of existing practices and programs, State OSHA programs, as well as available scientific information, and reflect comments received from representatives of trade and professional associations, labor organizations, the medical community, individual firms, and other interested parties. OSHA thanks the many organizations and individuals involved for their thoughtful comments, suggestions, and assistance.
NTIS
Human Factors Engineering; Musculoskeletal System; Signs And Symptoms; Medical Services

20030068989 TIAX LLC CAMBRIDGE MA, Cambridge, MA, USA
Human/Machine Interface Modalities for Soldier Systems Technologies
Mulgund, Sandeep; Stokes, John; Turieo, Melanie; Devine, Marlene; Oct. 30, 2002; 69 pp.; In English
Report No.(s): AD-A414918; Rept-71950-00; No Copyright; Avail: CASI; A04, Hardcopy

The Army's Objective Force Warrior program seeks to create a lightweight overwhelmingly lethal fully integrated individual combat system. This includes weapon, head-to-toe individual protection, networked communications, soldier-worn power sources, and enhanced human performance. Achieving this objective will in part entail the development of soldier-centric human/machine interfaces (HMIs) that optimize cognitive fightability. Such optimization is possible only if these HMIs are designed in such a way that takes into account the nature of human information processing and cognition. This in turn depend on understanding how best to use the senses by which humans perceive their environment and the means by which they can affect it; i.e., the modalities for human/machine interaction. Traditional approaches to HMI design have centered on the use of visual displays and manual inputs, but these do not take advantage of the full range of means by which humans can perceive and interact with their environment. This report reviews the literature on human/machine interface modalities. It also provides guidelines for system designers to consider when choosing which modalities should be considered in a system intended to augment human cognitive performance.
DTIC
Man Machine Systems; Information; Display Devices

20030071079 Lockheed Martin Space and Strategic Missiles, Denver, CO, USA
System Safety Hazards Assessment in Conceptual Program Trade Studies
Eben, Dennis M.; Saemisch, Michael K.; [2003]; 5 pp.; In English; 21st International System Safety Conference, 4-8 Aug. 2003, Ottawa, Ontario, Canada
Contract(s)/Grant(s): NAS8-01098; No Copyright; Avail: CASI; A01, Hardcopy

Providing a program in the concept development phase with a method of determining system safety benefits of potential concepts has always been a challenge. Lockheed Martin Space and Strategic Missiles has developed a methodology for developing a relative system safety ranking using the potential hazards of each concept. The resulting output supports program decisions with system safety as an evaluation criterion with supporting data for evaluation. This approach begins with a generic hazards list that has been tailored for the program being studied and augmented with an initial hazard analysis. Each proposed concept is assessed against the list of program hazards and ranked in three derived areas. The hazards can be weighted to show those that are of more concern to the program. Sensitivities can be also be determined to test the robustness of the conclusions
Author
Hazards; Systems Engineering; Safety Factors

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*.

20030079976 California Univ., San Diego, La Jolla, CA, USA
Domain-Level Differences in Microsatellite Distribution and Content Result from Different Relative Rates of Insertion and Deletion Mutations
Metzgar, David; Liu, Li; Hansen, Christian; Dybvig, Kevin; Wills, Christopher; Genome Research; [2003]; ISSN 1088-9051; Volume 12, pp. 408-413; In English
Contract(s)/Grant(s): NAG5-4546; NIH-A141113; Copyright; Avail: Other Sources

Microsatellites (short tandem polynucleotide repeats) are found throughout eukaryotic genomes at frequencies many orders of magnitude higher than the frequencies predicted to occur by chance. Most of these microsatellites appear to have evolved in a generally neutral manner. In contrast, microsatellites are generally absent from bacterial genomes except in locations where they provide adaptive functional variability, and these appear to have evolved under selection. We demonstrate a mutational bias towards deletion (repeat contraction) in a native chromosomal microsatellite of the bacterium Mycoplasma gallisepticum, through the collection and analysis of independent mutations in the absence of natural selection. Using this and similar existing data from two other bacterial species and four eukaryotic species, we find strong evidence that deletion biases resulting in repeat contraction are common in bacteria, while eukaryotic microsatellites generally experience unbiased mutation or a bias towards insertion (repeat expansion). This difference in mutational bias suggests that eukaryotic microsatellites should generally expand wherever selection does not exclude them, whereas bacterial microsatellites should be driven to extinction by mutational pressure wherever they are not maintained by selection. This is consistent with observed bacterial and eukaryotic microsatellite distributions. Hence, mutational biases that differ between eukaryotes and bacteria can account for many of the observed differences in microsatellite DNA content and distribution found in these two groups of organisms.
Author
Eukaryotes; Genome; Polynucleotides; Deoxyribonucleic Acid

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*.

20030069063 National Inst. of Standards and Technology, Gaithersburg, MD, Mitretek Systems, Inc., Washington, DC, USA
Studies of Fingerprint Matching Using the NIST Verification Test Bed (VTB)
Wilson, C. L.; Watson, C. I.; Garris, M. D.; Hicklin, A.; 2003; In English
Report No.(s): PB2003-106882; No Copyright; Avail: National Technical Information Service (NTIS)

A series of fingerprint matching studies have been conducted on an experimental laboratory system called the Verification Test Bed (VTB). The VTB is a collection of commercial off the shelf (COTS) computer hardware, an open-source operating system, and a suite of public domain application software. Results are presented that compare various sources of fingerprints, assess the image quality of fingerprints by analyzing the matcher scores for inked and live-scan impressions, and study the trade-offs of matching rolled fingerprints with plain impressions. Database size in these studies range from 216 to approx. 600,000 people. Performance statistics are primarily reported for single-finger matching; however, results from two different approaches to two-finger fusion matching are also presented. At a false accept rate (FAR) of 1%, the best two-finger true accept rate (TAR) is 99% while the worst single-finger TAR is 71%. This report illustrates the wide range of image types and quality that exist in government fingerprint databases and the effect this variability has on the accuracy of matching using a single algorithm. An appendix compares the VTB matcher to two commercial fingerprint systems and concludes that the performance of the VTB is very similar to commercial verification systems currently on the market. This further confirms that data quality uniformity is of paramount importance in the evaluation of fingerprint biometrics.
NTIS
Performance Tests; Laboratory Equipment; Identifying; Program Verification (Computers)

20030071192 Newcastle-upon-Tyne Univ., Newcastle
Visualisation of Partial Order Models in VLSI Design Flow
Bystrov, A.; Koutny, M.; Yakovlev, A.; Sep. 2002; 22 pp.
Report No.(s): PB2003-105198; CS-TR-744; Copyright; Avail: National Technical Information Service (NTIS)

This paper presents a new method, algorithms and tool for the visualization of a finite complete prefix of a Petri net or a signal transition graph. A transformation is defined that converts such a prefix into a two-level model. At the top level, it has a finite state machine, describing modes of operation and transitions between them. At the low level, there are marked graphs, which can be drawn as waveforms, embedded into the top level nodes. The models of both levels are abstractions traditionally used by electronics engineers. The resultant model is completed trace equivalent to the original prefix. Moreover, the branching structure of the latter is preserved as much as possible.
NTIS
Petri Nets; Algorithms; Integrated Circuits

20030071193 Newcastle-upon-Tyne Univ., Newcastle
Adaptive Methods for Piecewise Polynomial Collocation for Ordinary Differential
Wright, K.; May 2003; 28 pp.
Report No.(s): PB2003-105199; CS-TR-796; Copyright; Avail: National Technical Information Service (NTIS)

Various adaptive algorithms for the solution of ordinary differential boundary value problems using piecewise polynomial collocation are considered. Five different criteria are compared using both interval subdivision and redistribution. All the algorithms are based on the idea of a criterion. It is, however, shown that when accuracy is poor that equidistribution may not give a unique solution. The main results indicate that mesh redistribution is more reliable than interval subdivision, and give an evaluation of the five criteria.
NTIS
Polynomials; Differential Equations

20030071195 Newcastle-upon-Tyne Univ., Newcastle
Error Recovery for a Boiler System with OTS PID Controller
Anderson, T.; Feng, M.; Riddle, S.; Romanovsky, A.; May 2003; 16 pp.
Report No.(s): PB2003-105200; CS-TR-798; Copyright; Avail: National Technical Information Service (NTIS)

We have previously presented initial results of a case study which illustrated an approach to engineering protective wrappers as a means of detecting errors or unwanted behavior in systems employing an OTS (Off-the-Shelf) item. The case study used a Simulink model of a steam boiler system together with an OTS PID (Proportional, Integral and Derivative) controller. The protective wrappers are developed for the model of the system in such a way that they allow detection and tolerance of typical errors caused by unavailability of signals, violations of range limitations, and oscillations. In this paper we extend the case study to demonstrate how forward error recovery based on exception handling can be systematically incorporated at the level of the protective wrappers.
NTIS
Computer Programs; Errors

20030071196 Newcastle-upon-Tyne Univ., Newcastle
Portal Replication for Web Application Availability via SOAP
Woodman, S. J.; Morgan, G.; Parkin, S. E.; May 2003; 16 pp.
Report No.(s): PB2003-105210; CS-TR-797; Copyright; Avail: National Technical Information Service (NTIS)

The interoperability of SOAP as eased the provision B2B (business to business) solutions where web applications (web form submission via browser) are only suitable for supporting B2C (business to client). As many services exist that is delivered to clients via web applications, enabling the delivery of such services via SOAP to provide B2B solutions are desirable. One mechanism for achieving this is via the use of portals. A portal may provide clients with a single point of access to geographically distributed services and tailor such services to satisfy client requirements. As a single point of access to many services, a portal may present a single point of failure. The provision of fault-tolerant portals may be viewed as essential by an organization. This paper describes a portal suitable for exhibiting web applications as SOAP based services and presents an approach for replicating portals to overcome the problem of a portal representing a single point of failure.
NTIS
Fault Tolerance; Interoperability

20030071198 Newcastle-upon-Tyne Univ., Newcastle
Computer Security Impaired by Legal Users
Besnard, D.; Arief, B.; May 2003; 20 pp.
Report No.(s): PB2003-105211; CS-TR-794; Copyright; Avail: National Technical Information Service (NTIS)

Computer security has traditionally been assessed from a technical point of view. In this paper, we wish to adopt a cognitive standpoint and investigate some of the cognitive processes involved in computer security. One angle which is not considered very often is the active role played by legal users of systems in impairing the level of protection. In this paper, we thus attempt to highlight the cognitive processes underlying security impairments by legal users. This approach relies on the concept of trade-off. At the end of the paper, we propose a short usability-centered set of recommendations.
NTIS
Computer Information Security; Cognition

20030071222 NASA Ames Research Center, Moffett Field, CA, USA
INFUSION: Modeling Robot and Crew Interaction
Laufenberg, Lawrence; June 24, 2003; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Brahms is a multi-agent modeling and simulation language and distributed runtime system developed at NASA. It can be used to model and run a simualtion of the distributed work activities of multiple agents, such as humans,robots, and software agents, to coordinate a mission on one or more locations.Brahms is being used to model activities at the Flashline Man Arctic Research Station for possible use in planning Mars missions. The station is located at Haughton Crater, Devon Island, Nutiavut, Arctic Canada.
Derived from text
Mars Missions; Models

20030071232 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Performance Enhancement Strategies for Multi-Block Overset Grid CFD Applications
Djomehri, M. Jahed; Biswas, Rupak; May 15, 2003; 22 pp.; In English
Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy

The overset grid methodology has significantly reduced time-to-solution of highfidelity computational fluid dynamics (CFD) simulations about complex aerospace configurations. The solution process resolves the geometrical complexity of the problem domain by using separately generated but overlapping structured discretization grids that periodically exchange information through interpolation. However, high performance computations of such large-scale realistic applications must be handled efficiently on state-of-the-art parallel supercomputers. This paper analyzes the effects of various performance enhancement strategies on the parallel efficiency of an overset grid Navier-Stokes CFD application running on an SGI Origin2000 machinc. Specifically, the role of asynchronous communication, grid splitting, and grid grouping strategies are presented and discussed. Details of a sophisticated graph partitioning technique for grid grouping are also provided. Results indicate that performance depends critically on the level of latency hiding and the quality of load balancing across the processors.
Author
Computational Fluid Dynamics; Computational Grids; Multiblock Grids

20030071624 National Inst. of Standards and Technology, Gaithersburg, MD
Singular Integrals, Image Smoothness, and the Recovery of Texture in Image Deblurring
Carasso, A. S.; 2002; 32 pp.; In English
Report No.(s): PB2003-105744; NISTIR-7005; No Copyright; Avail: CASI; A03, Hardcopy

Total variation (TV) image deblurring is a PDE-based technique that preserves edges, but often eliminates vital small-scale information, or texture. This phenomenon reflects the fact that most natural images are not of bounded variation. The present paper reconsiders the image deblurring problem in Lipshitz (Besov) spaces A(alpha, p, q) wherein a wide class of non-smooth images can be accomodated, and develops a fast FFT-based deblurring method that can recover texture in cases where TV deblurring fails completely. Singular integral mollifiers, such as the Poisson kernel, are used to create an effective new image analysis tool that can calibrate the lack of smoothness in an image.
NTIS
Image Resolution; Integrals; Fast Fourier Transformations

20030071630 Newcastle-upon-Tyne Univ., Newcastle
Canonical Prefixes of Petri Net Unfoldings
Khomenko, V.; Koutny, M.; Vogler, W.; Sep. 2002; 28 pp.
Report No.(s): PB2003-105195; CS-TR-741; Copyright; Avail: National Technical Information Service (NTIS)

In this paper, we develop a general technique for truncating Petri net unfoldings, parameterized according to the level of information about the original unfolding one wants to preserve. Moreover, we propose a new notion of completeness of a truncated unfolding, which with the standard parameters is strictly stronger than that given in, and is more appropriate for the existing model checking algorithms. A key aspect of our approach is an algorithm-independent notion of cut-off events, used to truncate a Petri net unfolding in the existing model checking systems. Such a notion is based on a cutting context and results in the unique canonical prefix of the unfolding. We show that the canonical prefix is complete in the new, stronger sense, and provide necessary and sufficient conditions for its finiteness, as well as upper bounds on its size in certain cases. We then consider the unfolding algorithm presented in, and the parallel unfolding algorithm proposed in. We prove that both algorithms, despite being non-deterministic, generate the canonical prefix. This gives an alternative correctness proof for the former algorithm, and a new (much simpler) proof for the latter one.
NTIS
Petri Nets; Algorithms

20030073489
R-Boundedness is Necessary for Multipliers on H(sub 1)
Hytoenen, T.; 2002; 26 pp.
Report No.(s): PB2003-107119; REPT-A-446; No Copyright; Avail: CASI; A03, Hardcopy

By now it is understood that R-boundedness of the pointwise values of an operator-valued function is intimately connected with the boundedness of the related Fourier-multiplier between Lp-spaces of vector-valued functions.
NTIS
Multipliers; Inequalities

20030075650
Technologies and Tools for High-Performance Distributed Computing
Karonis, N. T.; Jan. 29, 2003; 24 pp.; In English
Report No.(s): DE2003-808724; No Copyright; Avail: Department of Energy Information Bridge

In this project we studied the practical use of the MPI message-passing interface in advanced distributed computing environments. We built on the existing software infrastructure provided by the Globus ToolkitTM, the MPICH portable implementation of MPI, and the MPICH-G integration of MPICH with Globus. As a result of this project we have replaced MPICH-G with its successor MPICH-G2, which is also an integration of MPICH with Globus. MPICH-G2 delivers significant improvements in mes- sage passing performance when compared to its predecessor MPICH-G and was based on superior software design principles resulting in a software base that was much easier to make the functional extensions and improvements we did. Using Globus services we replaced the default implementation of MPI's collective operations in MPICH-G2 with more efficient multilevel topology-aware collective operations which, in turn, led to the development of a new timing methodology for broadcasts. MPICH-G2 was extended to inlcude client/server functionality from the MPI-2 standard to facilitate remote visualization applications and, through the use of MPI idioms, MPICH-G2 provided

application-level control of quality-of-service parameters as well as application-level discovery of underlying Grid-topology information. Finally, MPICH-G2 was successfully used in a number of applications including an award-winning record-setting computation in numerical relativity. In the sections that follow we describe in detail the accomplishments of this project, we present experimental results quantifying the performance improvements, and conclude with a discussion of our applications experiences.
NTIS
Distributed Processing; Software Engineering

20030079963 General Accounting Office, Washington, DC
Information Security: Computer Controls over Key Treasury Internet Payment System
Jul. 2003; 34 pp.
Report No.(s): PB2003-106945; GAO-03-837; No Copyright; Avail: CASI; A03, Hardcopy

Pay.gov is an Internet portal sponsored and managed by the Department of the Treasurys Financial Management Service (FMS) and operated at three Federal Reserve facilities. Pay.gov is intended to allow the public to make certain non-incometax payments to the federal government securely over the Internet. FMS estimates that Pay.gov eventually could annually process 80 million transactions valued at $125 billion annually. Because of the magnitude of transaction volume and dollar value envisioned for Pay.gov, GAO was asked to determine whether FMS (1) conducted a comprehensive security risk assessment and (2) implemented and documented appropriate security measures and controls for the systems protection. GAO recommends that the Commissioner of FMS direct the Pay.gov program manager to implement a number of actions to strengthen security over Pay.gov. The FMS Commissioner concurred with our recommendations and stated that FMS had taken action to correct almost all of the weaknesses that GAO identified and has plans to correct the remaining weaknesses.
NTIS
Computer Security; Control Systems Design

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*.

20030068979 NASA Ames Research Center, Moffett Field, CA, USA
Transmitting Data from Space at Higher Speeds
Laufenberg, Lawrence; Infusion; July 08, 2003; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The CICT Program's Space Communications (SC) Project is responsible for developing technologies that deliver data quickly between Earth and space, and directly to users. To achieve this ambitious goal. the SC Project is providing technologies for building the Space Internet, which will require back-bone networks that pass data from one infrastructure to another. These infrastructures include the Earth-based wide-area and local-area networks. NASAs Tracking and Data Relay Satellite System (TDRSS) that provides links between low-earth orbiting spacecraft, and the ground planetary networks, and the Deep Space Network (DSN).
Derived from text
Deep Space Network; Local Area Networks; Transmission

61
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.

20030068973
A Constraint Satisfaction Neural Network Approach for Data Mining Classification and Association Rules in Breast Cancer Databases
Tourassi, Georgia D.; Jan. 2003; 52 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0516
Report No.(s): AD-A414891; No Copyright; Avail: CASI; A04, Hardcopy

We propose to explore an innovative, data mining (DM) process for application in breast cancer (BC) databases. The DM process is the Constraint Satisfaction Neural Network (CSNN). Contrary to feed-toward networks and statistical models, the CSNN has a non- hierarchical architecture that allows it to be used either as a prediction/classification tool or as an analysis tool for mining association rules in databases. This is a feasibility study to investigate to what degree the CSNN can deliver the above promises for the mammographic diagnosis of breast lesion malignancy. The main objectives of the study are the following: (1) to develop a CSNN for mining a database of patients suspected with BC who underwent breast biopsy; (2) to evaluate the CSNN as a diagnostic tool; (3) to evaluate the CSNN as a patient prototype analysis tool to discover prevalent trends and associations among the variables; (4) to assess the network's robustness with missing data. Initially, the CSNN is intended as a computer-assisted diagnostic tool to help physicians optimize the decision to refer a probably benign breast lesion to short-term follow-up instead of biopsy. Ultimately, the CSNN can be applied as a support tool individualizing the decision process in BC patient management.
DTIC
Neural Nets; Data Management; Information Retrieval

20030068988 NASA Ames Research Center, Moffett Field, CA, USA
Calculation of Rotor Performance and Loads Under Stalled Conditions
Yeo, Hyeonsoo; [2003]; 15 pp.; In English; 59th American Helicopter Society Forum, 6-8 May 2003, Phoenix, AZ, USA; Copyright; Avail: CASI; A03, Hardcopy

Rotor behavior in stalled conditions is investigated using wind tunnel test data of a l/l0-scale CH-47B/C type rotor, which provides a set of test conditions extending from unstalled to light stall to some deep stall conditions over a wide range of advance ratios. The rotor performance measured in the wind tunnel is similar to the main rotor performance measured during the NASA/Army UH-60A Airloads Program, although the two rotors are quite different. The analysis CAMRAD II has been used to predict the rotor performance and loads. Full-scale airfoil test data are corrected for Reynolds number effects for comparison with the model-scale rotor test. The calculated power coefficient shows good correlation with the measurements below stall with the Reynolds number-corrected airfoil table. Various dynamic stall models are used in the calculations. The Boeing model shows the lift augmentation at low advance ratios and the Leishman-Beddoes model shows better correlation of torsion moment than the other models at mu = 0.2. However, the dynamic stall models, in general, show only a small influence on the rotor power and torsion moment predictions especially at higher advance ratios.
Author
Aerodynamic Loads; Airfoils; Reynolds Number; Rotors; Torsion; Wind Tunnel Tests; Computation

20030068991 Naval Postgraduate School, Monterey, CA
Ship Shock Trial Simulation of USS Winston S. Churchill (DDG-81): Surrounding Fluid Effect
Hart, David T.; Mar. 2003; 111 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414919; No Copyright; Avail: CASI; A06, Hardcopy

The USS Winston S. Churchill (DDG-81) shock trial was conducted in May and June of 2001 off the coast of Naval Station Mayport, Florida. Because the USS winston S. Churchill best represented the new line of Flight 11-A Arleigh Burkes, it was chosen to undergo ship shock trials for its class. These trials are necessary in order to evaluate the vulnerability and survivability of the hull and the mission essential equipment in a combat shock environment. However, shock trials are very expensive, require extensive planning and coordination, and represent a potential hazard to the marine environment and its mammals. Computer modeling and simulation are showing themselves to be a plausible alternative in investigating the dynamic response of a ship under these shock trials conditions. This thesis investigates the use of computer ship and fluid modeling, coupled with underwater explosion simulation and compares it to actual shock trial data from the USS Winston S. Churchill. Of particular concern in this study is the amount of fluid that must be modeled to accurately capture the structural response of a frill ship finite element model. Four fluid meshes were constructed and used to study the ship's response to an underwater explosion. Each simulation data was analyzed to determine which mesh best represented the actual ship shock trial results.
DTIC
Computerized Simulation; Shock Tests

20030069051
Developing A Web-based User Interface for Semantic Information Retrieval
Berrios, Daniel C.; Keller, Richard M.; [2003]; 6 pp.; In English; 2nd International Semantic Web Conference: Semantic Web Technologies for Searching and Retrieving Scientific Data Workshop, 20-23 Oct. 2003, Sanibel Island, FL, USA
Contract(s)/Grant(s): NCC2-1006; Copyright; Avail: CASI; A02, Hardcopy

While there are now a number of languages and frameworks that enable computer-based systems to search stored data semantically, the optimal design for effective user interfaces for such systems is still unclear. Such interfaces should mask unnecessary query detail from users, yet still allow them to build queries of arbitrary complexity without significant restrictions. We developed a user interface supporting semantic query generation for Semanticorganizer, a tool used by scientists and engineers at NASA to construct networks of knowledge and data. Through this interface users can select node types, node attributes and node links to build ad-hoc semantic queries for searching the SemanticOrganizer network.
Author
Information Retrieval; Scientists; Programming Languages; Websites

20030071106 Oregon Health Sciences Univ., Portland, OR, USA
Multimodal Interaction for Wearable Augmented Reality Environments
Cohen, Philip R.; Feb. 28, 2003; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0377; Proj-01PRO7322-00
Report No.(s): AD-A414964; No Copyright; Avail: CASI; A03, Hardcopy

We describe an approach to natural 3D multimodal interaction in immersive environments. Our approach fuses symbolic and statistical information from a set of 3D gesture and speech agents, building in part on prior research on disambiguating the user's intent in 2D and 2.5D user interfaces. We present an experimental system architecture that embodies this approach, and provide examples from a preliminary 3D multimodal testbed to explore our ideas in augmented and virtual reality.
DTIC
Architecture (Computers); Virtual Reality

20030071118 Naval Postgraduate School, Monterey, CA
Design and Test of the Cross-Format Schema Protocol (XFSP) for Networked Virtual Environments
Serin, Ekrem; Mar. 2003; 149 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414968; No Copyright; Avail: CASI; A07, Hardcopy

A Networked Virtual Environment (Net-VE) is a distributed software system in which multiple users interact with each other in real time even though these users may be located around the world Zyda 99. Net-VEs gained first attention through a variety of DOD and Academic research projects. After release of the multiplayer game DOOM, the gaming industry captured the idea of interactive multiplayer games. Today there are many popular Internet-based multiplayer games available. Effective networking of diverse entities and systems is a common problem for Networked Virtual Environments. In order to communicate with other entities a variety of communication protocols are used. Historically these communication protocols are 'hard coded' into the software system and all nodes that participate in the environment must identically implement the protocols to interact with others. These communication protocols require authoring and compiling by a trained programmer. When the compiling process is introduced to the networked virtual environment, it detracts the extensibility and dynamicism of the system.
DTIC
Software Engineering; Virtual Reality

20030071125 NASA Ames Research Center, Moffett Field, CA, USA
Developing Visualization Techniques for Semantics-based Information Networks
Keller, Richard M.; Hall, David R.; July 14, 2003; 5 pp.; In English; Workshop on Visualizing Information in Knowledge Engineering, 25-26 Oct. 2003, Sanibel Island, FL, USA; Copyright; Avail: CASI; A01, Hardcopy

Information systems incorporating complex network structured information spaces with a semantic underpinning - such as hypermedia networks, semantic networks, topic maps, and concept maps - are being deployed to solve some of NASA s critical information management problems. This paper describes some of the human interaction and navigation problems associated with complex semantic information spaces and describes a set of new visual interface approaches to address these problems. A key strategy is to leverage semantic knowledge represented within these information spaces to construct abstractions and views that will be meaningful to the human user. Human-computer interaction methodologies will guide the development and evaluation of these approaches, which will benefit deployed NASA systems and also apply to information systems based on the emerging Semantic Web.
Author
Information Systems; Information Management; Semantics

20030071149 Maryland Univ., College Park, MD, USA, NASA Ames Research Center, Moffett Field, CA, USA
CONDUIT: Control Designer's Unified Interface
Levine, William S.; Tischler, Mark B.; February 17, 1999; 5 pp.; In English; 1999 IEEE International Conference on Control Appls., Aug. 1999, HI, USA
Contract(s)/Grant(s): NAG2-1122; RTOP 581-30-22; Copyright; Avail: CASI; A01, Hardcopy

CONDUIT, which stands for control designer's unified interface, is a computer software package. Its purpose is to assist a human control system designer in designing control systems for aircraft. At the present time CONDUIT is being used by most of the major U. S. rotorcraft and fixed-wing aircraft manufacturers to assist in the design of stability and control augmentation systems. Work is also continuing on the development of additional features for CONDUIT, including tools for analyzing the sensitivity of solutions, and on further enhancements to the basic package. The purpose of this paper is to describe CONDUIT, its operation, and the sensitivity tools that are being developed for inclusion in the next release of the package.
Derived from text
Computer Programs; Control Systems Design; Applications Programs (Computers); Aircraft Control; Aircraft Configurations

20030071151 NASA Ames Research Center, Moffett Field, CA, USA
Instrumentation of Java Bytecode for Runtime Analysis
Goldberg, Allen; Haveland, Klaus; [2003]; 9 pp.; In English; Formal Techniques for Java-like Programs, Jul. 2003
Report No.(s): NAS2-00065; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes JSpy, a system for high-level instrumentation of Java bytecode and its use with JPaX, OUT system for runtime analysis of Java programs. JPaX monitors the execution of temporal logic formulas and performs predicative analysis of deadlocks and data races. JSpy s input is an instrumentation specification, which consists of a collection of rules, where a rule is a predicate/action pair The predicate is a conjunction of syntactic constraints on a Java statement, and the action is a description of logging information to be inserted in the bytecode corresponding to the statement. JSpy is built using JTrek an instrumentation package at a lower level of abstraction.
Author
Computer Programs; Run Time (Computers); Systems Analysis

20030071154 NASA Ames Research Center, Moffett Field, CA, USA
Performance of a Heterogeneous Grid Partitioner for N-body Applications
Harvey, Daniel J.; Das, Sajal K.; Biswas, Rupak; June 2003; 24 pp.; In English; 32nd International Conference on Parallel Processing (ICPP)
Contract(s)/Grant(s): RTOP 704-44-54; Copyright; Avail: CASI; A03, Hardcopy

An important characteristic of distributed grids is that they allow geographically separated multicomputers to be tied together in a transparent virtual environment to solve large-scale computational problems. However, many of these applications require effective runtime load balancing for the resulting solutions to be viable. Recently, we developed a latency tolerant partitioner, called MinEX, specifically for use in distributed grid environments. This paper compares the performance of MinEX to that of METIS, a popular multilevel family of partitioners, using simulated heterogeneous grid configurations. A solver for the classical N-body problem is implemented to provide a framework for the comparisons. Experimental results show that MinEX provides superior quality partitions while being competitive to METIS in speed of execution.
Author
Loads (Forces); Many Body Problem; Dynamic Loads

20030071158 Naval Postgraduate School, Monterey, CA
Towards an Interoperability Ontology for Software Development Tools
Hasni, Neji; Mar. 2003; 271 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414998; No Copyright; Avail: CASI; A12, Hardcopy

The automation of software development has long been a goal of software engineering to increase efficiency of the development effort and improve the software product. This efficiency (high productivity with less software faults) results from best practices in building, managing and testing software projects via the use of these automated tools and processes. However, each software development tool has its own characteristics, semantics, objects, and concepts. While there have been significant results achieved by use of automated software development tools (coming mainly from the widespread increase of customers' adoption of these tools), there remains many challenging obstacles: lack of communication between the different software

development tools, poor shared understanding; use of different syntax and concepts between tools, limits in interoperability between tools, absence of a unifying conceptual models and ideas between tools, and redundant work and cross purposes between tools. The approach undertaken in this thesis to overcome these obstacles was to construct a 'pilot' ontology that is extensible. We applied the Feature-Oriented Domain Analysis Approach to capture the commonalities between two software development tools (Rational Software Corporation's RequisitePro, a main-stream, complex, commercial tool), and a software prototyping tool (the Software Engineering Automation tool (SEATools), a research model with tool support for developing executable software prototypes) and developed an ontology for the software development tools using the Protege-2000 system. The ontology, expressed in UML, promotes interoperability and enhanced communication.
DTIC
Automation; Interoperability; Software Development Tools; Computer Programming

20030071159
Evaluation of Personnel Parameters in Software Cost Estimating Models
Quick, Steven L.; Mar. 25, 2003; 156 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414997; AFIT/GCA/ENV/03-07; No Copyright; Avail: CASI; A08, Hardcopy

Software capabilities have steadily increased over the last half century. The Department of Defense has seized this increased capability and used it to advance the warfighter's weapon systems However, this dependence on software capabilities has come with enormous cost. The risks of software development must be understood to develop an accurate cost estimate.
DTIC
Computer Programming; Cost Estimates; Software Engineering; Personnel

20030071162 NASA Ames Research Center, Moffett Field, CA, USA, QSS Group, Inc., Moffett Field, CA, USA
Transitioning from Software Requirements Models to Design Models
Lowry, Michael, Technical Monitor; Whittle, Jon; [2003]; 18 pp.; In English; NASA Software Assurance Symposium, 30 Jul. 2003, WV, USA
Contract(s)/Grant(s): NAS2-00065; No Copyright; Avail: CASI; A03, Hardcopy

Summary: 1. Proof-of-concept of state machine synthesis from scenarios - CTAS case study. 2. CTAS team wants to use the syntheses algorithm to validate trajectory generation. 3. Extending synthesis algorithm towards requirements validation: (a) scenario relationships' (b) methodology for generalizing/refining scenarios, and (c) interaction patterns to control synthesis. 4. Initial ideas tested on conflict detection scenarios.
Derived from text
Computer Programming; Models; Refining; Design Analysis

20030071171 Naval Postgraduate School, Monterey, CA
A Hypermedia Representation of a Taxonomy of Usability Characteristics in Virtual Environments
Tokgoz, Asim; Mar. 2003; 162 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415046; No Copyright; Avail: CASI; A08, Hardcopy

The goal of much work in Virtual Environments (VEs) to date has been to produce innovative technology but until recently, there has been very little user-centered, usability-focused research in VEs that will turn interesting applications into usable ones. There is beginning to be at least some awareness of the need for usability engineering within the VE community. A handful of articles address usability concerns for particular parts of the VE usability space. From this point Gabbard and Hix 1997 has proposed a taxonomy about usability characteristics in VEs to help VE usability engineers and designers. This taxonomy can be used to learn characteristics of VEs or to develop usability engineering methodologies specifically for VEs. In this study, we built hypermedia representation of the taxonomy and evaluated the effectiveness of the user interface by using scenario based formative usability engineering method that developed by Hix and Hartson 1993. First, we discussed the need for usability engineering for VEs and took a look at a proposed usability engineering methodology Gabbard and others, 1999 for VEs. Second we implemented hypermedia based web-site taxonomy and then evaluated it iteratively. Last, we added a new study to show the dynamic nature of web-site application.
DTIC
Taxonomy; Virtual Reality; Computer Programming; Programming Environments

20030071189 Newcastle-upon-Tyne Univ., Newcastle

Detecting State Coding Conflicts in STGs Using Integer Programming

Khomenko, V.; Koutny, N.; Yakovlev, A.; Sep. 2002; 28 pp.

Report No.(s): PB2003-105192; CS-TR-736; Copyright; Avail: National Technical Information Service (NTIS)

The behavior of asynchronous circuits is often described by Signal Transition Graphs (STGs), which are Petri nets whose transitions are interpreted as rising and falling edges of signals. One of the crucial problems in the synthesis of such circuits is that of identifying whether an STG satisfies the Complete State Coding (CSC) or Unique State Coding (USC) requirements, e.g. by using model-checking based on the reachability graph of an STG. In this paper, we avoid constructing the reachability graph of an STG, which can lead to state space explosion and instead use only the information about causality and conflicts between the events involved in a finite and complete prefix of its unfolding. The model-checking algorithm is derived by adopting the integer programming approach. Following the basic formulation of the state coding conflict relationship, we present some problem-specific optimization rules. This technique leads not only to huge memory savings when compared to the CSC (or USC) detection methods based on reachability graphs, but also to significant speedups in many cases. In addition, the method allows one to easily derive execution paths leading to an encoding conflict. Finally, the approach is also extended for checking the normalcy property of STGs, which is a necessary condition for their implementability using gates whose characteristic functions are monotonic.

NTIS

Programming; Coding; Circuits

20030071205 Newcastle-upon-Tyne Univ., Newcastle

Verifying an Infinite Systolic Algorithm using Third-Order Algebraic Methods

Steggles, L. J.; May 2003; 24 pp.

Report No.(s): PB2003-105212; CS-TR-795; Copyright; Avail: National Technical Information Service (NTIS)

We consider using third-order algebraic methods to specify and equationally verify an infinite systolic algorithm for convolution. The detailed case study we present provides an interesting insight into the use of third-order algebra as a formal framework for developing families of computing systems. We consider using purely equational reasoning in our verification proofs and in particular, using the rule of free variable induction. We conclude by considering how our verification proofs can be automated using rewriting techniques.

NTIS

Algebra; Program Verification (Computers); Algorithms

20030071252

The Generalizability of Private Sector Research on Software Project Management in Two USAF Organizations: An Exploratory Study

Garman, Michael R.; Mar. 2003; 89 pp.; In English

Report No.(s): AD-A415138; AFIT/GIR/ENV/03-04; No Copyright; Avail: CASI; A05, Hardcopy

Project managers typically set three success criteria for their projects: meet specifications, be on time, and be on budget. However, software projects frequently fail to meet these criteria. Software engineers, acquisition officers, and project managers have all studied this issue and made recommendations for achieving success. But most of this research in peer reviewed journals has focused on the private sector. Researchers have also identified software acquisitions as one of the major differences between the private sector and public sector MIS. This indicates that the elements for a successful software project in the public sector may be different from the private sector. Private sector project success depends on many elements. Three of them are user interaction with the project's development, critical success factors, and how the project manager prioritizes the traditional success criteria. High user interaction causes high customer satisfaction, even when the traditional success criteria are not completely met. Critical success factors are those factors a project manager must properly handle to avoid failure, And priorities influence which success criteria the project manager will most likely succeed in meeting. Through a survey of software project managers at two USAF software development organizations, my research discovered the following: 1) Air Force software project managers' top priority is fulfilling requirements, 2) User interaction during the software life cycle strongly influences user satisfaction with the final product, and 3) Air Force and private sector projects share many of the same critical success factors for nonweapon systems, but there are still some sharp differences.

DTIC

Software Engineering; Project Management

20030071253 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Automatic Relative Debugging of OpenMP Programs
Matthews, Gregory; Hood, Robert; Jin, Hao-Qiang; Johnson, Stephen; Leggett, Peter; [2003]; 5 pp.; In English; European Workshop on OpenMP, 22-26 Sep. 2003, Aachen, Germany
Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; Copyright; Avail: CASI; A01, Hardcopy

In this work we show how automatic relative debugging can be used to find differences in computation between a serial program and an OpenMP parallel version of that program. Backtracking and re-execution are used to determine the first OpenMP parallel region that produces a difference in computation that may lead to an incorrect value the user has indicated. Tool-parallelized programs are addressed by utilizing static analysis and directive information from the parallelization tool. Manually-parallelized programs are addressed as well by performing data dependence and directive analysis.
Author
Program Verification (Computers); Parallel Programming

20030071692 Defence Science and Technology Organisation, Edinburgh, Australia
Tactical Data Link Systems and the Australian Defence Force (ADF): Technology Developments and Interoperability Issues
Asenstorfer, John; Cox, Thomas; Wilksch, Darren; August 2003; 52 pp.; In English
Report No.(s): DSTO-TR-1470; DODA-AR-012-846; Copyright; Avail: Other Sources

With the increasing importance of sharing computer-based information between tactical platforms, the Australian Defence Force (ADF) is aware of the need to enhance its ability to distribute such information, to those who need it, in a timely fashion. There are many systems available or being developed that can contribute to meeting this requirement. This report describes the capabilities provided by a selection of technologies, considered to be of potential relevance to the ADF. This includes enhancements to Link-16, the Improved Data Modem (IDM), Link-22 and the Common Data Link (CDL). A discussion of the interoperability issues that need to be considered when implementing any such systems in the ADF, is also included.
Author
Interoperability; Data Links; Computer Techniques

20030073504 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Modeling and Simulation of Dynamically Tuned Girometer using an Electronics CAD
Garrotti, Jose Carlos; 2003; 152 pp.; In Portuguese; CD-ROM contains full text document in PDF format and color illustrations. PDF also has many blank pages.
Report No.(s): INPE-9702-TDI/856; Copyright; Avail: CASI; C01, CD-ROM; A08, Hardcopy

The motivation of this work is the simulation of the Dry Tuned Gyroscope in the environment of an Electronics CAD. The emphasis is on the development of the loop electronics with the greatest fidelity as possible. Initially a study of the equations of motion of the sensor is made. The torquer and the pick-offs are also modeled. The result is a transfer function of the complete sensor in open loop. Using the angular position of the rotor the control loop is closed and the objective is null error at steady state for a constant input. The location of the roots of the control loop are determined by means of the use of the proportional gain. The roots are allocated so that a damping factor of 0.7 and an overshoot of 20% with the least time of rise is obtained in the case of an input of unitary step. For that development Matlab is used. The model is then adapted to the Electronics CAD environment. Step and sinusoidal rate inputs are applied to the system. The RMS contribution of the noise at the output of the electronics is obtained. The results of the saturation of the electronics is observed and also the effects of the cross-coupling terms. As a result of the application of the above presented methodology one obtains an electronics that can be closer to what can be obtained by the use of commercially available components.
Author
Gyroscopes; Computer Aided Design; Simulation

20030075643 Los Alamos National Lab., NM
Operation of the Bayes Inference Engine
Hanson, K. M.; Cunningham, G. S.; 1999; 18 pp.; In English
Report No.(s): DE2003-760017; LA-UR-99-4253; No Copyright; Avail: Department of Energy Information Bridge

We have developed a computer application, called the Bayes Inference Engine, to enable us to make inferences about models of a physical object from radiographs taken of it. In the BIE calculational models are represented by a dataflow diagram that can be manipulated by the analyst in a graphical-programming environment. We demonstrate the operation of

the BIE in terms of examples of two-dimensional tomographic reconstruction including uncertainty estimation.
NTIS
Mathematical Models; Bayes Theorem; Computer Programs

20030075721 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Introduction to Data Input in OpenDix: '.dx', '.general' and '.grb' Formats
Blaz, Roberto; Domingues, Margarete Oliveira; Mendes, Odim, Jr.; January 2003; 2 pp.; In Portuguese
Report No.(s): INPE-9558-NTC/351; Copyright; Avail: CASI; A01, Hardcopy

OpenDX is a free computer program similar to IBM's Data Explorer (additional information can be accessed at http://www.openddx.org). It consists of a tool package to handle, process, change, view and animate data in various platforms and can also be used for viewing data at the parallel processing level.
Author
Computer Programs; Data Processing

20030077826 Boeing Co., Saint Louis, MO, USA
Transport Layer Abstraction in Event Channels for Embedded Systems
Sharp, David; Pla, Edward; Pratap M, Ravi; Cytron, Ron K.; May 2003; 11 pp.; In English
Contract(s)/Grant(s): F33615-00-C-3048; Proj-ARPF
Report No.(s): AD-A415061; AFRL-VA-WP-TP-2003-312; No Copyright; Avail: CASI; A03, Hardcopy

As embedded systems increase in complexity and begin to participate in distributed systems, the need for middleware in the building of such systems becomes imperative. However, the use of middleware that fully implements such standards can impose a significant increase in footprint for an application, making it unsuitable for use in embedded systems. We consider the use of a standard CORBA event channel in a setting where distribution and inter-language support are unnecessary. We report our experience in applying aspects to abstract the transport layer (CORBA) of the event channel into a selectable feature. Thus, enabling or disabling CORBA for a specific application can be decided at build-time, by merely selecting CORBA as a feature. We describe the patterns used to achieve this abstraction and present footprint and throughput results showing the effect of CORBA on automatically derived subsets of the event channel.
DTIC
Computer Programs; Footprints

20030077840 Naval Postgraduate School, Monterey, CA
Speeding Up a Path-Based Policy Language Compiler
Guven, Ahmet; Mar. 2003; 167 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414923; No Copyright; Avail: CASI; A08, Hardcopy

Policy based network management has an increasing importance depending on the increasing importance of distributed large networks and the growing number of services that run on them. Policy languages, which enable users define policies in a formal language, are one of the main tools of policy management. Even though there are policy languages like PFDL or RPSL, none of them has the capability of a robust conflict detection and resolution focused on policy. A new Policy Language, Pathbased Policy Language (PPL) 10, has been developed recently. It encompasses as many of the features addressed in the other policy languages as possible, as well as providing means for testing policies for consistency and defining both static and dynamic policies. PPL's pathbased approach enables establishing policies that will be based on path, like Integrated Services, as well as non path based policies, which are more suited for Differentiated Services. The most important, PPL provides the ability to detect and resolve conflicts between by translating policy rules into formal logic statement and checking them with a Prolog program.
DTIC
Policies; Computer Programming

20030077843 Naval Postgraduate School, Monterey, CA
Analyzing Anti-Terrorist Tactical Effectiveness of Picket Boats for Force Protection of Navy Ships Using X3D Graphics and Agent-Based Simulation
Harney, James W.; Mar. 2003; 252 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415066; No Copyright; Avail: CASI; A12, Hardcopy

Despite the many advances achieved within both Modeling and Simulation and Information Technology over the past

several decades, practical application of such technology remains under-utilized by operational units in the USA Navy. Furthermore, when such technology has been deployed in the last decade it has been to exercise operator proficiency or increase C41 battlespace awareness. Few tools have allowed operational warfighters to run what-if' simulation scenarios to aid in development of tactical plans for executing published doctrine. The approach taken in this thesis is to select an exemplar warfare area, in this case Anti-Terrorism and Force Protection for Navy ships, and through research and development to identify, develop, and deploy the necessary modeling and simulation (M & S) technologies to demonstrate a prototypical planning tool that can be used by today's deployed warfighter. All research and work is conducted in a web-based, user-centric' fashion utilizing a combination of user-driven and agent-based control of entities for simulation iterations, along with various open source technologies which include Extensible 3D Graphics (X3D), Scalable Vector Graphics (SVG), and Extensible Markup Language (XML).
DTIC
Information Systems; Warfare

20030077848 Naval Postgraduate School, Monterey, CA
Distributed Architecture for the Object-Oriented Method for Interoperability
Lawler, George M.; Mar. 2003; 157 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415087; No Copyright; Avail: CASI; A08, Hardcopy

The Department of Defense (DoD) is both challenged by the quest for interoperability and capable of the bottom-up development of a solution. The predominant method for achieving interoperability is the development of an intermediate representation that provides a common integration language or data model. An example is Young's Object-Oriented Method for Interoperability (OOMI), which produces a Federation Interoperability Object Model (FIOM) for the resolution of heterogeneities in representation and view of a real-world entity. An FIOM generates a standard for interoperability by associating the nonstandard, component system data models into an extersible lattice, which captures translations that resolve data modeling differences.
DTIC
Interoperability; Object-Oriented Programming; Modulus Of Elasticity

20030077853 Texas Univ., Austin, TX
Diver Charting and Graphical Display
Krueger, Kenneth L.; May 5, 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0173
Report No.(s): AD-A415201; No Copyright; Avail: CASI; A03, Hardcopy

The Diver Charting and Graphical Display (DCGD) software application was developed as a mission planning and data analysis tool for divers using an Integrated Navigation Sonar Sensor (INSS). It is a Microsoft Windows based graphical user interface application that can be installed and executed on computers using a Microsoft Windows based operating systems. The need and usefulness of this tool becomes apparent when one understands what is required to plan, execute and report results from a typical mine countermeasures (MCM) mission using an lNSS. The INSS is a combined navigation and acoustic imaging device used by divers to navigate underwater, search for objects, and mark their locations. To execute an effective mission, a well defined area must be completely searched with no gaps left. The DCGD software tool provides a framework to plan missions using optional geo-rectified overhead images as a background underlay and then adding geographically referenced symbols to create a dive plan virtual map. That map, consisting of a navigation baseline, waypoints and marked positions, is downloaded into the diver's unit (the INSS) and used during the mission. This project seeks to enhance mission MCM effectiveness with the fusion of sensor data collected by multiple divers and/or multiple dive missions into a unified database of areas surveyed by divers. The principle component of the system will be a software module resident on a PC. This software will communicate through data files with INSS units and merge these data sets to form a single database for a group of dive missions. An intuitive operator interface will provide for interaction with and evaluation of a merged data set. Examples of such interaction and evaluation include selecting a particular target mark and reviewing all sonar images of the object corresponding to the mark, developing a near-real-time assessment of dive mission area coverage and effectiveness, and planning future dive missions.
DTIC
Computer Graphics; Navigation Aids; Software Development Tools

20030080008 Academy of Sciences (USSR), Moscow, USSR
Modification of ANEOS for Rocks in Compression
Ivanov, B. A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

The Analytical Equation of State (ANEOS) is a useful computer code to generate equations of state (EOS) for rocks and minerals. An accurate EOS is one of essential points necessary for the numerical modeling of impact events. We analyze here a possibility to use a 'standard' ANEOS in a 'non-standard' way to make more flexible the procedure of an EOS construction. Author

Computer Programs; Computerized Simulation; Equations Of State; Compressibility Effects

20030080038 New Brunswick Univ., Fredericton, New Brunswick, Canada
Impact Melting in Sedimentary Target Rocks?
Osinski, G. R.; Spray, J. G.; Grieve, R. A. F.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Sedimentary rocks are present in the target sequence of approx. 70% of the world's known impact structures. One of the outstanding questions in impact cratering studies is: do sedimentary rocks undergo impact melting? This question cannot be addressed through experimentation in the laboratory, which is limited to impact velocities generally below that required for wholesale melting. Numerical and computer-based modeling may offer some important information, however, as Pierazzo et al. note, there is no good model for melt production from impact craters in sedimentary targets . Studies of naturally shocked rocks, therefore, offer the only true ground-truth data on the response of sedimentary rocks to impact. We have carried out detailed field and analytical studies of naturally shocked sedimentary rocks that will hopefully provide constraints for future modeling.
Derived from text

Impact Velocity; Melting; Sedimentary Rocks; Mathematical Models

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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.

20030068964 Stanford Univ., Stanford, CA
TRIAD: Translating Relaying Internetwork Architecture Integrating Active Directories: Final Report
Cheriton, David R.; May 29, 2003; 27 pp.; In English
Contract(s)/Grant(s): MDA972-99-C-0024; ARPA ORDER-H719
Report No.(s): AD-A414840; No Copyright; Avail: CASI; A03, Hardcopy

The TRIAD project addresses a crisis in the Internet architecture that has arisen because the original architecture has been significantly compromised to support content distribution and NAT, reducing the robustness and the security of Internet applications, yet IPv6 does not address these problems fully and shows no immediate prospect of being significantly deployed. This research developed and demonstrated the benefits of a new/revised Internet architecture in which all endpoints and (multicast) channels are identified by name rather than address. This simple change in Internet design leads to a consequential set of changes, including name-based checksums, integrated naming and routing, unified transport, secure internet access, feedback-based routing and a number of other innovations that dramatically improve the availability and security of the Internet without imposing the gratuitous cost of changing to IPv6, which fails to address these issue. TRIAD's revolutionary approach to Internet architecture thus allows multi-dimensional scaling that is particularly suitable for future military needs, including very small-scale embedded systems and distributed command and control.
DTIC

Internets; Computer Information Security

20030071163 Naval Postgraduate School, Monterey, CA
A Generic Software Architecture for Deception-Based Intrusion Detection and Response Systems
Uzuncaova, Engin; Mar. 2003; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415021; No Copyright; Avail: CASI; A05, Hardcopy

Today, intrusion detection systems provide for detecting intrusive patterns of interaction. Although the responses of such systems are typically limited to primitive actions, they can be supplemented with deception-based strategies. We propose a generic software architecture combining intrusion detection and deceptive response capabilities in a uniform structure. Detecting and responding to attacks are realized via runtime instrumentation of kernel-based modules. The architecture provides for dynamically adjusting system performance to maintain continuity and integrity of both legitimate services and security activities.
DTIC
Warning Systems; Software Engineering; Architecture (Computers); Intrusion Detection (Computers)

20030071165 Naval Postgraduate School, Monterey, CA
How Intrusion Detection Can Improve Software Decoy Applications
Monteiro, Valter, Jr; Mar. 2003; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415028; No Copyright; Avail: CASI; A05, Hardcopy
This research concerns information security and computer-network defense. It addresses how to handle the information of log files and intrusion-detection systems to recognize when a system is under attack. But the goal is not the usual one of denying access to the attacker but providing a justification for deceptive actions to fool the attacker. We implemented a simple demonstration of how two different kinds of open-source intrusion-detection systems can efficiently pool data for this purpose.
DTIC
Computer Networks; Computer Information Security; Intrusion Detection (Computers); Software Engineering

20030071190
Fundamental Concepts of Dependability
Avizienis, A.; Laprie, J. C.; Randell, B.; Sep. 2002; 28 pp.; In English
Report No.(s): PB2003-105194; CS-TR-739; Copyright; Avail: National Technical Information Service (NTIS)
Dependability is the system property that integrates such attributes as reliability, availability, safety, security, survivability, maintainability. The aim of the presentation is to summarize the fundamental concepts of dependability. After a historical perspective, definitions of dependability are given. A structured view of dependability follows, according to (1) the threats, i.e., faults, errors and failures; (2) the attributes; and (3) the means for dependability that are fault prevention, fault removal and fault forecasting.
NTIS
Distributed Processing; Reliability; Computer Systems Performance

20030071212 Air Force Inst. of Tech., Wright-Patterson AFB, OH, USA
Outsourcing Information Technology and the Insider Threat
Caruso, Valerie L.; Mar. 2003; 145 pp.; In English
Report No.(s): AD-A415113; AFIT/GIR/ENG/03-01; No Copyright; Avail: CASI; A07, Hardcopy
As one of our nation's top critical infrastructures, telecommunications is an essential element of many aspects of our lives upon which we, as a society, are becoming increasingly dependent. Computers, digital telephone switches, and interconnected information technology (IT) systems impact finances, travel, infrastructure management, and missions of national defense. This research examined whether the trend in increased outsourcing of information technology systems is a significant contributing factor to a reportedly increasing amount of insider attacks. In light of changing social, global economic, and technological conditions, the paradigm in which risk analysis, management practices, and operational and personnel security practices are applied to protect information has shifted over the last decade. A comprehensive model of the discursive nature of the insider threat in the outsourced IT environment was developed using a qualitative grounded theory approach put forth by Glaser and Strauss in 1967. The theory generated by this research suggests a multidimensional real and growing threat resulting from outsourced IT as well as preconditions for continued future growth of the insider threat phenomenon.
DTIC
Information Systems; Security; Telecommunication

20030071237 Computer Sciences Corp., Moffett Field, CA, USA
Comparing the OpenMP, MPI, and Hybrid Programming Paradigm on an SMP Cluster
Jost, Gabriele; Jin, Haoqiang; anMey, Dieter; Hatay, Ferhat F.; September 23, 2003; 7 pp.; In English; European Workshop on OpenMP and Applications 2003, 23-26 Sep. 2003, Anachen, Germany
Contract(s)/Grant(s): NAS2-14303; DTTS59-99-D-00437; NASA Order A-61812-D; Copyright; Avail: Other Sources

With the advent of parallel hardware and software technologies users are faced with the challenge to choose a programming paradigm best suited for the underlying computer architecture. With the current trend in parallel computer architectures towards clusters of shared memory symmetric multi-processors (SMP), parallel programming techniques have evolved to support parallelism beyond a single level. Which programming paradigm is the best will depend on the nature of the given problem, the hardware architecture, and the available software. In this study we will compare different programming paradigms for the parallelization of a selected benchmark application on a cluster of SMP nodes. We compare the timings of different implementations of the same CFD benchmark application employing the same numerical algorithm on a cluster of Sun Fire SMP nodes. The rest of the paper is structured as follows: In section 2 we briefly discuss the programming models under consideration. We describe our compute platform in section 3. The different implementations of our benchmark code are described in section 4 and the performance results are presented in section 5. We conclude our study in section 6.
Author
Parallel Programming; Architecture (Computers)

20030071241 AMTI, USA
IPG Job Manager v2.0 Design Documentation
Hu, Chaumin; 29 May 2003; 9 pp.; In English
Contract(s)/Grant(s): NASA Order A-61812-D; DTTS59-99-D-00437; No Copyright; Avail: CASI; A02, Hardcopy

This viewgraph presentation provides a high-level design of the IPG Job Manager, and satisfies its Master Requirement Specification v2.0 Revision 1.0, 01/29/2003. The presentation includes a Software Architecture/Functional Overview with the following: Job Model; Job Manager Client/Server Architecture; Job Manager Client (Job Manager Client Class Diagram and Job Manager Client Activity Diagram); Job Manager Server (Job Manager Client Class Diagram and Job Manager Client Activity Diagram); Development Environment; Project Plan; Requirement Traceability.
Derived from text
Architecture (Computers); Computer Systems Design; Client Server Systems

20030071243
Visualization of Career-Related Computer-Mediated Communication for Increased Knowledge Management
Grayson, Marc A.; Mar. 2003; 109 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415132; AFIT/GIR/ENV/03-05; No Copyright; Avail: CASI; A06, Hardcopy

Retention and retrieval of organizational memory has been the concentration of many conceptualized models of an organizational memory information system (OMIS). This thesis presents an extended view for system development of an OMIS from a knowledge management perspective. The USA Air Force maintains various career-related mailing lists (listservs) for information technology (IT) specialists sponsored by the Air Force Communications Agency (AFCA). AFCA has realized the importance of monitoring the communication for patterns in content and behavior. This thesis details an experimental study, which includes a repository of computer-mediated communication (CMC) of IT specialists, analyzed by software created for this study, the OrgDiscovery system. This system is designed to visualize the content and behavior patterns of computer-mediated communication. The purpose of this study is to show that visualization of mailing list communication provides a more usable method to make conclusions about the participants of mailing lists versus the text-based Microsoft Outlook. M.S. Outlook is the mail program currently being used by management to store and review mailing list emails.
DTIC
Memory (Computers); Systems Engineering

20030071255 Research Inst. for Advanced Computer Science, Moffett Field, CA, USA
Discovery Systems
Pell, Barney;]2003]; 17 pp.; In English; IJCAI 03: Workshop in Information Integration using the Web, 12 Aug. 2003, Acapulco, Mexico; No Copyright; Avail: CASI; A03, Hardcopy

A viewgraph presentation on NASA's Discovery Systems Project is given. The topics of discussion include: 1) NASA's Computing Information and Communications Technology Program; 2) Discovery Systems Program; and 3) Ideas for Information Integration Using the Web.
CASI
NASA Programs; Computer Systems Programs; Systems Engineering; Information Adaptive System

20030075788 Naval Postgraduate School, Monterey, CA
Metric Methodology for the Creation of Environments and Processes to Certify a Component: The NRL Pump
Holmgren, Jonathan S., Sr; Mar. 2003; 175 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415064; No Copyright; Avail: CASI; A08, Hardcopy

Information superiority has many components. Of critical importance is information security. Over forty years ago, when information security for computer based systems started being discussed, the military leadership looked for general-purpose, high-assurance, multi-level secure (MLS) computers and software. Information is compiled at various data sensitivity levels, but it also incorporates low-level data with high-level data to provide the necessary information at the system high-level being evaluated. What is the best way to get the low-level data to the high-level system/user without compromising the high-level system? One proposed solution is the Naval Research Laboratory's (NRL) Network Pump (NP) to prevent unauthorized information flow between competitors of different security levels. To incorporate the NP into the DoD infrastructure it is necessary to get the NP through the hurdle of Certification and Accreditation. The NRL has produced and provided many useful documents for the C&A of the NP, but the key requirement for Certification and Accreditation is the creation of a Protection Profile and an understanding of the DITSCAP requirements and process. This thesis creates a Protection Profile for the NP along with a draft Type SSAA for Certification and Accreditation of the NP.
DTIC
Computer Information Security; Computer Programs

20030077857 Army Forces Command, Fort McPherson, GA, USA
ILOVEYOU Virus Lessons Learned Report
Apr. 29, 2003; 67 pp.; In English
Report No.(s): AD-A415104; No Copyright; Avail: CASI; A04, Hardcopy

On 4 May OO the 'lLOVEYOU' Virus, also known as the 'Love Bug', originated in the Philippines and wormed its way into government and business E-mail systems around the globe from Australia and Hong Kong westward through Asia, Europe, and the U.S, including throughout HQ FORSCOM and its subordinate commands. The 'lLOVEYOU' Virus spread about 15 times faster than last year's Melissa computer virus. The program's rapid proliferation brought E-mail Systems worldwide to a grinding halt forcing technicians to take hundreds of systems off-line. The virus was spread through an E-mail attachment designed to propagate the virus message automatically throughout an agency's Global Email Address Directory. Unsuspecting users who opened the attachment automatically caused the virus to start spreading throughout their agencies' E-mail System. This overloaded E- mail servers and caused technicians to shut down servers to assess what was happening and attempt to fix the problem. The virus spread throughout Army networks before Army anti-virus software updates that could detect and remove it were available. FORSCOM DOIMs and activities responded quickly to contain the virus but in the process, email service was impacted. The impact of the virus as reported to the Army Computer Emergency Response Team (ACERT) is: workstations infected - 2258, manhours lost - 12,010, estimated cost - $79.2K.
DTIC
Electronic Mail; Computer Viruses

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*.

20030071278 NAVAL POSTGRADUATE SCHOOL MONTEREY CA, Monterey, CA, USA
A Comparison of Computational Cognitive Models: Agent-Based Systems Versus Rule-Based Architectures
Oeltjen, Craig L.; Mar. 2003; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415186; No Copyright; Avail: CASI; A05, Hardcopy

Increased operational costs and reductions in force size are two of the major factors driving the need for improved computer simulations within the military community. Human performance models are used in various aspects of simulation, including the control of computer-generated forces, as tactical decision aides, in intelligent tutoring systems, and in new system design. This research compares two categories of human performance models: multi-agent systems and rule-based architectures. Each model has its own strengths and weaknesses and is best suited for certain applications. Complex military simulations need human performance models that take advantage of the strengths of more than one type of model. This study compares the implementation and performance of these two models, and demonstrates the need for hybrid systems that employ

the best aspects of each for a given situation. The thesis is organized as follows: Chapter II discusses the background of naturalistic decision making and provides overviews of the following computational cognitive architectures: Adaptive Control of Thought-Rational (ACT-R); Soar; COGnition as a NEtwork of Tasks (COGNET); Java Expert System Shell (JESS); Operator Model ARchitecture (OMAR); Micro Saint; Neural Networks; and Agent-Based Systems. In Chapter III, the two models are applied to the decision making problems of the Officer of the Deck onboard a submarine as he maneuvers the vessel to carry out the assigned mission. His highest goals are to avoid running aground, to avoid colliding with another vessel or stationary navigation hazard, to remain within the assigned operating area boundaries, and when these safety goals are met, to carry out the assigned mission. Chapter IV discusses the application of the agent-based model to the problem, and chapter V discusses the application of the rule-based model to the problem. Chapter VI compares the two models. Chapter VII provides conclusions and recommendations for future work. (9 r7
DTIC
Computerized Simulation; Decision Making; Problem Solving

20030075651
Sensor Guided Control and Navigation with Intelligent Machines
Ghosh, B. K.; Mar. 26, 2001; 54 pp.; In English
Report No.(s): DE2003-809368; No Copyright; Avail: Department of Energy Information Bridge

The report discusses dynamical systems approach to problems in robust control of possibly time varying linear systems, problems in vision and visually guided control and finally applications of these control techniques to intelligent navigation with a mobile platform. Robust design of a controller for a time varying system essentially deals with the problem of synthesizing a controller that can adapt to sudden changes in the parameters of the plant and can maintain stability. The approach presented in the report is to design a compensator that simultaneously stabilizes each and every possible modes of the plant as the parameters undergo sudden and unexpected changes. Such changes can in fact be detected by a visual sensor and hence visually guided control problems are studied as a natural consequence. The problem here is to detect parameters of the plant and maintain stability in the closed loop using a c.c.d camera as a sensor. The main result discussed in the report is the role of perspective systems theory that was developed in order to analyze such a detection and control problem. The robust control algorithms and the visually guided control algorithms are applied in the context of a PUMA 560 robot arm control where the goal is to visually locate a moving part on a mobile turntable. Such problems are of paramount importance in manufacturing with a certain lack of structure. Sensor guided control problems are extended to problems in robot navigation using a NOMADIC mobile platform with a c.c.d and a laser range finder as sensors. The location and map building problems are studied with the objective of navigation in an unstructured terrain.
NTIS
Robots; Visual Control

20030082116 Research and Technology Organization, Neuilly-sur-Seine, France
Multilingual Speech and Language Processing
April 2003; 84 pp.; In English; Multilingual Speech and Language Processing, 8 Sep. 2001, Aalborg, Denmark; See also 20030082117 - 20030082128
Report No.(s): RTO-MP-066; AC/323(IST-025)TP/21; Copyright; Avail: CASI; A05, Hardcopy

This volume contains the 12 papers, presented in 4 sessions at the Information Systems Technology Panel Workshop held in Aalborg, Denmark on 8th September 2001. The papers presented covered the following headings: N4 Corpus and Speaker Identification; Non-Native Speech; Language Identification and Multilingual Applications; and Speech Recognition.
Author
Speech Recognition; Languages; Pattern Recognition; Conferences; Voice Communication

20030082117 Delegation Generale de l'Armement, Arcueil, France
The NATO Native and Non-Native (N4) Speech Corpus
Benarousse, Laurent; Geoffrois, Edouard; Grieco, John; Series, Robert; Steeneken, Herman; Stumpf, Hans; Swail, Carl; Thiel, Dieter; Multilingual Speech and Language Processing; April 2003, pp. 1-1 - 1-3; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A01, Hardcopy

The NATO Native and Non-Native (N4) corpus has been developed by the NATO research group on Speech and Language Technology, in order to provide a military oriented database for multilingual and non-native speech processing studies. Speech data has been recorded in the Naval transmission training centers of four countries (Germany, The

Netherlands, UK and Canada). The material mainly consists in NATO English procedure between ships. In addition, the same speakers read a text ('The north wind and the sun') both in English and in their mother tongue. The number of speakers per country ranges from 11 to 51, for a total of 115. The duration of speech ranges from 1.6h to 3.0h, for a total of around 9.5h. This corpus can be used for various studies, including the influence of non-nativeness on speech, language and speaker recognition, and accent recognition.
Author
Speech Recognition; Data Bases; Articulation (Speech); Languages

20030082118 Massachusetts Inst. of Tech., Lexington, MA, USA
Preliminary Speaker Recognition Experiments on the NATO N4 Corpus
Zissman, M. A.; vanBuuren, R. A.; Grieco, J. J.; Reynolds, D. A.; Steeneken, H. J. M.; Huggins, M. C.; Multilingual Speech and Language Processing; April 2003, pp. 2-1 - 2-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

The NATO N4 corpus contains speech collected at naval training schools within several NATO countries. The speech utterances comprising the corpus are short, tactical transmissions typical of NATO naval communications. In this paper, we report the results of some preliminary speaker recognition experiments on the N4 corpus. The corpus was intended to support development of automatic speech processing systems for tactical military applications . We compare the performance of three speaker recognition systems developed at TNO Human Factors, the US Air Force Research Laboratory, Information Directorate and MIT Lincoln Laboratory on the segment of N4 data collected in the Netherlands. Performance is reported as a function of both training and test data duration. We also investigate the impact of cross-language training and testing.
Author
Speech Recognition; Data Bases; Languages; Human Factors Engineering; Voice Data Processing

20030082119 Mitre Corp., McLean, VA, USA
Multilingual Processing for Operational Users
Miller, Keith J.; Reeder, Florence; Hirschman, Lynette; Palmer, David D.; Multilingual Speech and Language Processing; April 2003, pp. 12-1 - 12-5; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A01, Hardcopy

This paper describes multilingual technology projects currently being undertaken in conjunction with the NATO BICES (Battlefield Information Collection and Exploitation) organization. First, we describe the basis of the multilingual processing for these projects, the CyberTrans machine translation environment, an operational system that enables the use of machine translation (MT) by intelligence analysts. We will briefly describe the impetus behind the development of CyberTrans as well as the system design and implementation. Next, we will discuss the operational pilot installation of CyberTrans on the BICES network. Finally, we will present some potential multilingual technology pilot experiments for BICES. These future technologies will enable NATO to meet the challenges of its inherently multilingual user community and will pave the way for interoperability across language barriers in the future.
Author
Machine Translation; Speech Recognition; Pattern Recognition; Languages

20030082120 Department of Defense, USA
Phonetic Refraction for Speaker Recognition
Kohler, Mary A.; Andrews, Walter D.; Campbell, Joseph P.; Hernandez-Cordero, Jaime; Multilingual Speech and Language Processing; April 2003, pp. 3-1 - 3-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

This paper describes a newly realized high performance speaker recognition system and examines methods for its improvement. Innovative experiments early this year showed that phone strings are exceptional features for speaker recognition. The original system produced equal error rates less than 11.5% on Switchboard-I audio files. Subsequent research indicates that the equal error rate can be nearly halved by improving the feature extraction and score fusion methods. Pre-processing the speech files to remove cross-talk, improved techniques for combining scores, and gender-specific phone models each reduce the error rates significantly.
Author
Speech Recognition; Phonetics; Pattern Recognition; Voice Data Processing

20030082121 Institute for Human Factors TNO, Soesterberg, Netherlands

Methods and Models for Quantitative Assessment of Speech Intelligibility in Cross-Language Communication

vanWijngaarden, Sander J.; Steeneken, Herman J. M.; Houtgast, Tammo; Multilingual Speech and Language Processing; April 2003, pp. 4-1 - 4-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

To deal with the effects of non-native speech communication on speech intelligibility, one must know the magnitude of these effects. To measure this magnitude, suitable test methods must be available. Many of the methods used in cross-language speech communication research are not very suitable for this, since these methods are designed to investigate specific effects regarding speech perception and production, rather than quantifying overall intelligibility. In this paper, a simple model of cross-language speech intelligibility is shown that helps in selecting experimental methods to assess speech intelligibility. Based on this model, and practical observations regarding assessment of cross language speech intelligibility, a multi-lingual version of the Speech Reception Threshold method was implemented as a suitable method for the quantification of cross-language speech intelligibility. The performance of this method is illustrated by means of experimental results.
Author

Intelligibility; Background Noise; Speech Recognition; Noise Intensity; Languages

20030082122 Instituto Superior Tecnico, Lisbon, Portugal

Evaluation of Speaker's Degree of Nativeness Using Text-Independent Prosodic Features

Teixeira, Carlos; Franco, Horacio; Shriberg, Elizabeth; Precoda, Kristin; Soenmez, Kemal; Multilingual Speech and Language Processing; April 2003, pp. 5-1 - 5-4; In English; Multilingual Speech and Language Processing; See also 20030082116
Contract(s)/Grant(s): DASW01-96-3-0001; NSF IRI-96-19921; Copyright; Avail: CASI; A01, Hardcopy

Giving feedback on the degree of nativeness of a student s speech is an important aspect of computer-aided language learning. This task has been addressed by many studies focusing on the segmental assessment of the speech signal. To better model human nativeness scores, other aspects of speech should also be considered, such as prosody. This study examines the use of prosodic information to evaluate the degree of nativeness of student pronunciation, independent of the text. Supervised strategies based on human grades are used in an attempt to select promising features for this task. Previous results obtained with non-native speakers showed improvements in the correlation between human and automatic scores. New strategies were evaluated with tests including native and non-native speakers. Specific features based on durations, namely for intra-sentence pauses, revealed potential use for further improvements.
Author

Speech Recognition; Voice Data Processing; Pattern Recognition

20030082123 Carnegie-Mellon Univ., Pittsburgh, PA, USA

Adaptation Methods for Non-Native Speech

Tomokiyo, Laura Mayfield; Waibel, Alex; Multilingual Speech and Language Processing; April 2003, pp. 6-1 - 6-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

Speech recognition performance is consistently poor on low-proficiency non-native speech. WHile gains from speaker adaptation can often bring recognizer performance on high proficiency non-native speakers close to that seen for native speakers, recognition for lower proficiency speakers remains low even after individual speaker adaptation. The challenge for accent adaptation is to maximize recognizer performance without collecting large amounts of acoustic data for each native language/target language pair. We focused on adaptation for lower proficiency speakers, exploring how acoustic data from up to 15 adaptation speakers can be put to its most effective use.
Author

Speech Recognition; Voice Data Processing; Pattern Recognition; Languages

20030082124 Lucent Technologies, Naperville, IL, USA

HMM-Based English Speech Recognizer for American, Australian, and British Accents

Chengalvarayan, Rathi; Multilingual Speech and Language Processing; April 2003, pp. 7-1 - 7-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

In this study, we focus on the problem of making a transition from the accent-dependent to accent-independent speech recognition technology in telephone communication devices. Previous studies showed that the multi-transitional model architecture is one of the solutions for robust speech recognition. In this paper, we investigate many universal hybrid systems that are trained with data recorded through Australian, American, and British accented speech for English language. This new

universal system uses less than double the number of parameters as in individual system (American or Australian or British acoustic models) and significantly reduces the model parameters without affecting the performance when compared with multiple classifiers or multi-transitional models. We compare the performance of universal hybrid system on several independent connected-digit telephone test databases and demonstrate the effectiveness of hybrid architectures with data taken from all three regional accented speech.
Author
Speech Recognition; Telephones; Pattern Recognition; English Language; Intelligibility

20030082125 Maribor Univ., Maribor, Slovenia
Crosslingual Adaptation of Multilingual Triphone Acoustic Models
Zgank, Andrej; Imperl, Bojan; Johansen, Finn Tore; Kacic, Zdravko; Horvat, Bogomir; Multilingual Speech and Language Processing; April 2003, pp. 8-1 - 8-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

The paper presents the results of experiments where the influence of adaptation of multilingual triphone speech recognizer in a crosslingual speech recognition was investigated for two different types of multilingual triphone acoustic models. The first type of multilingual triphone acoustic models represents the triphone models generated with the agglomerative clustering technique and the second one represents the triphone models generated with use of the tree-based clustering algorithm. The agglomerative clustering algorithm is based on a definition of distance measure for triphones defined as a weighted sum of explicit estimates of the context similarity on a monophone level. The monophone similarity estimation method is based on the algorithm of Houtgast. The second set of acoustic models was generated using the phonetic decision tree procedure with common set of broad phonetic classes. The crosslingual speech recognition experiments were performed using the multilingual recognizer trained on the Slovenian, Spanish and German 1000 FDB SpeechDat(II) databases for the recognition of the utterances from the Norwegian 1000 FDB SpeechDat(II) database. The mapping of Norwegian phonemes was done with the IPA scheme where five different Norwegian recognition vocabularies were generated. Adaptation of multilingual triphone models was performed on 400 Norwegian utterances. The adaptation significantly improved the recognition results. The best adapted system achieved the recognition accuracy very close to the original Norwegian recognizer.
Author
Speech Recognition; Phonemes; Phonetics; Intelligibility; Pattern Recognition; Voice Data Processing

20030082126 Nokia Mobile Phones, Copenhagen, Denmark
Multilingual Text-To-Phoneme Mapping for Speaker Independent Name Dialing in Mobile Terminals
Jensen, Kare Jean; Riis, Soren Kamaric; Pedersen, Morten With; Multilingual Speech and Language Processing; April 2003, pp. 9-1 - 9-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

This paper presents recent experiments on multilingual Text- To-Phoneme (ML-TTP) mapping for speaker independent name dialing using the low complexity ML-TTP method first introduced at EuroSpeech 2001. The ML-TTP method avoids the use of a Language IDentification (LID) module and produces phoneme transcriptions for different languages using the same model. Through an extensive comparison on an 11 language name dialing task it is illustrated that the ML-TTP method yields a similar performance to that of a baseline LID/TTP method, but at a significant saving in model size and real-time decoding complexity.
Author
Languages; Speech Recognition; Intelligibility; Phonemes; Voice Data Processing

20030082127 Hitachi Ltd., Tokyo, Japan
Multilingual Speech Interpretation for Cellular Phones
Obuchi, Yasunari; Kitahara, Yoshinori; Koizumi, Atsuko; Multilingual Speech and Language Processing; April 2003, pp. 10-1 - 10-6; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A02, Hardcopy

This paper describes the development and field trial tests of the multilingual speech interpretation system. The system is based on the fixed sentence interpretation, in order to achieve a high recognition rate and to guarantee the translation accuracy. More than 1,700 sentences are registered, and a simple network grammar enables the system to deal with various expression forms for the same meaning. The first field trial was carried out with the Japanese-to-Korean interpretation system. We received 6,753 calls during two months, and the data showed that the biggest problem was the out-of-vocabulary (OOV)

inputs, which resulted in 39% task completion rate. The second prototype system, that has the output of ten languages, was improved in view of the result of the first field trial. We added various expression forms found in the first trial data, and we also introduced the OOV detecting module using garbage models. The second field trial results showed that those improvements reduced recognition errors due to the OOV inputs. The paper also describes the prototype of the bi-directional interpretation system between Japanese and Korean. We adapted the Hidden Markov Models (HMMs) made by the Japanese speech data to the Korean speech recognition system. The experimental results showed that the system works well for the fixed sentence recognition, even though its robustness in other tasks and different conditions remains to be discussed.
Author
Speech Recognition; Languages; Intelligibility; Voice Data Processing; Mobile Communication Systems; Pattern Recognition

20030082128 Queensland Univ. of Technology, Brisbane, Australia
Fusion of Output Scores on Language Identification System
Wong, Eddie; Sridharan, Sridha; Multilingual Speech and Language Processing; April 2003, pp. 11-1 - 11-5; In English; Multilingual Speech and Language Processing; See also 20030082116; Copyright; Avail: CASI; A01, Hardcopy

This paper investigates the fusion of multiple output scores generated using different parameterization methods by the language identification system. A number of different fusion techniques including simple addition, simple multiplication, max rule and linear score weighting have been investigated. We have used a Gaussian mixture model based system to calculate the output scores. The universal background model adaptation technique has been incorporated to reduce the computation time on both training and testing phases. Five different parameterisation methods were generated by the system. They included mel-frequency cepstrum coefficients, linear prediction cepstrum coefficients, line spectrum pair frequencies, mel-cepstral coefficients and perceptual linear predictive coefficients. Results have shown that the fusion of mel-cepstral coefficients with perceptual linear predictive coefficients using the linear score weighting method improved the system accuracy from 75% to 79% on the 45 seconds test segment and from 66% to 71% on the 10 seconds test segment compared to the best independent scores without fusion. An error reduction of 5% and 7% respectively were achieved.
Author
Languages; Speech Recognition; Voice Data Processing; Pattern Recognition; Intelligibility

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20030068987 National Advisory Committee for Aeronautics, Washington, DC, USA
On the Flutter of Cylindrical Shells and Panels Moving in a Flow of Gas
Stepanov, R. D.; September 1958; 26 pp.; In English
Report No.(s): NACA-TM-1438; No Copyright; Avail: CASI; A03, Hardcopy

The equations of shells are taken in the form of the general technical theory of shallow shells and shells of medium length. The aerodynamic forces acting on a shell are taken into account only as forces of excess pressure according to the formula proposed by A.A. Iliushin in reference 3.
Author (revised)
Cylindrical Shells; Mathematical Models; Gas Flow; Flutter

20030071098 NASA Langley Research Center, Hampton, VA, USA
A Discrete Analysis of Non-reflecting Boundary Conditions for Discontinuous Galerkin Method
Hu, Fang Q.; Atkins, Harold L.; [2003]; 11 pp.; In English; 9th AIAA/CEAS Aeroacoustics Conference, 12-14 May 2003, Hilton Head, SC, USA
Contract(s)/Grant(s): NAG1-01044
Report No.(s): AIAA Paper 2003-3301; Copyright; Avail: CASI; A03, Hardcopy

We present a discrete analysis of non-reflecting boundary conditions for the discontinuous Galerkin method. The boundary conditions considered in this paper include the recently proposed Perfectly Matched Layer absorbing boundary condition for the linearized Euler equation and two non-reflecting boundary conditions based on the characteristic decomposition of the flux on the boundary. The analyses for the three boundary conditions are carried out in a unified way. In each case, eigensolutions of the discrete system are obtained and applied to compute the numerical reflection coefficients of a specified out-going wave. The dependencies of the reflections at the boundary on the out-going wave angle and frequency

as well as the mesh sizes arc? studied. Comparisons with direct numerical simulation results are also presented.
Author
Boundary Conditions; Direct Numerical Simulation; Galerkin Method; Decomposition

20030071216 Texas A&M Univ., College Station, TX
An Investigation into Inelasticity Accompanying High Velocity Impact and Penetration Problems
Rajagopal, H. R.; Srinivasa, A. R.; Oct. 2001; 7 pp.; In English
Contract(s)/Grant(s): DAAG55-98-1-0337
Report No.(s): AD-A415119; ARO-38944.1-EG; No Copyright; Avail: CASI; A02, Hardcopy

The problems investigated in the project fall into three broad categories: (1) Modeling of twinning under high velocity impact (2) Constitutive equations for elasto-plastic response under large deformations with application to simple shear, and (3) variational approaches to the development of governing equations and boundary conditions for incorporating 'lattice curvature effects' in plasticity with application to shear banding problems. Results and their significance: Using a novel 'multiconfigurational' framework developed by us, we have developed models that account for deformation twinning under high velocity impact. The results show good agreement with experimental data. We found that the nonlinearity of the elastic response will lead to interesting softening behavior when the material undergoes simple shear deformations. We have developed a theory incorporating lattice curvature effects that can effectively simulate the formation of shear bands. We have also developed a new variational technique based on the maximization of the rate of energy dissipation that not only delivers the governing differential equations but also the accompanying boundary conditions. This work will allow for the development of computational codes that can delineate the relative influence of lattice curvature, twinning and strain softening on the formation of shear bands.
DTIC
Impact; Penetration; Energy Dissipation

20030071712 Royal Inst. of Tech., Stockholm, Sweden
Spectrum of the Sturm-Liouville Operator
Vagharshakyan, A.; Apr. 2000; 22 pp.; In English
Report No.(s): PB2003-105154; TIRTA-MAT-00/MA-09; No Copyright; Avail: CASI; A03, Hardcopy

In this paper the Sturm-Liouville operator, on the finite interval is considered. For special case of the boundary conditions, a family of the potential functions, which generate the operator with the same spectrum, is described. The existence of the transformations which provide the shift of the spectrum is proved.
NTIS
Sturm-Liouville Theory; Spectrum Analysis

20030073578 Arizona Univ., AZ, USA
Modeling the Infrared Emission from Protoplanetary Dust Disks
Li, Aigen; Lunine, J. I.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 45; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We model the infrared (IR) emission from protoplanetary dust disks in terms of highly porous cometary-type dust made either of coagulated but otherwise unaltered protostellar interstellar grains, or grains that are highly-processed in protostellar/protoplanetary nebulae with silicate dust annealed and carbon dust oxidized. It is shown that the porous dust model with a vacuum volume fraction of N 90% is successful in reproducing the near-IR to submillimeter spectral energy distributions and the mid-IR emission features of amorphous and/or crystalline silicate dust and polycyclic aromatic hydrocarbon (PAH) molecules from four archetypal dust disks.
Author
Infrared Radiation; Interstellar Matter; Polycyclic Aromatic Hydrocarbons; Cosmic Dust; Amorphous Materials; Mathematical Models

20030075686 Joensuu Univ., Finland
Meromorphic Solutions of Some Composite Functional Equations
Silvennoinen, Heli; Marto, Olli, Editor; 2003; ISSN 1239-6303; 41 pp.; In English
Report No.(s): Rept-133; Copyright; Avail: Other Sources

In this paper we study the growth and existence of meromorphic solutions of functional equations of the generalized form

f(P(2)) = R(z,f(z)), (1) where p(z) is a polynomial and the coefficients of R(z,f) are small functions as compared with f. The problem is that explicit transcendental meromorphic solutions to these equations are hard to find. Since we are interested in meromorphic solutions in the whole complex plane we can use the Nevanlinna theory as a tool to study the properties of solutions. We begin by recalling basic notations of the Nevanlinna theory and by introducing some important results about composite functions in Section 1. Section 2 is dedicated to studying the equation f(az+b) = R(z,f). (2) We prove for example that any transcendental meromorphic solution of (2) is of regular growth. However, our main interest is devoted to the case when deg p is greater than or equal to 2 in (1). In Section 3, we start to consider the equation (1) in its general form. Most of the results in this section concern the growth of the meromorphic solutions in terms of the characteristic function. In Section 4, we consider growth relations between the solution f and the coefficient a in the equation f(p(z))=a(z)R(z,f(z)). (3) Section 5 is devoted to considering a special case of (3), that is, the equation f(p(z)) = a(z)f(z)(sup m). We are able to prove results concerning the existence of meromorphic solutions. A connection between the meromorphic solutions of the equation f(p(z)) = a(sub 0)(z)+a(sub)1(z)f(z)+...+a(sub m-2)(z)f(z)(sup m-2)+f(z)(sup m) and of a certain Riccati differential equation is considered in Section 6. Finally, in Section 7 we study meromorphic solutions of equations of the form f(p(z))=a(sub 0)(z)+a(sub 1)(z)f(z)+...+a(sub m)(z)f(z)(sup m) (4) under restriction on the growth, and respectively, the number of poles, of the coefficients in (4).
Derived from text
Composite Functions; Polynomials; Transcendental Functions; Meromorphic Functions

20030075688 NASA Ames Research Center, Moffett Field, CA, USA, Maryland Univ., College Park, MD, USA
A High-Order, Time Invariant, Linearized Model for Application to HHCIAFCS Interaction Studies
Cheng, Rendy P.; Tischler, Mark B.; Celi, Roberto; [2003]; 14 pp.; In English; 59th Annual AHS Forum, 6-8 May 2003, Phoenix, AZ, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAG2-1407; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes a methodology for the extraction of a linear time invariant model from a nonlinear helicopter model, and followed by an examination of the interactions of the Higher Harmonic Control (HHC) and the Automatic Flight Control System (AFCS). This new method includes an embedded harmonic analyzer inside a linear time invariant model, which allows the periodicity of the helicopter response to be captured. The: coupled high-order model provides the needed level of dynamic fidelity to permit an analysis and optimization of the AFCS and HHC loops. Results of this study indicate that the closed-loop HHC system has little influence on the AFCS or on the vehicle handling qualities, which indicates that the AFCS does not need modification to work with the HHC system. The results also show that the vibration response to maneuvers must be considered during the HHC design process, which leads to much higher required HHC loop crossover frequencies. This research also demonstrates that the transient vibration response during maneuvers can be reduced by optimizing the closed-loop higher harmonic control laws using conventional control system analyses.
Author
Control Theory; Feedback Control; Harmonic Control; Helicopters; Nonlinearity; Periodic Variations

20030075707 Brown Univ., Providence, RI
Mathematical and Computational Issues in Plasma Microthrusters
Karniadakis, George E.; Jan. 2000; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-00-1-0269
Report No.(s): AD-A415042; AFRL-SR-AR-TR-03-0204; No Copyright; Avail: CASI; A02, Hardcopy

This grant involved two different projects: The first one was focused on COIL flows and was performed during the first year. The second one was focused on micro-ppt thrusters. Specifically, the objectives of this grant were as follows: (1) Numerical study of unsteadiness effects in the Chemical Oxygen Iodine (COIL) experiment conducted at Air Force Labs (year 1 only). (2) Develop spectral/hp element algorithms for the multi-species, compressible, viscous MHD equations for non-equilibrium plasma microflows in the continuous and transitional regimes (years 1-3). (3) Apply algorithms to modeling and optimization of micro-plasma thruster (micro-PPTs) (year 2-3).
DTIC
Plasma Engines; Microthrust; Numerical Analysis; Mathematical Models; Chemical Oxygen-Iodine Lasers

20030075783 Texas Univ., Arlington, TX, USA
Parallel Multigrid DNS/LES Methods for Time-Dependent Compressible Turbulent Flow
Liu, Chaoqun; May 2003; 62 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0028
Report No.(s): AD-A415043; AFRL-SR-AR-TR-03-210; No Copyright; Avail: CASI; A04, Hardcopy

During the past two years (12/00-3/03), we have developed a very efficient and reliable direct numerical simulation (DNS) and large eddy simulation (LES) software (DNSUTA) for compressible flow in a curvilinear coordinates which is a continuation of our previous effort supported by AFOSR. The software includes a high-quality grid generation code which can generate smooth and near-orthogonal, body-fitted grids and a parallel efficient flow solver which applies sixth-order compact scheme, eighth-order filter, LU-SGS flow solver, non-reflecting boundary condition, high-order weighted compact scheme for shock capturing, structure function sub-grid model, and MPI parallel computation. The code has been successfully used for prediction of flow transition around flat plate and airfoils with various attack angles. The code has also been used for flow separation control for low Reynolds airfoils with steady and pulsed blowing jets. All of these simulations are real time dependent, 3-D, with general geometry and have demonstrated qualitative or quantitative agreement with experiment or theoretical work. We believe the topics described above are very challenging and our accomplishment is very significant for both basic science and Air Force mission. The high-order weighted compact scheme and non-reflecting boundary conditions in a curvilinear coordinate are the original work conducted by us which is a significant contribution to the CFD community.
DTIC
Mathematical Models; Turbulent Flow

20030077855 Air Force Inst. of Tech., Wright-Patterson AFB, OH, USA
Feature Guided Image Registration Applied to Phase-and Wavelet-Based Optic Flow
Duffy, Kate R.; Mar. 2003; 74 pp.; In English
Report No.(s): AD-A415098; AFIT/GE/ENG/03-09; No Copyright; Avail: CASI; A04, Hardcopy

Optic Flow algorithms are useful in problems such as computers vision, navigational systems, and robotics. However, current algorithms are computationally expensive or lack the accuracy to be effective compared with traditionally navigation systems. Recently, lower accuracy inertial navigation systems (INS) based on Microelectromechanical systems (MEMS) technology have been proposed to replace more accurate traditional navigation systems.
DTIC
Algorithms; Wavelet Analysis; Pattern Registration

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20030071088
Analysis of Statistical Performance Measures
Zoltowski, Michael D.; Dec. 30, 2002; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-1066
Report No.(s): AD-A414936; TR-EE-03-11; No Copyright; Avail: CASI; A03, Hardcopy

Key accomplishments were fueled by the discovery of an inherent relationship between the Multi-Stage Wiener Filter (MWF) and the iterative search method of Conjugate-Gradients (CG) This lead to a host of new algorithmic implementations of CG-MWT that offer a number of important advantages over the original implementation of MWF The discovery that adding a 'stage' to the MWF was equivalent to taking a 'step' of a CG search has lead to substantial improvements to the MWF in terms of: (i) computationally efficient implementations that exploit structure in the data matrices or correlation matrices, such as Toeplitz, sparseness, etc.; (ii) amenability to real-time implementation; (iii) amenability to 'smart' initialization (based on information learned or statistics estimated during the process of searching for a training sequence embedded in the data, for example), (iv) easy incorporation of a-priority information, constraints, and/or 'past history' for accelerated convergence; and (v) amenability to complementary PC based rank reduction.
DTIC
Statistical Analysis; Passivity

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20030068944
Polynomial Algorithm for P/pj = 1, rj, outtree/sigmaC(sub j) and P/pj = 1, rj, outtree, pmtn/sigmaC(sub j)
Brucker, P.; Hurink, J.; Knust, S.; Jan. 2001; 16 pp.
Report No.(s): PB2003-104830; MEMO-1566; No Copyright; Avail: CASI; A03, Hardcopy

A polynomial algorithm is proposed for two scheduling problems for which the complexity status was open. A set of jobs with unit processing times, release dates and outtree precedence relations has to be processed on parallel identical machines such that the total completion time is minimized. It is shown that the problem can be solved in O(n2) time if no preemption is allowed. Furthermore, it is proved that allowing preemption does not reduce the optimal objective value, which verifies a conjecture of Baptiste and Timkovsky.
NTIS
Polynomials; Algorithms

20030071131 Naval Postgraduate School, Monterey, CA
Initial Studies of Structure Coupling Effects for a Trolley/RRDF Interface
Teh, Chong-Ann; Mar. 2003; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414992; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this thesis is to lay the foundation for analyzing structural coupling effects for a proposed trolley interface between a ship and a roll-on roll-off discharge facility (RRDF). Such a facility could allow heavy cargo transfer at higher sea states. Previous studies have analyzed motions assuring that there is no structural coupling between the trolley and the RRDF. A mathematical model that incorporates structural coupling is developed using the principle of virtual work. In order to assess the degree of necessity for the proposed model we conduct a systematic series of numerical experiments. In these calculations we model the trolley through a generalized stiffness coefficient and assess its influence on RRDF motions. It is shown that modeling of structural coupling may be necessary depending on the relative order of magnitude of trolley structural rigidity and trolley placement.
DTIC
Mathematical Models; Structural Stability; Cargo

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20030071120
Z(2)-Systolic Freedom and Quantum Codes
Freedman, Michael H.; Meyer, David A.; Luo, Feng; Jan. 2002; 18 pp.; In English
Report No.(s): AD-A414975; No Copyright; Avail: CASI; A03, Hardcopy

This document is a report of the Z(2)-Systolic Freedom and Quantum Codes.
DTIC
Differential Geometry; Cauchy Problem

20030071713 Royal Inst. of Tech., Stockholm, Sweden
Zeros of the Reimann Zeta-Function
Vagharshakyan, A.; Apr. 2000; 14 pp.; In English
Report No.(s): PB2003-105155; TRITA-MA-00/MA-08; No Copyright; Avail: CASI; A03, Hardcopy

In this paper we give a new condition which is equivalent to the B. Riemann hypothesis.
NTIS
Cauchy Problem; Functions (Mathematics)

20030082190 Goettingen Univ., Germany
Theory of Lifting Surfaces, Part 2
Prandtl, L.; From an unknown German document; August 1920; 10 pp.; In English
Report No.(s): NACA-TN-10-Pt-2; No Copyright; Avail: CASI; A02, Hardcopy

A mathematical model is presented towards a theory of lifting and resistance on wings. It consists of a theory of multiplanes, conditions of flow at a great distance from the wing, lifting systems of minimum resistance, and free stream and stream limited by walls.
CASI
Mathematical Models; Lift

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*.

20030068947 Brookhaven National Lab., Upton, NY
New Forms of High Energy Density Matter
McLerran, L.; 2002; 16 pp.; In English
Report No.(s): DE2003-805487; BNL-69441; No Copyright; Avail: Department of Energy Information Bridge

In this talk, the author discusses the scientific issues being addressed in ultrarelativistic heavy ion collisions. He also discusses some of the recent results from RHIC at Brookhaven National Laboratory which give some experimental insight into these issues.
NTIS
Ionic Collisions; Nuclear Physics

20030068948 Department of Energy, Washington, DC
Optimizing Pinhole and Parallel Hole Collimation for Scintimammography with Compact Pixellated Detectors
2003; In English
Report No.(s): DE2003-805767; No Copyright; Avail: National Technical Information Service (NTIS)

The relative advantages of pinhole and parallel hole collimators for scintimammography with compact, pixellated gamma detectors were investigated using analytic models of resolution and sensitivity. Collimator design was studied as follows. A desired object resolution was specified for a pixellated detector with a given crystal size and intrinsic spatial resolution and for a given object-to-collimator distance. Using analytic formulas, pinhole and parallel hole collimator parameters were calculated that satisfy this object resolution with optimal geometric sensitivity. Analyses were performed for 15 cm x 20 cm field of view detectors with crystal elements 1.0, 2.0 and 3.0 mm on a side and 140 keV incident photons. The sensitivity for a given object resolution was greater for pinhole collimation at smaller distances, as expected. The object distance at which the pinhole and parallel hole sensitivity curves cross each other is important. The crossover distances increased with larger crystal size for a constant object resolution and increased as the desired object resolution decreases for a constant crystal size.
NTIS
Collimation; Mathematical Models; Optimization; Detectors; Mammary Glands

20030068950
IBIS The Integrated Box Interrogation System
Croft, S.; Martancik, D.; Young, B.; Chard, P. M. J.; 2002; 162 pp.; In English
Report No.(s): DE2003-807585; No Copyright; Avail: Department of Energy Information Bridge

Canberra Industries has won the tendered solicitation, INEEL/EST-99-00121 for boxed waste Nondestructive Assay Development and Demonstration. Canberra will provide the Integrated Box Interrogation System (IBIS) which is a suite of assay instrumentation and a data reduction system that addresses the measurement needs for Boxed Wastes identified in the solicitation and facilitates the associated experimental program and demonstration of system capability. The IBIS system will consist of the next generation CWAM system, i.e. CWAM II, which is a Scanning Passive/Active Neutron interrogation system which we will call a Box Segmented Neutron Scanner (BSNS), combined with a physically separate Box Segmented Gamma-ray Scanning (BSGS) system. This document summarizes the conceptual design parameters of the IBIS and indicates

areas key to the success of the project where development is to be centered. The work presented here is a collaborative effort between scientific staff within Canberra and within the NIS-6 group at LANL.
NTIS
Assaying; Interrogation; Neutrons; Scanners

20030068959 Rutherford Appleton Lab., Chilton
Proceedings of the School for Young High Energy Physicists
Watkins, P. M.; Evans, M. E.; May 2002; 286 pp., September 2 - 14, 2001, Chilton, England
Report No.(s): PB2003-104814; RAL-TR-2002-011; Copyright; Avail: National Technical Information Service (NTIS)
The document contains lectures presented at the School of Young High Energy Physicists Rutherford Appleton Laboratory, September 2001. Contents include: Introduction to Quantum Field Theory; Introduction to Quantum Electrodynamics; The Standard Model; and Topics in Phenomenology.
NTIS
Quantum Electrodynamics; Quantum Theory; Education

20030069030 Department of Energy, Washington, DC
Automatic Component Calibration and Error Diagnostics for Model-Based Accelerator Control
Sep. 25, 2000; 20 pp.; In English
Report No.(s): DE2003-765670; No Copyright; Avail: Department of Energy Information Bridge
Phase I work studied the feasibility of developing software for automatic component calibration and error correction in beamline optics models. A prototype application was developed that corrects quadrupole field strength errors in beamline models. This application uses a decompositional approach, first analyzing the beamline to identify good and bad regions within the model, then correcting each bad region individually. This application deploys a new method for localized error correction that is described in this report. Phase I work also studied the heuristics necessary for successful use of this component calibration methodology. This study established the need for intelligent heuristics in the area of data filtering, data interpretation, and search. A full system for automated component calibration will need to provide customization options so that users can specify the particular heuristics needed to handle a given data set and problem configuration. A method for assuring maximal flexibility and customizability is to provide the necessary functionality in the form of a general toolkit and function library for building model-based applications. Initial analysis was begun on the design of such a toolkit.
NTIS
Calibrating; Diagnosis; Error Analysis; Heuristic Methods; Model Reference Adaptive Control

20030069067 Los Alamos National Lab., NM
Self-Consistent Langevin Simulation of Coulomb Collisions in Charged-Particle Beams
Quiang, J.; Ryne, R. D.; Habib, S.; 2000; 14 pp.; In English
Report No.(s): DE2003-768985; LA-UR-2354; No Copyright; Avail: Department of Energy Information Bridge
In many plasma physics and charged-particle beam dynamics problems, Coulomb collisions are modeled by a Fokker-Planck equation. In order to incorporate these collisions, we present a three-dimensional parallel Langevin simulation method using a Particle-In-Cell (PIC) approach implemented on high-performance parallel computers. We perform, for the first time, a fully self-consistent simulation, in which the friction and diffusion coefficients are computed from first principles. We employ a two-dimensional domain decomposition approach within a message passing programming paradigm along with dynamic load balancing. Object oriented programming is used to encapsulate details of the communication syntax as well as to enhance reusability and extensibility. Performance tests on the SGI Origin 2000 and the Cray T3E-900 have demonstrated good scalability. Work is in progress to apply our technique to intrabeam scattering in accelerators.
NTIS
Coulomb Collisions; Langevin Formula; Plasma Physics; Simulation; Three Dimensional Models

20030071066
Physics Prospects with the JLab 12-GeV Upgrade
Smith, E. S.; 2002; In English
Report No.(s): DE2003-805239; No Copyright; Avail: National Technical Information Service (NTIS)
Increasing the beam energy of the CEBAF accelerator to 12 Ge V will greatly expand the physics opportunities to explore the nature of strongly interacting matter. The primary thrusts of the experimental program will include the study of quark

confinement and the direct exploration of the quark-gluon structure of hadrons and nuclei in the valence-quark region.
NTIS
Linear Accelerators; Quarks

20030071119 Los Alamos National Lab., NM
13th Topical Conference on High Temperature Plasma Diagnostics Scientific Program
Barnes, C.; 2000; 326 pp.; In English
Report No.(s): DE2003-769033; LA-UR-2564; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Conferences; High Temperature Plasmas; Plasma Diagnostics

20030071160 Army Armament Research, Development and Engineering Center, Watervliet, NY
Bauschinger Test Fixture
Mossey, C.; Troiano, E.; Pfindel, F.; Feb. 2003; 8 pp.; In English
Report No.(s): AD-A415003; ARCCB-MR-03001; No Copyright; Avail: CASI; A02, Hardcopy
Evaluating the Bauschinger effect on ASTM A723 gun steel necessitated the design and fabrication of a specialized fixture that remained rigid and properly aligned during testing. The configuration of the fixture can be easily modified to accommodate various specimen geometries and monitoring devices. This fixture did not allow specimen bending or buckling and was successful in obtaining accurate Bauschinger data.
DTIC
Bauschinger Effect; Fabrication; Steels; Guns (Ordnance)

20030071200 Michigan Univ., Ann Arbor, MI
The Effects of Clustering Multiple Hall Thrusters on Plasma Plume Properties
Beal, Brian E.; Gallimore, Alec D.; Hargas, William A.; Apr. 29, 2003; 12 pp.; In English
Contract(s)/Grant(s): Proj-1011
Report No.(s): AD-A415051; AFRL-PR-ED-TP-2003-113; No Copyright; Avail: CASI; A03, Hardcopy
Clusters of Hall thrusters have been proposed as a means of achieving electric propulsion systems capable of operating at very high power levels. To facilitate testing in existing vacuum facilities initial tests have focused on a cluster of low-power Busek BHT-2OO-X3 Hall thrusters. A combination of triple Laugmuir probes and floating emissive probes has been used to study the effects of multi-thruster operation on the electron number density, electron temperature, and plasma potential in the plasma plume. The resultant number density is shown to be a result of linear superposition of the plumes of individual thrusters while the electron temperature in the cluster plume is measured to be slightly higher than that caused by operation of a single thruster. The plasma potential downstream of the cluster is shown to obey the Boltzmann relation. In the region between the thrusters the plasma potential increases as a function of downstream distance and may result in reflection of some low-energy charge exchange ions back toward the cluster. A mechanism that may lead to slightly reduced ion beam divergence through focusing of ions directed toward the thruster centerline is discussed.
DTIC
Electric Propulsion; Hall Thrusters; Plasmas (Physics); Plumes

20030071254
Detection of Bolt Stress Relaxation in Hybrid Bolted Connections
Mewer, Richard; Vel, Senthil S.; Caccese, Vincent; Apr. 2003; 79 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0916
Report No.(s): AD-A415171; UM-MACH-RPT-01-07; No Copyright; Avail: CASI; A05, Hardcopy
The effort summarized in this report focuses upon real time detection of stress relaxation in bolted connections in hybrid structures. A proof-of-concept test bed for this effort consists of a 24-1/2 inch square plate made of Eglass/ vinyl ester composite. Several interrogation techniques were employed and compared including: 1) low frequency modal analysis; 2) high frequency transfer functions and 3) high frequency transmittance functions. Each of these techniques employed a piezoelectric actuator bonded to the panel so to deliver a characterized disturbance in a controlled manner. The technique using

transmittance functions to evaluate changes in bolt tensioning level shows the most promise.
DTIC
Hybrid Structures; Stress Relaxation

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*.

20030068974 Washington Univ., Seattle, WA
Effects of Biota on Backscatter: Experiments with the Portable Acoustic Laboratory (PAL)
Jones, Christopher D.; Feb. 3, 2003; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0034
Report No.(s): AD-A414899; No Copyright; Avail: CASI; A02, Hardcopy

This is a report of the field test of a 'portable acoustic laboratory,' a set of observational tools that can be used for in situ testing of the effects of organisms, biological processes, and benthic structures on underwater acoustic propagation in sediments. A test was conducted off the end of a pier at the Friday Harbor Laboratories of the University of Washington. A semicircular region of seabed was monitored for several weeks, then clean sand was spread over two muddy patches. Monitoring showed a sudden drop in backscatter, but this was short lived. Abundant mysid shrimp appeared to have caused microtopographic changes that quickly raised backscatter intensity to near-background levels. Subsequent introduction of burrowing thalassinid shrimp had the anticipated effect of enhancing backscatter above background and pre-sand-layer levels. It is anticipated that this kind of portable laboratory will be able to answer many specific questions about potential biological effects on backscatter. For example, how does the acoustic signature- of a mine-like object change as organisms foul the exposed surfaces? And, how does the acoustic coupling of such an object with overlying water and underlying sediments) change in the presence of bioturbation and geochemical processes?
DTIC
Acoustic Scattering; Underwater Acoustics; Ocean Bottom

20030071099
Statistical Methods for Processing of Harmonic and Cyclostationary Signals
Hurd, Harry L.; Feb. 2, 2002; 6 pp.; In English
Contract(s)/Grant(s): DAAD19-00-C-0124
Report No.(s): AD-A414963; FR01-1; ARO-40303-MA; No Copyright; Avail: CASI; A02, Hardcopy

The efforts on this contract were directed toward further development of the theory of periodically correlated (cyclostationary) and almost periodically correlated processes and to further investigation of the exploitation of harmonic signal structure in battlefield acoustical data. In addition a major part of the effort was devoted to problems in target positioning and tracking based on acoustical data.
DTIC
Harmonics; Statistical Analysis; Signal Processing

20030075703
Distributed Algorithms for Sensor Fusion
Meyer, David; Remmel, Jeffrey; Oct. 31, 2002; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0724
Report No.(s): AD-A415039; ARO-42724.2-MA; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project was to develop algorithms which will process the information collected by networks of large numbers of low power, low bandwidth sensors. We have analyzed failure modes for simple cases of hierarchical networks, developed foundational results in logic programming and hybrid control, and constructed a simulation package. We would like to continue with this project which, despite a slow start, is now-after 3 quarters-showing results.
DTIC
Algorithms; Failure Modes; Multisensor Fusion; Distributed Processing

20030077846 Research and Technology Organization, Neuilly-sur-Seine, France
Reconsideration of the Effects of Impulse Noise
April 2003; 114 pp.; In English; Original contains color and black and white illustrations
Report No.(s): RTO-TR-017; AC/323(HFM-022)TP/17; Copyright; Avail: CASI; C01, CD-ROM; A06, Hardcopy

This report contains the main outcome of the work constituted by NATO Research Study Group RSG.29 Reconsideration of the effects of impulse noise. The main objective of the work of RSG.29 was to assess the risk of hearing loss from exposure to impulse sounds, by identifying occurrences which are hazardous and by developing measures which will protect hearing. This final report is not a consensus report of the entire RSG. It focuses on the risk of auditory damage from impulse noise (rifles and blasts) and gives recommendations for good and safe criteria for the exposure to impulse noise generated by weapons. It contains a chapter on a model to predict the risk of hearing damage (AHAAH model) and a chapter on hearing protection, primarily based on data from large caliber impulses. Furthermore, attention is given to hearing conservation programs and to the treatment of acute noise trauma.
Author
Auditory Defects; Algorithms; Acoustics; Noise (Sound); Human Factors Engineering

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*.

20030068702 Argonne National Lab., IL, USA
Interrelationships Among Carbon Nanostructures
Sternberg, Michael; Gruen, Dieter M.; Zapol, Peter; Proceedings of the Seventh Applied Diamond Conference/Third Frontier Carbon Technology Joint Conference; August 2003, pp. 525; In English; See also 20030068525
Contract(s)/Grant(s): W-31-109-eng-38; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Carbon nanostructures such as nanotubes, fullerenes, and diamond nanocrystals are receiving increasing attention because of their interest both from fundamental and applied points of view. Interrelationships between the properties of all groups of carbon entities at the nanoscale need to be better understood so that the energetics and conditions under which one form transforms to another can be rationalized. We present primarily electronic structure calculations showing in detail the growth mechanism of ultrananocrystalline diamond, which results from the reaction of the carbon dimer, C2, with the (110) diamond surface. The evolution of a new monolayer of the diamond lattice is traced from the initial reaction of a single C2 molecule, to the half-monolayer stage to the completed monolayer. Fullerene- and nanotubelike intermediate structural elements appear on the diamond surface during growth. The challenge will be to relate these calculations to studies mentioned below and to gauge the extent to which our current knowledge can lead to an integrated systematics of carbon nanostructures. Recent calculations by Barnard et al. delineate the stability relationships between diamond clusters, fullerenes and hydrogenated graphite clusters based on size ranges, while the transition of diamond nanocrystals to carbon onions was simulated by Fugaciu and Hermann. Again a comparison of the stability of fullerenes and closed nanotubes was made by Park et al. If the various known members of the nanocarbon family are related to each other by yet to be discovered hierarchical structures, it is possible that insight into the criteria determining the stability of each structure could lead to new, hitherto unknown family members with interesting and useful properties.
Author
Carbon; Electronic Structure; Nanocrystals

20030071063
Electron Drift Velocities in Fast Argon and CF(sub 4) Based Drift Gases
Wijngaarden, D. A.; Sep. 22, 1998; 52 pp.
Report No.(s): PB2003-104835; NIKHEF-98-030; No Copyright; Avail: CASI; A04, Hardcopy

Electron drift velocities in gas mixtures were measured in a tabletop experiment using a nitrogen laser to create the primary electrons. The maximum drift times for electrons in a 5 mm (10 mm) honeycomb drift cell at 2200 V anode voltage were 28 ns (53 ns) and 21 ns (61 ns) for Ar-CF(sub 4)-CH(sub 4) (76/18/6) and Ar-CF(sub 4)-CO(sub 2) (68/27/5), respectively. Changing the ratio of the latter mix did not change the drift velocity very much. The gains of the gases are

approximately 10(sup 4) for a single primary electron. CF(sub 4) causes electron attachment.
NTIS
Electrons; Argon; Gases; Drift Rate

20030071206 NASA Ames Research Center, Moffett Field, CA, USA
Doping-Induced Type-II to Type-I Transition and Interband Optical Gain in InAs/AlSb Quantum Wells
Kolokolov, K. I.; Ning, C. Z.; April 30, 2003; 12 pp.; In English
Contract(s)/Grant(s): DTT559-99-D-00437; No Copyright; Avail: CASI; A03, Hardcopy

We show that proper doping of the barrier regions can convert the well-known type-II InAs/AlSb QWs to type I, producing strong interband transitions comparable to regular type-I QWs. The interband gain for TM mode is as high as 4000 l/cm, thus providing an important alternative material system in the mid-infrared wavelength range. We also study the TE and TM gain as functions of doping level and intrinsic electron-hole density.
Author
Aluminum Antimonides; Indium Arsenides

20030071261 Arizona Univ., Tucson, AZ
Visible Spectrometer Measurements of the PAC III Intercept of Hera at WSMR on 31-Mar-2001
Dereniak, Eustace L.; George, James D., Jr.; Sep. 30, 2002; 5 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0471
Report No.(s): AD-A415180; ARO-42540.3-PH; No Copyright; Avail: CASI; A01, Hardcopy

A snapshot imaging spectrometer known as the Computed Tomography Imaging Spectrometer (CTIS), operating at 15 frames per second, measured the PAC III intercept of a Hera at White Sands Missile Range (WSMR) on March 31, 2001. As in computed tomography, the collected data must be processed to produce the spectral images. A technical report describes the collection technique, the reconstruction techniques, and the resulting spectral images. A paper emphasizing the hyperspectral aspect of CTIS was written and presented. A paper emphasizing the insight gained about the intercept from the CTIS instrument was written and presented. The reconstructed data was submitted in computer-readable form to the sponsoring agency, Space and Missile Defense Command, SMDC-TSC.
DTIC
Image Processing; Tomography

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*.

20030075704 Alabama Univ., Huntsville, AL, USA
Production of Loop-Top Hard X-Ray Emission
Miller, James A.; Seaquist, Valerie; September 26, 2003; 4 pp.; In English
Contract(s)/Grant(s): NAG5-9598; No Copyright; Avail: CASI; A01, Hardcopy

The main goal of this work has been to understand the particle acceleration mechanism (or mechanisms) in impulsive solar flares, using hard X-ray observations of high spatial and spectral resolution. Several new observations, including the observations by YOHKOH that reveal emission from both footpoints and loop tops, have suggested to us that a model employing stochastic acceleration is the most likely candidate for explaining energetic particles in a majority (if not all) of impulsive flares. In this model, most of the flare energy is initially converted into plasma waves and turbulence, which in turn can accelerate particles from thermal to relativistic energies on sub-second timescales. This research has provided important tools for the interpretation of the high spectral and spatial resolution observations obtained from the Ramaty High Energy Solar Spectroscopic Imager (RHESSI) . In the course of our research, we have focused on two different (but possibly related) stochastic acceleration models: (1) a model that employs high-frequency whistler turbulence and concentrates on the energetic electrons, and (2) a model that employs low frequency MHD waves, and is able to accelerate both the ambient electrons and ions.
Author
Particle Acceleration; Solar Flares; X Rays; Thermal Energy; Stochastic Processes; Energetic Particles

20030075803 McDonnell-Douglas Aerospace, Huntington Beach, CA, USA
Design Considerations for a Microgravity Isolation System to Fly on Space Shuttle
Edberg, D. L.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 909-920; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The design of a microgravity isolation system must take into account predicted vibration levels, payload requirements, and logistic considerations. This paper describes the results of current research being carried out at MDA (McDonnell Douglas Aerospace) to produce a vibration attenuation system for possible use on Shuttle or Space Station. The system is a very tow frequency, flexible interface between a scientific payload and the orbiting host platform. The platforms natural modes may be excited by on-board equipment and astronaut activities, and predictions indicate that these disturbances may be enough to upset the desired levels of microgravity. The MDA isolator concept has been demonstrated in 3-axis testing in the laboratory and nearly meets the desired space station specifications. However, the design needs on-orbit testing to verify its performance in a true space environment. This paper discusses the practical aspects of the design and operation of a flight-test version. NASA has notified MDA that a Phase A award for an experiment will be made under the IN-STEP program.
Author
Design Analysis; Microgravity; Vibration; Payloads; Isolators

20030077860 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
The X-Ray Baldwin Effect: Z = 2 Fe-K and Compton Humps as Ionized Disk Diagnostics
Mushotzky, Richard F., Technical Monitor; Elvis, Martin; September 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9987; No Copyright; Avail: CASI; A01, Hardcopy

Work on this project is almost complete. A final trip to the XMM Survey Science Center at the University of Leicester is being undertaken to ensure that the with Prof. A. King on theoretical implications in the context of his super- Eddington wind model for AGNs, that has just been published on astro-ph. The wind model we developed has led to a paper being submitted to ApJ. The referee's response requires some care, and so the PI will be visiting Dr. Guido Risaliti, with whom he developed the code, at the Arcetri Observatory, Italy, during the above trip.
Author
Active Galactic Nuclei; X Rays; Ionization; Disk Galaxies

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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*.

20030068970 Naval Postgraduate School, Monterey, CA
Refinements in a DCT Based non-Uniform Embedding Watermarking Scheme
Giakoumakis, Michail D.; Mar. 2003; 143 pp.; In English; Original contains color illustrations
Report No.(s): AD-A414890; No Copyright; Avail: CASI; A07, Hardcopy

Perceptual watermarking is a promising technique towards the goal of producing invisible watermarks. It involves the integration of formal perceptual models in the watermarking process, with the purpose of determining those portions of an image that can better tolerate the distortion imposed by the embedding and ensuring that the watermarking will inflict the least possible degradation on the original image. In a previous study the Discrete Cosine Transform was used, and the watermark embedding was done in a non- uniform matter with criteria based on both the host image and the watermark. The decoder model employed made use of apriori access to unmarked and marked images as well as to the watermark. A fair level of success was achieved in this effort. In our research we refine this scheme by integrating a perceptual model and by proposing a modification to the decoder model that makes possible the successful recovery of the watermark without apriori access to it. The proposed perceptual scheme improves the watermark's transparency while at the same time maintains sufficient robustness to quantization and cropping.
DTIC
Images; Embedding

20030069010 NASA Marshall Space Flight Center, Huntsville, AL, USA
AM03-AM121-115 Hard X-Ray Optics Development at MSFC
Ramsey, Brian; Elsner, Ron; Engelhaupt, Darell; Gubarev, Mikhail; Kolodziejczak, Jeffery; Martin, Greg; ODell, Steve; Speegle, Chet; Weiskopf, Martin; [2003]; 1 pp.; In English; Optics for EUV, X-Ray and Gamma-Ray Astronomy, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We have developed the electroformed-nickel replication process to enable us to fabricate light-weight hard-x-ray region. Two projects currently utilizing this technology are the production of over 250 r from 5 to 10 cm, for our HERO balloon payload, and 15- and 23-cm-diameter shells for a prototype module. The challenge for the former is to fabricate, mount, align and fly a large number of high-r constraints of a modest budget. For the latter, the challenge is to maintain high angular resolution shell thicknesses (100 micron) which make the shells extremely sensitive to electroforming stresses process does not degrade the ultra-smooth surface finish (approx. 3 A required for eventual multilayer c on these two programs.
Author
X Ray Optics; Electroforming; Fabrication

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20030071064 Sandia National Labs., Albuquerque, NM
Proceedings of 1999 US/Japan Workshop (99FT-05) on High Heat Flux Components and Plasma Surface Interactions For Next Fusion Devices
Nygren, R.; Stavros, D.; Jul. 10, 2000; 700 pp.; In English
Report No.(s): DE2003-759447; SAND2000-1369; No Copyright; Avail: Department of Energy Information Bridge

The 1999 US-Japan Workshop on High Heat Flux Components and Plasma Surface Interactions in Next Step Fusion devices was held at the St. Francis Hotel in Santa Fe, New Mexico, on November 1-4, 1999. There were 42 presentations as well as discussion on technical issues and planning for future collaborations. The participants included 22 researchers from Japan and the USA as well as seven researchers from Europe and Russia. There have been important changes in the programs in both the US and Japan in the areas of plasma surface interactions and plasma facing components. The US has moved away from a strong focus on the ITER Project and has introduced new programs on use of liquid surfaces for plasma facing components, and operation of NSTX has begun.
NTIS
Thermonuclear Reactions; Heat Flux; Conferences; Fusion Reactors; Japan

20030075763 North Carolina State Univ., Raleigh, NC, USA
Safety of Plasma-Facing Components and Aerosol Transport during Hard Disruptions and Accidental Energy Release in Fusion Reactors
Bourham, M. A.; Gilligan, J. G.; Aug. 1999; 288 pp.; In English
Report No.(s): DE2003-763378; No Copyright; Avail: Department of Energy Information Bridge

Safety considerations in large future fusion reactors like ITER are important before licensing the reactor. Several scenarios are considered hazardous, which include safety of plasma-facing components during hard disruptions, high heat fluxes and thermal stresses during normal operation, accidental energy release, and aerosol formation and transport. Disruption events, in large tokamaks like ITER, are expected to produce local heat fluxes on plasma-facing components, which may exceed 100 GW/m(sup 2) over a period of about 0.1 ms. As a result, the surface temperature dramatically increases, which results in surface melting and vaporization, and produces thermal stresses and surface erosion. Plasma-facing components safety issues extends to cover a wide range of possible scenarios, including disruption severity and the impact of plasma-facing components on disruption parameters, accidental energy release and short/long term LOCA's, and formation of airborne particles by convective current transport during a LOVA (water/air ingress disruption) accident scenario. Study, and evaluation of, disruption-induced aerosol generation and mobilization is essential to characterize database on particulate formation and distribution for large future fusion tokamak reactor like ITER. In order to provide database relevant to ITER, the SIRENS electrothermal plasma facility at NCSU has been modified to closely simulate heat fluxes expected in ITER.
NTIS
Fusion Reactors; Accidents; Safety Factors

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*.

20030071226 Computer Sciences Corp., USA, NASA Ames Research Center, Moffett Field, CA, USA
Many-Body Effects and Lineshape of Intersubband Transitions in Semiconductor Quantum Wells
Ning, Cun-Zheng; June 16, 2003; 9 pp.; In English; EP2DS Conference, 9-18 Jul. 2003, Japan
Contract(s)/Grant(s): DTT559-99-D-00437; No Copyright; Avail: CASI; A02, Hardcopy

Intersubband Transition (ISBT) infrared (IR) absorption and PL in InAs/AlSb were studied for narrow Quantum Wells (QWs). A large redshift was observed (7-10 meV) as temperature increased. A comprehensive many-body theory was developed for ISBTs including contributions of c-c and c-phonon scatterings. Many-body effects were studied systematically for ISBTs. Redshift and linewidth dependence on temperature, as well as spectral features were well explained by theory.
Derived from text
Infrared Absorption; Quantum Wells; Indium Arsenides; Aluminum Antimonides; Semiconductors (Materials)

20030071632 NASA Marshall Space Flight Center, Huntsville, AL, USA
Characterization of Pixelated Cadmium-Zinc-Telluride Detectors for Astrophysical Applications
Gaskin, Jessica; Sharma, Dharma; Ramsey, Brian; Seller, Paul; [2003]; 1 pp.; In English; X-Ray and Gamma-Ray Instrumentation for Astronomy XIII, 3-8 Aug. 2003, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Comparisons of charge sharing and charge loss measurements between two pixelated Cadmium-Zinc-Telluride (CdZnTe) detectors are discussed. These properties along with the detector geometry help to define the limiting energy resolution and spatial resolution of the detector in question. The first detector consists of a 1-mm-thick piece of CdZnTe sputtered with a 4x4 array of pixels with pixel pitch of 750 microns (inter-pixel gap is 100 microns). Signal readout is via discrete ultra-low-noise preamplifiers, one for each of the 16 pixels. The second detector consists of a 2-mm-thick piece of CdZnTe sputtered with a 16x16 array of pixels with a pixel pitch of 300 microns (inter-pixel gap is 50 microns). This crystal is bonded to a custom-built readout chip (ASIC) providing all front-end electronics to each of the 256 independent pixels. These detectors act as precursors to that which will be used at the focal plane of the High Energy Replicated Optics (HERO) telescope currently being developed at Marshall Space Flight Center. With a telescope focal length of 6 meters, the detector needs to have a spatial resolution of around 200 microns in order to take full advantage of the HERO angular resolution. We discuss to what degree charge sharing will degrade energy resolution but will improve our spatial resolution through position interpolation.
Author
Astrophysics; Cadmium Tellurides; Zinc Tellurides; Pixels; Detectors

77
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*.

20030071081 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Zero-Degree Detector System
Adams, James H., Jr.; Kouznetsov, Evgueni; [2003]; 1 pp.; In English; 28th International cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: CASI; A01, Hardcopy

A new detector system has been developed to measure light fragments from heavy ion fragmentation reactions. The detector system separately measures the signals from simultaneous fragments.
Author
Fragmentation; Fragments; Light Ions; Ionic Collisions

20030077825 Department of Energy, Washington, DC
Collaboration of Prairie View A&M University with The Lawrence Livermore National Laboratory on the BABAR Detector and Experiment at SLAC
Jan. 20, 2000; 18 pp.; In English
Report No.(s): DE2003-765702; No Copyright; Avail: Department of Energy Information Bridge

The Prairie View A&M University High Energy Physics Group with its contingent of three undergraduates physics majors, joined the BaBar Collaboration at SLAC in September 1994. BaBar is the experiment and detector running in the PEP-II ring at SLAC as part of the Asymmetric B Factory project there to study CP violation and heavy flavor physics. The focus of our effort before this year was with the Muon/Neutral Hadron Detector/Instrumented Flux Return (IFD) subgroup within the BaBar collaboration, and particularly with the GEANT simulation of the IFR. With the GEANT3 simulation essentially frozen, and the GEANT4 full simulation of the IFR done, we have decided to redirect our efforts toward other areas.
NTIS
Linear Accelerators; University Program

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20030071101 Cayuga County Community Coll., Auburn, NY, USA
Defining Earth System Enterprise Information Needs and Pilot Programs for Utilization by Local Government in the Eastern US
Brower, Robert N.; [2003]; 8 pp.; In English
Contract(s)/Grant(s): NAG5-7473; No Copyright; Avail: CASI; A02, Hardcopy
This report profiles 13 objectives of the grant it covers, and summarizes significant findings or accomplishments.
Author
Geographic Information Systems; Governments; Resources Management

20030082130 Office of the Secretary of Defense, Washington, DC, USA
Realistic Cost Estimates for Acquisition Programs: CAIG Perspectives
Burke, Richard; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 20-1 - 20-6; In English; See also 20030082129; Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy
This paper discusses three specific questions: 1.Why do we do realistic cost estimates? 2. How we develop and use the cost estimates? and 3. How successful are we?
CASI
Cost Estimates; Acquisition; Life Cycle Costs

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*.

20030071130 Army War Coll., Carlisle Barracks, PA
National Security Policy on Government Secrecy
Brown, Alan F.; Apr. 7, 2003; 30 pp.; In English
Report No.(s): AD-A414990; No Copyright; Avail: CASI; A03, Hardcopy
Protecting certain information in government is vital to the national security and public safety. The American public has the right to know of the activities of its government. How has the balance of secrecy and openness in the national security policy changed over the years? Where is the Federal Government headed with its national security policy on secrecy?
DTIC
Policies; Security

20030071246
Developing a Web-Based Developmental Feedback Program
Douglas, Matthew A.; Mar. 2003; 200 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415134; AFIT/GLM/ENV/03-01; No Copyright; Avail: CASI; A09, Hardcopy
Developmental feedback programs provide an opportunity to improve leadership practices by giving leaders feedback about their performance from a number of sources, This thesis expanded on Capt Doug Patton's pilot study (2002) that

developed and validated an upward feedback instrument (UFI) for Aeronautical Systems Center (ASC) and Air Force Security Assistance Center (AFSAC) supervisors. Specifically, the purpose of this thesis was to develop a web-based developmental feedback collection, reporting, and analysis tool-set.
DTIC
Computer Programs; Feedback

20030071247
Perceptions vs Reality: A Longitudinal Experiment in Influenced Judgement Performance
Knode, Monti L.; Mar. 25, 2003; 118 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415135; AFIT/GIR/ENV/03-09; No Copyright; Avail: CASI; A06, Hardcopy

Government reliance on computer-mediated information has transformed it from 'enabler' to 'target' which now demands the detection of manipulated and deceptive measures a primary security objective. As people are not inherently good performers at detecting deceptive communications, this study draws on interpersonal deception theory (Burgoon, 1986) and social cognitive theory (Bandura, 1986) to measure personal perceptions that influence decisions operationalized as the successful detection of a deceptive measure. Department of Defense personnel (N--119) participated in a longitudinal experiment that measured detection performance before and after training and feedback treatments. Self-efficacy and perceived training effectiveness emerged as dominant factors in predicting performance. The most significant finding was the reciprocated effect of feedback on performance history as it clearly governed self-reports of self-efficacy and training effectiveness, which in turn positively influenced future deception detection accuracy. This suggests the cognitive foundation for future decision- making can be altered and performance predicted as a result. Furthermore, while personal beliefs influence behavior, realized performance will direct personal beliefs which in turn further influence future behavior. It is recommended that continued research on the effect of honest feedback and effects of media richness be investigated when regarding computer-mediated information.
DTIC
Detection; Deception

20030071276
An Extensible Information Grid for Risk Management
Maluf, David A.; Bell, David G.; [2003]; 6 pp.; In English; SAE International World Aviation Conference, 9 Sep. 2003, Montreal, Quebec, Canada
Contract(s)/Grant(s): NCC2-1006; Copyright; Avail: Other Sources

This paper describes recent work on developing an extensible information grid for risk management at NASA - a RISK INFORMATION GRID. This grid is being developed by integrating information grid technology with risk management processes for a variety of risk related applications. To date, RISK GRID applications are being developed for three main NASA processes: risk management - a closed-loop iterative process for explicit risk management, program/project management - a proactive process that includes risk management, and mishap management - a feedback loop for learning from historical risks that escaped other processes. This is enabled through an architecture involving an extensible database, structuring information with XML, schemaless mapping of XML, and secure server-mediated communication using standard protocols.
Author
Risk; Information Systems; Project Management; Feedback; Accidents

20030073439 Environmental Protection Agency, Las Vegas, NV, USA, Oak Ridge National Lab., TN, Hunter Coll., New York, NY, USA, Brookhaven National Lab., Upton, NY
Environmental Technology Verification Report: Environmental Decision Support Software, University of Tennessee Research Corporation, Spatial Analysis and Decision Assistance (SADA)
Sullivan, T.; Armstrong, A. Q.; Dindal, A. B.; Jenkins, R. A.; Osleeb, J.; Feb. 2000; In English
Report No.(s): PB2003-106581; EPA/600/R-00/036; No Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: Introduction (Background, Demonstration Overview, Summary of Analysis Performed by SADA, SADA Technology Description, SADA Features, SADA Assessment Capabilities, Human Health Risk, Geospatial Analysis, Decision Analysis); Demonstration process and design, (Development of Test Problems, Test Problem Definition, Summary of Test Problems, Analysis of Test Problems, Preparation of Demonstration Plan); SADA evaluation (SADA Technical Approach, SADA Implementation of Geostatistical Approach, Additional Information about the SADA Software, Summary

of Performance); SADA update and representative applications (Objective, Technology Update, Representative Applications); References.
NTIS
Environmental Control; Cost Analysis

20030073440 Environmental Protection Agency, Las Vegas, NV, USA, Brookhaven National Lab., Upton, NY, Oak Ridge National Lab., TN, Hunter Coll., New York, NY, USA
Environmental Technology Verification Report: Environmental Decision Support Software, C Tech Development Corporation, Environmental Visualization System Pro (EVS-PRO)
Sullivan, T.; Armstrong, A. Q.; Dindal, A. B.; Jenkins, R. A.; Osleeb, J.; Mar. 2000; In English
Report No.(s): PB2003-106586; EPA/600/R-00/047; No Copyright; Avail: National Technical Information Service (NTIS)

The U.S. Environmental Protection Agency (EPA) is charged by Congress with protecting the nation's natural resources. The National Exposure Research Laboratory (NERL) is EPA's center for the investigation of technical and management approaches for identifying and quantifying risks to human health and the environment. NERL's research goals are to (1) develop and evaluate technologies for the characterization and monitoring of air, soil, and water; (2) support regulatory and policy decisions; and (3) provide the science support needed to ensure effective implementation of environmental regulations and strategies. EPA created the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative technologies through performance verification and information dissemination. The goal of the ETV Program is to further environmental protection by substantially accelerating the acceptance and use of improved and cost-effective technologies. The ETV Program is intended to assist and inform those involved in the design, distribution, permitting, and purchase of environmental technologies. This program is administered by NERL's Environmental Sciences Division in Las Vegas, Nevada.
NTIS
Environment Protection; Information Dissemination

20030073441 Environmental Protection Agency, Las Vegas, NV, USA, Sandia National Labs., Albuquerque, NM
Environmental Technology Verification Report: Groundwater Sampling Technologies, Burge Environmental, Inc., Multiprobe 100
Einfeld, W.; Koglin, E. N.; Aug. 2000; 40 pp.; In English
Report No.(s): PB2003-106589; EPA/600/R-00/074; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Environmental Protection Agency (EPA) has created the Environmental Technology Verification Program (ETV) to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by substantially accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high-quality, peer reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies. ETV works in partnership with recognized standards and testing organizations and stakeholder groups consisting of regulators, buyers, and vendor organizations, with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible.
NTIS
Environment Protection; Information Dissemination

20030077858 Air Force Inst. of Tech., Wright-Patterson AFB, OH, USA
Analyzing Differences Between Public and Private Sector Information Resource Management: Chief Information Officer Challenges and Critical Technologies
Mitchell, Scott M.; Jan. 2002; 128 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415107; AFIT/GIR/ENV/03-12; No Copyright; Avail: CASI; A07, Hardcopy

The office of the Chief Information Officer is still new within public sector organizations. Further, the office of the CIO was hastily created by Federal laws that provide only broad direction for its implementation and practice while at the same time limiting each office's power and reach within Federal agencies. Presently, because of broadly defined scope and the newness of the office in the public sector, Federal CIOs now face many challenges and critical technologies in managing their

agency's information resources. Private sector organizations have a valuable knowledge base from their CIO office implementation efforts and subsequent operations. This private sector knowledge could offer public sector CIOs invaluable insight into successful information resource management practices. However, public and private managers must take great care in deciphering which IRM prescriptions are relevant to their organizational situation. The goal of this research is to discover if public and private sector CIOs are faced with the same challenges and view the same technologies as critical for their organization's operations .The results of an annual survey of public sector CIOs and senior IRM managers are compared with data collected from FORTUNE 1000 CIOs using the same instrument. Findings from this study provide evidence that public and private sector CIOs do perceive to be faced with many of the same challenges and also view many of the same technologies as critical to their organization's operations.
DTIC
Resources Management; Information Management

20030082137 Marine Corps, Washington, DC, USA
Innovations and Improvements in Cost Information Management
Robinson, David M.; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 7-1 - 7-3; In English; See also 20030082129; Copyright; Avail: CASI; C01, CD-ROM; A01, Hardcopy

This presentation outlines the status of weapon system cost reporting in the U.S. Department of Defense (DoD), including an overview of DoD cost reporting history and a description of the major reengineering effort that began in the mid-1990s. In addition, it will summarize the planned expansion of the Contractor Cost Data Reporting (CCDR) system into a more comprehensive, life-cycle cost data and document retrieval tool, called the Defense Automated Cost Information Management System. The DoD has been collecting cost data from the defense manufacturing industry since 1942, when it began purchasing large quantities of aircraft. There were a number of reports developed during the 1940s and 1950s that focused primarily on the aircraft and missile industries; however, cost collection was not done uniformly or with any industry-wide standards making comparisons of data rather difficult. Cost reporting continued to be refined during the 1960s and into the early 1970s until the DoD developed its current Contractor Cost Data Report system. The CCDR system was a set of documents that standardized cost reporting across all defense industries and became the major source of independent cost data for DoD analysts. defense industries and became the major source of independent cost data for DoD analysts. However, in the early 1990s, the CCDR system came under significant criticism from both the DoD Inspector General and defense industry manufacturers for being inaccessible, unreliable, and overly burdensome. In response to these criticisms the DoD created the CCDR Project Office and empowered it with three objectives: make old data available electronically over the World Wide Web; collect and distribute new data using the Internet; and, reduce the financial and administrative burden of cost reporting to the defense industry.
Derived from text
Automatic Control; Data Acquisition; Data Retrieval; Data Systems; Defense Industry; Defense Program; Information Retrieval

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20030082129 Research and Technology Organization, Neuilly-sur-Seine, France
Cost Structure and Life Cycle Cost (LCC) for Military Systems
June 2003; 196 pp.; In English; In French; Cost Structure and Life Cycle Cost (LCC) for Military Systems, 24-25 Oct. 2001, Paris, France; See also 20030082130 - 20030082140
Report No.(s): RTO-MP-096; AC/323(SAS-036)TP/27; Copyright; Avail: CASI; C01, CD-ROM; A09, Hardcopy

Cost, not limited to acquisition costs but all costs involved in the use and disposal of systems, has become a major issue in military systems analysis. In order to harmonize the most important aspects of Life Cycle Cost (LCC) a study was carried out by Technical Team SAS-028 covering three concurrent aspects: the cost breakdown structure that defines and organizes all cost elements to be considered, the boundaries of those cost elements defined by LCC, TOC, COO and WLC and the uses of those concepts (economic or financial analysis, optimisation, etc.) by decision makers. Following this study, a symposium entitled Cost Structure and Life Cycle Cost (LCC) for Military Systems was held in Paris from 24 to 25 October 2001.

Twenty-two papers, focusing on concepts such as Life Cycle Cost (LCC), Whole Life Cost (WLC), Cost of Ownership (COO) or Total Ownership Cost (TOC), were presented.
Author
Conferences; Life Cycle Costs; Systems Analysis; Military Technology; Logistics; Value Engineering

20030082131 Turkish General Staff Headquarters, Ankara, Turkey
Life Cycle Cost Procurement Techniques
Ozkil, Altan; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 13-1 - 13-15; In English; See also 20030082129; Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy

The primary purpose of this presentation is to describe the nature of a spectrum of currently identified types of life cycle cost procurement techniques. These techniques have the common characteristic that all are designed to motivate contractors to design, manufacture and deliver equipment with lower life cycle costs. You may believe that savings may be in the acquisition cost component of life cycle costs. However, primary emphasis is generally on reducing and controlling operating and support costs by transferring more responsibility to the contractor for equipment operating and support cost performance.
Author
Life Cycle Costs; Procurement; Value Engineering; Manufacturing

20030082133 Turkish General Staff Headquarters, Ankara, Turkey
The Use of Life Cycle Cost and Nature of Decisions
Ozkil, Altan; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 3-1 - 3-14; In English; See also 20030082129; Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy

The use of life cycle cost must, whatever the phase of a programme, inform the process by which managers can bid for future expenditure, manage existing budgets and make the best decisions on options presented to them. Most of the major costs determining decisions are made during the initial phases of the Defense Program Management. In this early decision period, the type of system technology procured, the basic design, the support system and the maintenance concept are determined. Decisions made in the early phases of any particular defense program freeze up to eighty percent of the potential life cycle cost of the aforementioned defense program. For this reason, it is essential that detailed and accurate assessments of anticipated costs must be made as early as possible.
Derived from text
Life Cycle Costs; Decision Making; Defense Program; Project Management

20030082134 North Atlantic Treaty Organization, Brussels, Belgium
Life Cycle Management in NATO
Fajardo, Emilio; Herreman, Robert; Glenister, Graeme; DiCicco, Sergio; Bouman, Cornelis; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 4-1 - 4-12; In English; See also 20030082129; Original contains color illustrations; Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy

Traditionally, NATO acquisition and logistics have operated through a series of relatively independent processes and organizations. The November 99 CNAD meeting (Conference of National Armaments Directors) confirmed a recommendation from the NATO Armament Review (NAR) to create a Life Cycle Working Group. This working group has adopted Life Cycle Management (LCM) principles and has accepted the following mission statement for its work: To propose guidance in the area of Life Cycle Management to CNAD by providing: A study of the basic elements (principles and definitions) needed to define a NATO-policy on LCM and a framework (high level process model) and a proposal to move forward.' This paper gives an overview of the contents of the report, which among others mentions the objectives for introducing LCM in NATO. Furthermore a definition for LCM is given and reasons are given why LCM might provide us with the necessary changes in our organisations to meet the demands of our war fighters and other stakeholders. It is clear that managing the total life cycle in organisations means the integration of the acquisition and logistic processes. However implementing LCM in an organization is not done without the necessary preparation. A number of key enablers need to be in place before any implementation can even start. An important enabler is a unified business process methodology which gives us the tool to develop a common framework to describe the life cycle of a system by a complete set of well-defined processes and associated terminology. Based on this a life cycle management model is presented. Although the work that has been done by the Life Cycle Working Group is of great importance it cannot stop here. In order to take LCM forward in NATO the Life Cycle Working Group recommends an action plan for the near, the medium and the long term to be carried out under the leadership of a high NATO authority. In order to make the transformation to LCM a success for NATO the Life Cycle Working Group

has recommended to CNAD to investigate the broadest possible participation of other organisations in NATO. Furthermore a high level Committee under CNAD should investigate in close co-ordination with SNLC and NC Board how these actions for the near, medium and long term can effectively be implemented in NATO. The NADREPs (National Armaments Directors Representatives) on behalf of the CNAD have approved at their 12th March 2001 meeting the Life-Cycle WG report and the NCMB was tasked to continue this important work and to act upon the given recommendations.
Derived from text
North Atlantic Treaty Organization (NATO); Life Cycle Costs; Logistics; Project Management

20030082135 Defence Procurement Agency, Bristol, UK
Life Cycle Costing in a Commercial Style Accounting Regime as it Impacts UK MoD
Burridge, Julian; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 5-1 - 5-10; In English; See also 20030082129; Original contains color illustrations; Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy

This paper reviews the drive towards commercial style accounting in the UK MoD and the requirements for life cycle costing. It then discusses the thrust towards whole life costs and how this is defined in the UK. The meaning of Cost Of Ownership, economic and financial appraisal is explained and what steps are required such that the various required outputs can be derived. Newly developed tools and processes are described that will help the MoD to realise the objectives of improving decision making and budgeting.
Author
Life Cycle Costs; United Kingdom; Accounting; Economics

20030082136 Cranfield Univ., Shrivenham, UK
Cost Estimating and Forecasting in the New Era of Smart Procurement
Hilton, Brian John; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 6-1 - 6-22; In English; See also 20030082129; Original contains black and white illustrations; Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy

This paper reports on research on the future cost estimating and forecasting challenges facing defense and aerospace. It shows that cost estimation is now a critical and changing capability for the UK Aerospace and Defense industries. As defense changes and downsizes projects are more infrequent, more risky, more dependent on new processes and support systems all less permissive of high error rates and profit margins. MoD and industry are responding by restructuring their processes, focussing on new business opportunities and widening the scope of cost information and support. Critical to this is support for Integrated Product Teams (IPTs) in estimating trade-offs between design and supply chain and ownership costs. Our work suggests significant added value from joint research by academia and industry. Traditional techniques for using data in Cost Estimating Relationships (CERs) do not take into account the simultaneous interaction between designing to deliver a particular through life capability to an available budget when one is willing to trade-off affordability against capability, reliability and support costs. Our work explores the potential of best commercial practice in production and distribution to contribute to lower cost military capability. Strenuous efforts are being made on this, smart procurement . If successful this will have a significant impact on cost and so estimating. Our work distinguished between three levels of impact by: 1) utilizing modern international distributional networks available to all 2) using modern 'lean' techniques within organizations 3) introducing new production process and materials. If defense manufacturing could work on a shorter cycle of flow based procurement, say over 5 to 10 years, things could change dramatically. The current cycle is 15-20 years using batch procurement. This batch procurement cycle has high initial costs followed by considerable inventory, updating and sustainment costs. Best modern commercial procurement practice requires a flow of frequently purchased reliable equipment requiring less in-service support. Could this be achieved in defense? Until now no investment has been made in the costing resources to test this hypothesis. We provide a theoretical basis for doing so However, defense departments are monoposonistic buyers driven by political and military, not commercial, imperatives. It is thus difficult to envisage how they can access all the benefits of commercial practice. The paper considers the potential impact in principle of these methods on defense procurement costs and so estimates. It then hypothesizes on the means by which the results desired might be achieved given the described constraints. A lack of historical defense data on the impact of these methods is a barrier to defense based research. The consequence is that estimators have to use commercial analogies. These then have to be modified to recognize the noncompetitiveness of the defense context. Specific new areas of research suggested by all this would be: 1) The extent to which commercial practice can work in military procurement; 2) To model the impact of processes on cost, as opposed to capability on cost; 3) The support implication of Commercial Off The Shelf (COTS) components and systems.
Author
Aerospace Industry; Cost Estimates; Defense Industry; Procurement

20030082138 Naval Center for Cost Analysis, Washington, DC, USA

Visibility and Management of Operating and Support Costs (VAMOSC) Management Information System

Cheshire, Leonard P.; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 8-1 - 8-14; In English; See also 20030082129; Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy

In the past, decision makers in the U.S. Navy focused largely on development and procurement costs to determine the inventory of ships, aircraft and other weapon systems to be acquired and operated. However, in recent years the cost of operating and maintaining these systems has become a primary factor in the acquisition decision-making process for determining force levels and composition of the U.S. Navy. As a result, great emphasis has been placed on the development, maintenance and availability of comprehensive databases for estimating operating and support (O&S) costs. The Navy's Visibility and Management of Operating and Support Cost (VAMOSC) Management Information System displays O&S costs and related information (e.g., operating hours, manning) about ships, aircraft, ordnance and tracked/wheeled vehicles. This information is contained in an Oracle relational database in a hierarchical cost element structure, by fiscal year. Depending on the specific system, this database contains up to 15 years of data collected annually from about 125 different sources. The objectives of the VAMOSC system are: To provide visibility of O&S costs for use in cost analysis of major defense acquisition programs and force structure alternatives in support of the Planning, Programming and Budgeting System (PPBS) process and satisfy the Congressional requirement that DoD track and report O&S costs for major acquisition programs. To provide visibility of critical maintenance and support costs at the subsystem level in sufficient detail to promote cost-conscious design and configuration management of new and fielded defense programs. To provide visibility of O&S costs so they may be managed to reduce and control program life-cycle costs. To improve the validity and credibility of O&S cost estimates by establishing a widely accepted database, thereby reducing the cost and time for collecting these defense program O&S costs for specific applications. The VAMOSC database was initiated in 1975 with a mandate to collect, process and display actual historical costs by platform and weapon system; thus, primarily direct costs are included. With minor exceptions, no allocated costs or indirect costs are included. Historically, VAMOSC data were used predominantly to develop the O&S cost portion of LCC estimates for future weapon systems. Today, the VAMOSC database is becoming an integral part of Navy efforts to understand better and reduce the Total Ownership Cost (TOC) of existing and future weapon systems. Navy VAMOSC is currently available to government and industry users by several means, but access is increasingly made directly to the Oracle relational database using a web browser software. The purposes of this paper are to present an overview of the U.S. Navy's VAMOSC program, provide detailed information on the various databases that comprise VAMOSC, discuss current and future VAMOSC improvement efforts and demonstrate the utility of VAMOSC data in structuring cost estimating models, such as the Operating and Support Cost Analysis Model (OSCAM). As a record of actual historical O&S costs of ships, aircraft, ordnance, and ground systems that are used for cost estimating purposes, the U.S. Navy's VAMOSC database is highly relevant to the symposium theme of 'Cost Structure and Life Cycle Cost for Military Systems' and specifically relates to the Database topic.

Author

Operating Costs; Management Information Systems; Relational Data Bases; Defense Program; Configuration Management

20030082139 Ministry of Defence, Bristol, UK

OSCAM: Simulating Operation and Support Costs Using System Dynamics

Burridge, Julian; Coyle, Jonathan; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 9-1 - 9-10; In English; See also 20030082129; Original contains color illustrations; Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy

Development of a a new cost model for the Operation and Support elements of an equipment life cycle is outlined. Existing tools do not properly represent the dynamic nature of Operation and Support (O&S), nor are they tailored to the needs of users. Therefore, a proof of concept demonstrator for shipboard systems (Sys model) was developed and delivered in late 1996. This demonstrator became known as the Operation and Support Cost Analysis Model (OSCAM). The OSCAM model tool set is based on the concept of System Dynamics modelling. This technique enables the processes surrounding operating and maintaining the equipment to be mapped into the model. To develop the model(s) takes time, commitment and resources from the developers, sponsors, and stake holders who operate and support the equipment. The initial stage is a facilitated workshop. During this session, all processes are identified and mapped out. Further workshop sessions then take place on each process. The end result is an influence diagram of all maintenance and support activities that make up the system dynamics model. Near neighbor or reference systems can then be used to initially populate the model. Forecasts for new systems or equipment O&S costs can then be soundly based.

Author

Cost Analysis; Life (Durability); Dynamic Models; Life Cycle Costs

20030082140 Physics and Electronics Lab. TNO, The Hague, Netherlands, Royal Netherlands Air Force, The Hague, Netherlands

LCC Analysis for the Replacement of the Dutch F-16

deHaas, R. C. T.; Smit, M. C.; deZeeuw, M.; Cost Structure and Life Cycle Cost (LCC) for Military Systems; June 2003, pp. 15-1 - 15-6; In English; Cost Structure and Life Cycle Cost (LCC) for Military Systems; See also 20030082129; Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy

In the presentation we will first describe the way Life Cycle Costs (LCC) analysis are performed in the Netherlands in a general way. In the Netherlands LCC-studies are mainly used in the acquisition process of new military equipment. Inside the armed forces a project team is responsible for the acquisition process and thus also for the execution of an LCC-study. TNO is also regularly involved for a number of reasons. The most important reason is that TNO is independent. Besides that TNO-FEL has developed a step by step approach for performing LCC-analyses inside the Defence Organisation, called FELSALDO. The FELSALDO method consists of five steps: planning, definition, development, analysis and report. We will show a common cost tree for the acquisition costs, the exploitation costs and the disposal costs. When the elements of the cost tree have been determined, these cost elements are estimated. There are different ways of estimating a cost element. After estimating the cost elements the total LCC can be calculated. After this introduction we will focus on the project: Replacement F-16. We will show how the FELSALDO method was applied during the LCC-analysis in this project. First we will give a little background of the F-16 replacement project. We will indicate that LCC is only one of seven main decision criteria. After that we will give a detailed description of the LCC process, from planning to report using the five steps of the FELSALDO methodology. The LCC analysis in this project was done thoroughly and extensively. A lot of effort was put into gathering the right data from the vendors and a lot of interaction with the vendors was necessary in order to make sure that the data used was the right one and that the vendors data was used in an appropriate manner. Finally we will give the current status of the project, describe what the next LCC related problems will be and share the lessons learned of the F-16 replacement project. Author

F-16 Aircraft; Life Cycle Costs; Cost Estimates; Methodology

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SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20030069023 NASA Marshall Space Flight Center, Huntsville, AL, USA

Initiating Sustainable Operations at Marshall Space Flight Center

Adams, Daniel E.; Orrell, Josh; July 2003; 1 pp.; In English; 8th Annual Joint Services Pollution Prevention and Hazardous Waste Management Conference and Exhibition, 11-14 Aug. 2003, San Antonio, TX, USA

Contract(s)/Grant(s): NAS8-00150; Copyright; Avail: Other Sources; Abstract Only

Marshall Space Flight Center conducted a preliminary sustainability assessment to identify sustainable projects for potential implementation at its facility in Huntsville, Alabama. This presentation will discuss the results of that assessment, highlighting current and future initiatives aimed at integrating sustainability into daily operations.

Derived from text

Space Flight; Operations; Project Management; Management Planning

20030071142 Alabama Univ., Huntsville, AL, USA

To Support Research Activities Under the NASA Experimental Program to Stimulate Competitive Research

Gregory, John C.; August 2003; 97 pp.; In English

Contract(s)/Grant(s): NCC5-165

Report No.(s): UAH-2000-276; No Copyright; Avail: CASI; A05, Hardcopy

The Alabama NASA EPSCoR Program is a collaborative venture of The Alabama Space Grant Consortium, The Alabama EPSCoR, and faculty and staff at 10 Alabama colleges and universities as well as the Alabama School of Math and Science in Mobile. There are two Research Clusters which include infrastructure-building and outreach elements embedded in their research activities. Each of the two Research Clusters is in an area of clear and demonstrable relevance to NASA's mission, to components of other Alabama EPSCoR projects, and to the State of Alabama's economic development. This Final Report summarizes and reports upon those additional activities occurring after the first report was submitted in March 2000 (included here as Appendix C). Since the nature of the activities and the manner in which they relate to one another differ by cluster,

these clusters function independently and are summarized in parallel in this report. They do share a common administration by the Alabama Space Grant Consortium (ASGC) and by this means, good ideas from each group were communicated to the other, as appropriate. During the past year these research teams, involving 15 scientists, 16 graduate students, 16 undergraduates, and 7 high school students involving 10 Alabama universities had 14 peer reviewed scientific journal articles published, 21 others reviewed for publication or published in proceedings, gave 7 formal presentations and numerous informal presentations to well over 3000 people, received 3 patents and were awarded 14 research proposals for more than $213K dollars in additional research related to these investigations. Each cluster's activities are described and an Appendix summarizes these achievements.
Derived from text
Research And Development; Education; Organizations; NASA Space Programs

20030073600 Mainz Univ., Germany
High-Temperature Fractionations in the Solar Nebular Preserved in Highly Siderophile Element Systematics of Earth Primitive Upper Mantle
Schmidt, G.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 67; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Precise abundance data of highly siderophile elements (HSE) in 'fertile' mantle rocks will lead to a better understanding of the late accretionary history of the Earth. Primary fractionated HSE in the Earth s mantle would have significant implications for Earth accretion. In this paper, I review high quality data from previous work on HSE abundances in fertile upper mantle samples and address cosmochemical constraints for the material of late planetary processes ('late veneer'). I will show the effects of cosmochemical processes in the solar nebular on the abundances of the HSE in Earth upper mantle. The investigations will focus on the evolution of condensed matter in the early solar system to better understand the processes involved in the formation of the Earth and their precursors. It is important to understand the behavior of elements during condensation and later nebular processes that separated elements from one another in the nebula, including separation of dust from gas, and created the components that accreted into asteroids and protoplanets. The results of this work may contribute to our understanding of the origin of the solar system and the processes involved to form planetary bodies and giving the Earth their unique composition.
Author
Earth Mantle; Fractionation; High Temperature; Nebulae

20030075797 Centre National d'Etudes Spatiales, France
Microgravity Data Analysis and the MIR Environment
Granier, Jean-Pierre; Faucher, Pascale; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 761-768; In English; See also 20030075796; No Copyright; Avail: CASI; A02, Hardcopy

This paper presents a new method to process the Megabytes of micro-acceleration data provided by the microgravity environment measurement. The Europe Informatique Company has developed under a CNES contract an Automatic Post-Processing Tool for the analysis of the MIR micro-acceleration environment data. The measurements have been performed during the ANTARES (August 92) and the Post-ANTARES flight (Autumn 92). The main objective of the microgravity Classification Tool is to provide a help for the analyst engineer. The classification principle is a comparison of the different computed distances between a signal to test and some representative signals contained in a data base. The classification tool selects the nearest class which contains the characteristic parameters of an event and associates this event to the initial signal. Three data bases are associated with each module of the MIR station, one per axis. Each classification base contains the events organized into classes. A test has been performed on the KVANT 2 classification base. The first analysis has shown excellent classification results with a ratio of good classification between 81% and 90% depending of the axis.
Author
Microgravity; Mir Space Station; Spacecraft Environments; Data Processing; Acceleration Measurement

20030075802 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA
Particle Dispersion Experiment (PDE): Preliminary Results From the USML-1 Glovebox
Marshall, John R.; Joint Launch + One Year Science Review of USML-1 and USMP-1 with the Microgravity Measurement Group, Volume 2; May 1994, pp. 717-732; In English; See also 20030075796; No Copyright; Avail: CASI; A03, Hardcopy

The Particle Dispersion Experiment was designed to test technologies for future Space Shuttle and Space Station

experiments that will be concerned with the dispersion of aerosols and related particulate clouds. PDE successfully tested a gas-pulse method of dispersing granular materials inside eight modular experiment chambers. The technique further demonstrated the ability of an air pulse to redisperse particles once they are already free-floating in a chamber. PDE was also designed to enable a limited parametric study of the aggregation of the dispersed particles caused by electrical interparticle forces. Such forces are prevalent on natural materials when dust is injected into planetary atmospheres by volcanic eruptions, meteorite impact, and dust storms. Electrostatic aggregation is inevitable in natural dust clouds, and is a major factor controlling the longevity of the dust palls. The PDE experiments showed that aggregation experiments can be conducted in small experiment chambers, that aggregating natural materials form amorphous and filamental structures, and that aggregation can lead to the formation of 'giant' (greater than centimeter) particle clusters with commensurately large electrical fields around them. The observed growth of the electrical fields has important implications for our understanding of the aggregation process, and of course, important ramifications for the behavior of natural dust clouds.
Author
Interplanetary Dust; Planetary Atmospheres; Spaceborne Experiments; Particulates; Volcanology

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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.

20030068992 NASA Ames Research Center, Moffett Field, CA, USA
Dynamical Study of Prebiotic Processing by Comet Impact
Huo, Winifred M.; Dateo, Christopher E.; McKay, Christopher P.; Borucki, William J.; July 10, 2003; 1 pp.; In English; Exobiology PI Conference, 26-29 Aug. 2003, Moffet Field, CA, USA
Contract(s)/Grant(s): RTOP 344-38-12-16; No Copyright; Avail: CASI; A01, Hardcopy

Comets and meteoroids that bombarded the Earth, other planets and moons are considered possible deliverers of prebiotic materials manufactured in space. Simultaneously, chemical processing can be initiated by the large kinetic energy imparted to the planetary atmosphere during comet/meteoroid entry. The efficiency of organic synthesis and the diversity of products by impact shock are known to decrease as the reducing power of the atmosphere decreases. It is generally accepted that rich organic products are produced in a methane atmosphere whereas a carbon dioxide atmosphere is reported to yield a dearth of products In order to understand the details of impact chemistry and how it depends on the atmospheric composition, we carried out simulations of the chemistry initiated by comet/meteoroid impact upon a planetary atmosphere using different atmospheric compositions. The simulations were done by solving the set of coupled equations for mass, momentum, and energy conservations, chemical kinetics, and transport, that describe a high-energy impact shock, subsequent expansion and cooling of the hot shocked gas by mixing with the ambient gas, and the eventual steady state composition.
Derived from text
Cometary Collisions; Atmospheric Composition; Carbon Dioxide; Meteorite Collisions; Dynamic Characteristics

20030069007 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Burst and Transient Source Experiment(BATSE)Earth Occultation Catalog of Low-Energy Gamma-Ray Sources. Short title: BATSE Earth Occultation Catalog v2.0
Harmon, B. A.; Wilson, C. A.; Fishman, G. J.; Connaughton, V.; Henze, W.; Paciesas, W. S.; Finger, M. H.; McCollough, M. L.; Sahi, M.; Peterson, B., et al.; [2003]; 2 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

The Burst and Transient Source Experiment (BATSE), aboard the Compton Gamma Ray Observatory (CGRO), provided a record of the low-energy gamma-ray sky (approx. 20-1000 keV) between 1991 April and 2000 May (9.1y). BATSE monitored the high energy sky using the Earth occultation technique (EOT) for point sources whose emission extended for times on the order of the CGRO orbital period (approx. 92m) or greater. Using the EOT to extract flux - 2 - information, a catalog of sources using data from the BATSE large area detectors has been prepared. The first part of the catalog consists of results from the all-sky monitoring of 58 sources, mostly Galactic, with intrinsic variability on timescales of hours to years. For these sources, we have included tables of flux and spectral data, and outburst times for transients. Light curves (or flux histories) covering the entire nine mission are being placed on the world wide web. We then performed a deep-sampling of these 58 objects, plus a selection of 121 more objects, combining data from the entire 9.ly BATSE dataset. Source types considered were primarily accreting binaries, but a small number of representative active galaxies, X-ray-emitting stars, and supernova remnants were also included. The sample represents a compilation of sources monitored and/or discovered with

BATSE and other high energy instruments between 1991 and 2000, known sources taken from the HEAO 1 A-4 (Levine et al. 1984) and Macomb and Gehrels (1999) catalogs. The deep sample results include definite detections of 82 objects and possible detections of 36 additional objects. The definite detections spanned three classes of sources: accreting black hole and neutron star binaries, active galaxies and supernova remnants. The average fluxes measured for the fourth class, the X-ray emitting stars, were below the confidence limit for definite detection. Flux data for the deep sample are presented in four energy bands: 20-40, 40-70, 70-160, and 160-430 keV. The limiting average flux level (9.1 y) for the sample varies from 3.5 to 20 mCrab (5delta) between 20 and 430 keV, depending on systematic error, which in turn is primarily dependent on the sky location. To strengthen the credibility of detection of weaker sources (approx.5-25 mCrab), we generated Earth occultation images, searched for periodic behavior using FFT and epoch folding methods, and critically evaluated the energy-dependent emission in the four flux bands. The deep sample results are intended for guidance in performing future all-sky surveys or pointed observations in the hard X-ray and low-energy gamma-ray band, as well as more detailed studies with the BATSE EOT.
Author
Gamma Ray Bursts; Active Galaxies; Emission Spectra; Gamma Rays

20030069021 NASA Marshall Space Flight Center, Huntsville, AL, USA
Tether-Cutting Energetics of a Solar Quiet Region Prominence Eruption
Sterling, Alphonse C.; Moore, Ronald L.; [2003]; 2 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

We study the morphology and energetics of a slowly-evolving quiet region solar prominence eruption occurring on 1999 February 8-9 in the solar north polar crown region, using soft X-ray data from the soft X-ray telescope (SXT) on Yohkoh and Fe xv EUV 284 A data from the EUV Imaging Telescope (EIT) on SOHO. After rising at approx. 1 km/s for about six hours, the prominence accelerates to a velocity of approx. 10 km/s, leaving behind EUV and soft X-ray loop arcades of a weak flare in its source region. Intensity dimmings occur in the eruption region cospatially in EUV and soft X-rays, indicating that the dimmings result from a depletion of material. Over the first two hours of the prominence s rapid rise, flare-like brightenings occur beneath the rising prominence which may correspond to 'tether cutting' magnetic reconnection. These brightenings have heating requirements of up to approx. 10(exp 28)-10(exp 29) ergs, and this is comparable to the mechanical energy required for the rising prominence over the same time period. If the ratio of mechanical energy to heating energy remains constant through the early phase of the eruption, then we infer that coronal signatures for the tether cutting may not be apparent at or shortly after the start of the fast phase in this or similar low-energy eruptions, since the plasma-heating energy levels would not exceed that of the background corona.
Author
Extreme Ultraviolet Radiation; Solar Prominences; Magnetic Field Reconnection

20030069031 NASA Marshall Space Flight Center, Huntsville, AL, USA
Wide-angle Optical Telescope for the EUSO Experiments
Hillman, L. W.; Takahaski, Y.; Zuccaro, A.; Lamb, D.; Pitalo, K.; Lopado, A.; Keys, A.; [2003]; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: Other Sources; Abstract Only

Future spacebased air shower experiments, including the planned Extreme Universe Space Observatory (EUSO) mission, require a wide-angle telescope in the near-UV wavelengths 330 - 400 nm. Widest possible target aperture of earth's atmosphere, such as greater than 10(exp 5) square kilometers sr, can be viewed within the field-of-view of 30 degrees from space. EUSO's optical design is required to be compact, being constrained by the allocated mass and diameter for use in space. Two doublesided Fresnel lenses with 2.5-m diameter are chosen for the baseline design. It satisfies the imaging resolution of 0.1 degree over the 30-degree field of view.
Author
Observatories; Space Missions; Optical Equipment; Wide Angle Lenses; Cosmic Ray Showers; Spaceborne Telescopes

20030069034 NASA Ames Research Center, Moffett Field, CA, USA
Disappearance of 19P/Borrelly's Silicate Feature in 2001 Apparition Is Attributed to Increase in Grain Size
Wooden, D. H.; Woodward, C. E.; Harker, D. E.; June 19, 2002; 1 pp.; In English; 35th American Astronomical Society Division of Planetary Sciences Annual Meeting, 2-6 Sep. 2003, Monterey, CA, USA
Contract(s)/Grant(s): RTOP 344-37-21-03; Copyright; Avail: Other Sources; Abstract Only

We report on observations and analysis of HIFOGS 10 microns spectrophotometry of short period comet 19P/Borrelly on 2003 October 13, 15 UT at the NASA IRTF. 19P/Borrelly is one of two short period comets, comet 4PIFaye being the other,

to have a silicate feature detected. During Borrelly s perihelion passage in 1994 December, a silicate feature was present with a flux-to-continuum ratio of 0.25. Two apparitions later in 2003 October, the silicate feature is absent. Thermal emission modeling using amorphous olivine and amorphous carbon shows that a slight increase in grain size accounts for the disappearance of the silicate feature. Analysis of 19P/Borrelly suggests grain size, and not the absence of olivine minerals, may be responsible for the absence of silicate features in most short period comets. 19P/Borrelly is one of the more active short period comets. However, short period comets as a family are less active than long period comets. Short period comets probably originated in the Kuiper Belt and suffered collisions while in residence in the outer solar system. Upon evolution into orbits that take them through the inner solar system, the surfaces of short period comets are exposed to sunlight through their many perihelion passages. This is in contrast to long period comets which probably originated near Jupiter and were expelled to the Oort cloud where they have existed and been exposed to cosmic ray processing. By studying the grain properties in short period comets and comparing to long period comets, we compare the effects on the grain populations of different parent body evolution histories. Upcoming opportunities to study short and long period comets will be advertised.
Derived from text
Carbon; Comets; Thermal Emission; Spectrophotometry

20030069057 NASA Marshall Space Flight Center, Huntsville, AL, USA
Four Years of Operation of the Chandra X-Ray Observatory
Weisskopf, Martin C.; [2003]; 1 pp.; In English; SPIE 48th Annual Meeting, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Chandra X-Ray Observatory is now entering its fourth year of operation. Data taken with Chandra have revolutionized our understanding of the high-energy universe. The operational status of the Observatory will be reviewed and recent results presented.
Author
X Ray Astrophysics Facility; X Ray Astronomy

20030071108 NASA Marshall Space Flight Center, Huntsville, AL, USA
Unraveling the Cooling Trend of the Soft Gamma Repeater, SGR162-41
Kouveliotou, C.; Eichler, D.; Woods, P. M.; Lybarsky, Y.; Patel, S. K.; Gogus, E.; vanderKlis, M.; Tennant, A.; Wachter, S.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

SGR 1627-41 was discovered in 1998 after a single active episode which lasted approx. 6 weeks. We report here our monitoring results of the decay trend of the persistent X-ray luminosity of the source during the last 5 years. We find an initial temporal power law decay with index 0.47, reaching a piateau which is followed by a sharp (factor of ten) flux decline approx. 800 days after the source activation. The source spectrum is best described during the entire period by a single power law with high absorption (N(sub H) = 9.0(7) x 10(exp 22)/sq cm); the spectral index, however, varies dramatically between 2.2-3.8 spanning the entire range for all known SGR sources. We discuss the cooling behavior of the neutron star assuming a deep crustal heating initiated by the burst activity of the source during 1998.
Author
Neutron Stars; X Ray Sources; Repeaters; Luminosity

20030071117 Georgia State Univ., Atlanta, GA, USA
Cross-Correlation Analysis of UV Profile Variations and Nonradial Pulsations in Be Stars
Gies, Douglas R.; [2001]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-6904; No Copyright; Avail: CASI; A01, Hardcopy

This study is an investigation of the role of photospheric nonradial pulsations in the mass loss processes of Be stars. Some 18 Be stars were the focus of intensive, multi-wavelength campaigns between 1985 and 1996 with the NASA/ESA International Ultraviolet Explorer Satellite (IUE) . The campaigns were designed to monitor variations in the UV flux and stellar wind lines with near simultaneous, high signal-to-noise, optical spectroscopy of photospheric lines. The high quality, ground-based spectra were required to record the subtle, blue-to-red moving bump patterns in spectral line profiles that result from nonradial pulsations. We found that the same fine variations in the UV photospheric lines can be extracted from noisy IUE spectra by cross-correlating each target spectrum with a narrow-lined standard spectrum. Time series analyses of the cross-correlation functions then reveal the periodic signals, amplitudes, phases, and modal identifications of the pulsations. Our goals are to compare such results from UV and optical time series in order to model the stellar photospheric temperature

and velocity fluctuations, and to search for correlated UV wind line variations to determine whether there is a connection between pulsation and mass loss.
Author
B Stars; Cross Correlation; Stellar Mass

20030071227 NASA Ames Research Center, Moffett Field, CA, USA
All in the Family: What Brown Dwarfs Teach Us About Extrasolar Giant Planets
Marley, M.; Bulletin of the American Astronomical Society; [2003]; Volume 35, No. 4; 1 pp.; In English; DPS 35th Meeting: Extra Solar Planets III Plenary, Organizer, 1-6 Sep. 2003, Monterey, CA, USA
Contract(s)/Grant(s): RTOP 344-04-10-05; No Copyright; Avail: Other Sources; Abstract Only

As we await the first direct image of an extrasolar giant planet, we can turn to theory and the experience gained in the campaign to detect and understand brown dwarfs for guidance on what to expect. As with any new arrival to a family, there should be a strong family resemblance (one hopes) along with notable unique features and interesting peculiarities. The 300 or so known L and T dwarfs, combined with our own giant planets, already span much of the effective temperature range within which extrasolar planets will be found. Only objects with thick, easily detectable, water clouds have yet to be seen. Thus we already know much of the family. I will describe what we have learned from studying these objects, focusing on the important roles clouds and atmospheric chemistry play in affecting their atmospheres and emergent spectra. Relying on these findings and theoretical models, I'll sketch out what we can expect from extrasolar giant planets, focusing on easily detectable features. Some wild cards, of course, are to be expected. Photochemical hazes, in particular, may obscure the family traits on the faces of Jupiter's distant cousins and may make one wonder, at least momentarily, about the milkman.
Author
Atmospheric Chemistry; Brown Dwarf Stars; Extrasolar Planets; Gas Giant Planets

20030073557 NASA Ames Research Center, Moffett Field, CA, USA
Comet Observations with SIRTF
Cruikshank, Dale P.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 23; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Comet observations are included in the programs of the Guaranteed Time Observers (GTO) on the Space Infrared Telescope Facility (SIRTF), scheduled to be in space and operational for five years beginning in late 2003. SIRTF is a cryogenic telescope with three basic instruments for imaging, photometry and spectroscopy from 3.6 m to 160 m. All of these capabilities will be used in studies of comets. The intent is to study the infrared radiation (emission) from comets (and dust tails, where relevant) in all stages of evolution, starting with Kuiper Belt objects and Centaurs (thermal emission at 24,70, and 160 m to derive dimensions and albedos). Active comets will be observed spectroscopically and in deep thermal images. Several known or suspected extinct comets will be observed spectroscopically (5-37 m) for information on their surface compositions. There are opportunities for Guest Observers (GO) to propose additional comet work. .
Author
Comets; Space Infrared Telescope Facility; Imaging Techniques; Cryogenics; Infrared Radiation

20030073561 Institute of Space and Astronautical Science, Sagamihara, Japan
Assessment of Analog Particle Capturing by Aerogel at the Flyby Speed of STARDUST
Okudaira, K.; Noguchi, T.; Nakamura, T.; Burchell, M. J.; Cole, M.; Yano, H.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 59; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

In 2006 the STARDUST spacecraft will return to the Earth with cometary dust and hopefully interstellar dust grains. They are to be collected by silica aerogel, amorphous SiO2 with extremely low bulk density (0.02 g/cu cm for STARDUST. Several investigations suggested that aerogel is suitable for hypervelocity particle capturing. But aerogel is an excellent thermal insulator, the heat converted from the kinetic energy of particles would affect the particles themselves. In these few years the authors have evaluated physical alterations of micrometeoroid analog particles captured by aerogel. Here we report on the results of impacts at around 6 km/s, which is the flyby speed of the STARDUST.
Author
Aerogels; Cosmic Dust; Silicon Dioxide; Particle Energy; Comets; Flyby Missions; Interstellar Matter

20030073579 University of Central Florida, Orlando, FL, USA
Can Meteors be Diagnostic of Cometary Chondrules and CAls?
Campins, H.; Swindle, T. D.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 17; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Studies of the Leonid meteor showers over the past few years have yielded a wealth of results relevant to the structure and composition of cometary solids. One of our goals is to test the existence of chondrules and Ca-Al-rich inclusions (CAls) in comets based on meteor observations. Chondrule-sized objects would be too faint to study in most meteor showers, but the high velocity (approx. 72 km/sec) of the Leonids (comet Tempel-Tuttle) make these small objects produce meteors in the range of Vmag +3 or +4. There is little consensus about the formation mechanisms for chondrules and CAIs. However, one prominent model (the 'X-wind' model) explicitly predicts that chondrules and CAls will be present in comets. Hence, observational constraints on the presence or absence of chondrules and CAls in comet Tempel-Tuttle are likely to contribute to a better understanding of their formation process. Evidence could potentially be found in the overall mass distribution of the shower, in chemical analyses of some meteors, or in light curves. There is no evidence for a chondrule abundance in the Leonid meteors similar to that found in chondritic meteorites. There is intriguing evidence for chondrule- or CAl-sized objects in a small fraction of the light curves, but further work is required to generate a definitive test. The STARDUST mission may provide more conclusive results relevant to the presence of chondrules and CAIs in comets.
Author
Chondrule; Comets; Leonid Meteoroids; Meteoritic Composition

20030073582 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Complex Organics from Laboratory Simulated Interstellar Ices
Dworkin, J. P.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 25; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Many of the volatiles in interstellar dense clouds exist in ices surrounding dust grains. The low temperatures of these ices (T < 50 K) preclude most chemical reactions, but photolysis can drive reactions that produce a suite of new species, many of which are complex organics. We study the UV and proton radiation processing of interstellar ice analogs to explore links between interstellar chemistry, the organics in comets and meteorites, and the origin of life on Earth. The high D/H ratios in some interstellar species, and the knowledge that many of the organics in primitive meteorites are D-enriched, suggest that such links are plausible. Once identified, these species may serve as markers of interstellar heritage of cometary dust and meteorites. Of particular interest are our findings that UV photolysis of interstellar ice analogs produce molecules of importance in current living organisms, including quinones, amphiphiles, and amino acids. Quinones are essential in vital metabolic roles such as electron transport. Studies show that quinones should be made wherever polycyclic aromatic hydrocarbons are photolyzed in interstellar ices. In the case of anthracene-containing ices, we have observed the production of 9-anthrone and 9,10 anthraquinone, both of which have been observed in the Murchison meteorite. Amphiphiles are also made when mixed molecular ices are photolyzed. These amphiphiles self-assemble into fluorescent vesicles when placed in liquid water, as do Murchison extracts. Both have the ability to trap an ionic dye. Photolysis of plausible ices can also produce alanine, serine, and glycine as well as a number of small alcohols and amines. Flash heating of the room temperature residue generated by such experiments generates mass spectral distributions similar to those of IDPs. The detection of high D/H ratios in some interstellar molecular species, and the knowledge that many of the organics, such as hydroxy and amino acids, in primitive meteorites are D-enriched provides evidence for a connection between intact organic material in the interstellar medium and in meteorites. Thus, some of the oxidized aromatics, amphiphiles, amino acids, hydroxy acids, and other compounds found in meteorites may have had an interstellar ancestry and not solely a product of parent body aqueous alteration. Such compounds should also be targeted for searches of organics in cometary dust.
Author
Interstellar Matter; Ice; Chemical Reactions; Ultraviolet Radiation; Protons; Molecular Clouds

20030073584 Tokyo Inst. of Tech., Tokyo, Japan
High Temperature Components in Carbonaceous Chondrites and Comets: Some Interesting Comparisons
Fagan, T. J.; MacPherson, G. J.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 27; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The diverse components in the many different kinds of chondritic meteorites record a long and complex history of events in the early solar system, from high temperature condensation and melting through aqueous alteration on undifferentiated asteroids. All but the most resilient presolar grains were heavily processed to the point of destruction in most chondrites. In contrast, comets are likely to preserve a more pristine record of the solid materials that comprised the nebular cloud that preceded our solar system [l]. For this reason a close comparison of the major components of the most primitive (carbonaceous) chondrites, CCs, with those of comets can be very instructive in terms of understanding the original materials and the processes that affected them.
Author
Carbonaceous Chondrites; High Temperature; Meteorites; Comets

20030073585 Osservatorio Astronomico, Capodimonte, Naples, Italy
In Situ Measurements and Laboratory Analyses of Interplanetary Dust Particles
Ferrini, G.; DellaCorte, V.; Palomba, E.; Palumbo, P.; Rotundi, A.; Colangeli, L.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 28; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Analyses performed so far on interplanetary dust particles have been based on in situ measurements or laboratory analyses after retrieval, separately. An important improvement for future missions is represented by the possibility of measuring in situ dynamic properties of single grains to be, subsequently, retrieved from the collecting devices (e.g., aerogel collectors) for laboratory analyses. In the present paper we report about a preliminary study performed on a system based on the use of aerogel collectors and optical detection device. Moreover, particles retrieved from aerogel collectors, exposed on the Mir station, and interplanetary dust particles, obtained from NASA, have been analysed in our laboratory.
Author
Interplanetary Dust; In Situ Measurement; Dynamic Characteristics; Aerogels; Aerosols

20030073586 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
Relations Between Crystalline Silicates in Different Circumstellar Environments
Molster, F. J.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 50; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Amorphous silicates are the most abundant dust species in the Universe. They are present around young stars, evolved stars and even in the medium between the stars. Before the launch of the Infrared Space Observatory (ISO), crystalline silicates were only known in the solar system and around one other (young) star Beta-Pic. ISO dramatically changed this view. Not only were the crystalline silicates found around other young (mass-accreting) stars, but also around evolved (mass-losing) stars. The presence of crystalline silicates in these environments (but not in the interstellar medium!), has changed our view about (crystalline) silicate formation and evolution.
Author
Amorphous Materials; Silicates; Crystallinity; Stellar Mass Accretion; Interstellar Matter

20030073588 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Observational Test for Shock-induced Crystallization of Cometary Silicates
Nuth, J. A.; Johnson, N. M.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 57; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Crystalline silicates have been observed in comets and in protostellar nebulae, and there are currently at least two explanations for their formation: thermal annealing in the inner nebula, followed by transport to the regions of cometary formation and in-situ shock processing of amorphous grains at 5 - 10 AU in the Solar Nebula. The tests suggested to date to validate these models have not yet been carried out: some of these tests require a longterm commitment to observe both the dust and gas compositions in a large number of comets. Here we suggest a simpler test.
Author
Comets; Silicates; Amorphous Materials; Crystallinity; Solar Nebula

20030073589 Lockheed Martin Astronautics, Denver, CO, USA
New Results in PIA Analysis, with Application to Comets Halley and Wild 2
Clark, B. C.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 20; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

It has long been known, since the Halley flyby missions, that the particles in that cometary coma exhibit not only a great range in physical size, but also span a range of compositions. We report here on new, unpublished results from the continued analysis of data from the Particle Impact Analyzer (PIA) on the Giotto mission which flew through the coma of Halley, less than 600 km from the nucleus, in 1986.
Derived from text
Cometary Atmospheres; Halley's Comet; Wild 2 Comet; Chemical Analysis; Particulates

20030073591 NASA, Washington, DC, USA
Future Mission Proposal Opportunities: Discovery, New Frontiers, and Project Prometheus
Niebur, S. M.; Morgan, T. H.; Niebur, C. S.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 55; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Office of Space Science is expanding opportunities to propose missions to comets, asteroids, and other solar system targets. The Discovery Program continues to be popular, with two sample return missions, Stardust and Genesis, currently in operation. The New Frontiers Program, a new proposal opportunity modeled on the successful Discovery Program, begins this year with the release of its first Announcement of Opportunity. Project Prometheus, a program to develop nuclear electric power and propulsion technology intended to enable a new class of high-power, high-capability investigations, is a third opportunity to propose solar system exploration. All three classes of mission include a commitment to provide data to the Planetary Data System, any samples to the NASA Curatorial Facility at Johnson Space Center, and programs for education and public outreach.
Author
Sample Return Missions; Space Exploration; Stardust Mission; Nuclear Electric Propulsion; Asteroids; Comets

20030073597 NASA Ames Research Center, Moffett Field, CA, USA
Mid-Infrared Spectrum of the Zodiacal Emission: Detection of Crystalline Silicates in Interplanetary Dust
Ootsubo, T.; Onaka, T.; Yamamura, I.; Ishihara, D.; Tanabe, T.; Roellig, T. L.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 60; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Within a few astronomical units of the Sun the solar system is filled with interplanetary dust, which is believed to be dust of cometary and asteroidal origin. Spectroscopic observations of the zodiacal emission with moderate resolution provide key information on the composition and size distribution of the dust in the interplanetary space. They can be compared directly to laboratory measurements of candidate materials, meteorites, and dust particles collected in the stratosphere. Recently mid-infrared spectroscopic observations of the zodiacal emission have been made by two instruments on board the Infrared Space Observatory; the camera (ISOCAM) and the spectrophotometer (ISOPHOT-S). A broad excess emission feature in the 9-11 micron range is reported in the ISOCAM spectrum, whereas the ISOPHOT-S spectra in 6-12 microns can be well fitted by a blackbody radiation without spectral features.
Author
Crystallinity; Silicates; Interplanetary Dust; Asteroids; Meteorites

20030073607 Chicago Univ., Chicago, IL, USA
Dust Mass and Flux Measurements on Cassini and STARDUST Missions with PVDF Detectors
Tuzzolino, A. J.; Economou, T. E.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 76; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The PVDF based High Rate Detector (HRD) and the Dust Flux Monitor Instrument (DFMI) from the University of Chicago are part of the Cassini and STARDUST mission payloads. The prime goal of the DFMI and the HRD is to measure the particle flux, intensity profile, and mass distribution during passage through the coma of comet Wild-2 in January 2004 and after Saturn orbit insersion in July 2004, respectively. Both instruments are capable of measuring dust particle mass of 8 decades, from 10(exp -11) to > 10(exp -3) g.
Author
Particle Mass; Interplanetary Dust; Cassini Mission; Mass Distribution; Stardust Mission

20030073609 Leiden Univ., Netherlands
Ices and Carbon Chemistry in Comets
Ehrenfreund, P.; Botta, O.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 26; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Our knowledge on the composition of small bodies is mainly determined from remote observations, however, fragments such as meteorites and interplanetary dust particles (IDPs) are frequently transported to Earth and provide the only extraterrestrial material which can be measured directly in laboratories. The cometary composition has been revisited through extensive observations of the very bright comets of the last decade, Hale-Bopp and Hyakutake. Though much has been learned about the coma chemistry our knowledge on the comet nucleus is still rather scarce. Cometary nuclei, being porous and stratified in various layers of different densities and temperatures are furthermore characterized by different coexisting ice phases, clathrates, and trapped gases. This leads to a rather complicate outgassing pattern. The bulk of cosmic carbon in the interstellar medium, and meteorites seems to be incorporated into complex aromatic networks. This strongly indicates that such networks must also be represented in comets. We present recent observation, results from interstellar laboratory ice simulations and the analysis of the carbon fraction of meteoritic samples. A combined analysis using astronomical observations, laboratory simulations and analysis of extraterrestrial material allows us to reveal the composition of comets,

to establish an inventory of material that could have been transported to the early planets via extraterrestrial delivery and to provide insights into the origin of our solar system.
Author
Extraterrestrial Matter; Interplanetary Dust; Hale-Bopp Comet; Carbon; Ice

20030073611 California Inst. of Tech., Pasadena, CA, USA
Large Particles from Short-Period Comets
Reach, W. T.; Sykes, M. V.; Kelley, M. S.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 61; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Deep optical and mid-infrared images reveal that short-period comets are trailed by large (>mm sized) particles. These particles are the same as those that produce meteor storms in the rare case when a comet's orbit nearly intersects the Earth's. We have begun a campaign of deep observations to determine whether all short-period comets produce large meteoroids. Cometary debris trails were first discovered (serendipitously) by the Infrared Astronomical Satellite, and they have only recently been detected in visible light. While we ultimately expect to observe nearly all short-period comets, we will initially concentrate on those with favorable apparitions and those that are targets of upcoming spacecraft missions.
Author
Comets; Debris; Meteoroids; Infrared Astronomy Satellite

20030073613 Argonne National Lab., IL, USA
Isotopic Analysis of Trace Elements in Cometary Grains
Savina, M. R.; Pellin, M. J.; Davis, A. M.; Workshop on Cometary Dust in Astrophysics; January 2003, pp. 66; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Samples returned from the STARDUST mission will present a strong challenge to the analytical community, particularly to those engaged in trace element isotopic analysis. Questions concerning grain origins can be addressed by looking at the isotopic compositions of heavy element, while fractions among the heavy elements can address issues of residence in the ISM and processing in the protosolar nebula. The very small grain sizes, combined with the low concentrations of heavy elements and finite number of grains available for analysis will require the utmost in sensitivity and multielement capability. Since grains returned by STARDUST will likely be agglomerates of several phases, and will at least partially vaporize and leave tracks on the aerogel collector, imaging capability will also be important in the analysis.
Author
Stardust Mission; Trace Elements; Isotopic Labeling; Accumulators; Aerogels

20030073614 Missouri Univ., Columbia, MO, USA
Observational Evidence for Presolar Grains Around Oxygen-rich Evolved Stars
Speck, Angela K.; Hofmeister, Anne M.; Mora, Melvin; Workshop on Cometary Dust in Astrophysics; 2003, pp. 70; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Many presolar grain types have been found in meteorites since the discovery of presolar silicon carbide (Sic) grains in the Murray meteorite. Initially these were mostly limited to carbon-rich grains. However, more recently, oxygen-rich presolar grains have been isolated [e.g. 2, 31: e.g. corundum (Al2O3), spinel (MgAl2O4), hibonite (CaAl12O19) and rutile (TiO2). The majority of these O-rich grains, like the Sic grains, have isotopic compositions indicative of formation around asymptotic giant branch (AGB) stars . Theoretical dust condensation models for O-rich AGB stars include the formation of Al2O3 and TiO2. usually as condensation nuclei for the more abundant silicates. However, there is not much observational evidence for most of these presolar grains around AGB stars, and what little evidence does exist is generally misinterpreted. The dominant minerals observed around AGB stars are the silicates, presolar examples of which are difficult to find in meteorites, although this may be due to the laboratory processing used to extract the grains. There is evidence for presolar silicates in the solar system found in interplanetary dust particles.
Author
Silicon Carbides; Titanium Oxides; Asymptotic Giant Branch Stars; Interplanetary Dust; Isotopic Labeling; Aluminum Oxides

20030073617 Manchester Coll. of Science and Technology, UK
The Formation and Survival of Organic Molecules in Interstellar and Circumstellar Environments
Millar, T. J.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 49; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Around 100 of the 120 or so molecules discovered in interstellar and circumstellar regions are organic in nature. In this paper I will discuss the formation of carbon-bearing molecules and the growth of carbonaceous grains, via PAH formation and aggregation, in AGB stars. I will also discuss the formation of carbon-bearing species in interstellar clouds and discuss the survival of these molecules. In order to become incorporated into the solar-system, it appears necessary for these species to be incorporated into interstellar grain mantles. The molecular complexity of such mantles may be studied directly, through infrared observations, or indirectly, through millimeter observations of evaporated gas in hot molecular cores around young stars. I shall summarize the observational data and its implications for complex molecule formation and survival. Finally, I shall present the results of some recent chemical-hydrodynamical models of protostellar disks. As with the interstellar medium, it is clear that the gas-grain interaction is very important in determining the radial distribution of molecules.
Author
Interstellar Matter; Stellar Envelopes; Molecular Clouds; Polycyclic Aromatic Hydrocarbons; Accretion Disks; Infrared Astronomy

20030079972 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Outbursts in Symbiotic Binaries
Mushotzky, Richard, Technical Monitor; Kenyon, Scott J.; September 2003; 5 pp.; In English
Contract(s)/Grant(s): NAG5-10431; No Copyright; Avail: CASI; A01, Hardcopy

Two models have been proposed for the outbursts of symbiotic stars. In the thermonuclear model, outbursts begin when the hydrogen burning shell of a hot white dwarf reaches a critical mass. After a rapid increase in the luminosity and effective temperature, the white dwarf evolves at constant luminosity to lower effective temperatures, remains at optical maximum for several years, and then returns to quiescence along a white dwarf cooling curve. In disk instability models, the brightness rises when the accretion rate from the disk onto the central white dwarf abruptly increases by factors of 5-20. After a few month to several year period at maximum, both the luminosity and the effective temperature of the disk decline as the system returns to quiescence.
Derived from text
Symbiotic Stars; Critical Mass; Stellar Temperature; Dwarf Stars; Accretion Disks

20030082095 California State Univ., Fullerton, CA, USA
Far-Ultraviolet Observations of the Circumstellar Gas in the 2 Andromedae System
Cheng, K.-P.; Neff, James E.; Astronomical Journal; [2003]; Volume 125, pp. 868-874; In English; Original contains poor quality, truncated or crooked pages
Contract(s)/Grant(s): NAS5-32985; NAG5-10312; NAG5-10313; NAG5-7584; NSF AST-98-19737; Copyright; Avail: Other Sources

The A5 star p Pictoris is a possible young planetary system and has the best studied circumstellar disk. Our visible and ultraviolet observations of 2 Andromedae indicated that this A3 star has p Pictoris-like gas infall. We present the far-ultraviolet spectrum (905-1195 A) of 2 Andromedae we obtained with the NASA-CNES-CSA Far Ultraviolet Spectroscopic Explorer (FUSE). Unlike beta Pic, 2 Andromedae FUSE spectrum does not show strong chromospheric emission lines from C III and O VI. However, 2 Andndromedae FUSE spectrum contains many non-photospheric lines that allow us to probe the circumstellar gas. For example, between 1120 and 1140 A, we detected several Fe III absorption lines arising from hyperfine levels of ground state, which cannot be formed in the interstellar medium. These lines are good diagnostics of the circumstellar gas. We also detected circumstellar Fe II, Cr III, Mn III, and O I (1D) lines. The simultaneous presence of these species suggests that the circumstellar environment of 2 Andromedae could include regions with different temperatures and densities.
Author
Andromeda Constellation; Far Uv Spectroscopic Explorer; Interstellar Matter; Chromosphere

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20030068966 NASA Marshall Space Flight Center, Huntsville, AL, USA
AGASA Results and EUSO
Adams, James H.; Nagano, Motohiko; [2003]; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; No Copyright; Avail: Other Sources; Abstract Only

Recently AGASA group reevaluated the energy estimation of AGSAS events and showed that the energy spectrum of cosmic rays extends without any sign of GZK-cutoff. Clustering of ultrahigh energy events within experimental angular resolution suggests the astronomical point sources and their distribution in whole sky may reveal the magnetic configuration of our galaxy and extragalactic magnetic field. Based on the AGASA results, we discuss what we can expect EUSO.
Author
Cosmic Ray Showers; Energy Spectra

20030068975 NASA Ames Research Center, Moffett Field, CA, USA
Cometary Silicates: Interstellar and Nebular Materials
Wooden, Diane H.; June 19, 2002; 1 pp.; In English; International Astronomical Union General Assembly XXV, Joint Discussion 14: Formation of Cometary Materials
Contract(s)/Grant(s): RTOP 344-37-21-03; No Copyright; Avail: Other Sources; Abstract Only

Evidence for interstellar material in comets is deduced from IR spectra, insitu measurements of Halley, and chondritic porous interplanetary dust particles (CP IDPs). IR spectra of comets reveal the spectrally active minerals: amorphous carbon, amorphous silicates, and (in some comets) crystalline silicates. Evidence suggests amorphous silicates are of interstellar origin while crystalline silicates are of nebular origin. 10 microns spectra of comets and submicron amorphous silicate spherules in CP IDPs have shapes similar to lines-of-sight through the ISM. Thermal emission models of cometary IR spectra require Fe-bearing amorphous silicates. Fe-bearing amorphous silicates may be Fe-bearing crystalline silicates formed in AGB outflows that are amorphized through He+ ion bombardment in supernova shocks in the ISM. Crystalline silicates in comets, as revealed by IR spectra, and their apparent absence in the ISM, argues for their nebular origin. The high temperatures (less than l000 K) at which crystals form or are annealed occur in the inner nebula or in nebular shocks in the 5-10 AU region. Oxygen isotope studies of CP IDPs show by mass only 1 % of the silicate crystals are of AGB origin. Together this suggests crystalline silicates in comets are probably primitive grains from the early solar nebula.
Author
Activated Carbon; Amorphous Materials; Interplanetary Dust; Interstellar Matter

20030068981 NASA Marshall Space Flight Center, Huntsville, AL, USA
Evidence for Gradual External Reconnection Before Explosive Eruption of a Solar Filament
Sterling, Alphonse C.; Moore, Ronald L.; [2003]; 3 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

We observe a slowly-evolving quiet region solar eruption of 1999 April 18, using EUV images from the EUV Imaging Telescope (EIT) on the Solar and Heliospheric Observatory (SOHO), and soft X-ray images from the Soft X-ray Telescope (SXT) on Yohkoh. Using difference images, where an early image is subtracted from later images, we examine dimmings and brightenings in the region for evidence of the eruption mechanism. A filament rose slowly at about 1 kilometer per second for six hours before being rapidly ejected at about 16 kilometers per second, leaving flare brightenings and post-flare loops in its wake. Magnetograms from the Michelson Doppler Imager (MDI) on SOHO show that the eruption occurred in a large quadrupo1ar magnetic region, with the filament located on the neutral line of the quadrupole's central inner lobe, between the inner two of the four polarity domains. In step with the slow rise, subtle EIT dimmings commence and gradually increase over the two polarity domains on one side of the filament, i.e. in some of the loops of one of the two side lobes of the quadrupole. Concurrently, soft X-ray brightenings gradually increase in both side lobes. Both of these effects suggest heating in the side-lobe magnetic arcades, which gradually increase over several hours before the fast eruption. Also during the slow pre-eruption phase, SXT dimmings gradually increase in the feet and legs of the central lobe, indicating expansion of the central-lobe magnetic arcade enveloping the filament. During the rapid ejection, these dimmings rapidly grow in darkness and in area, especially in the ends of the sigmoid field that erupts with the filament, and flare brightenings begin underneath the fast-moving but still low-altitude filament. We consider two models for explaining the eruption: 'breakout,' which says that reconnection occurs high above the filament prior to eruption, and tether cutting, which says that the eruption is unleashed by reconnection beneath the filament. The pre-eruption evolution is consistent with gradual breakout that led to (and perhaps caused) the fast eruption. Tether-cutting reconnection below the filament begins early in the rapid ejection, but our data are not complete enough to determine whether this reconnection began early enough to be the cause of the fast-phase onset. Thus, our observations are consistent with gradual breakout reconnection causing the long slow rise of the filament, but allow the cause of the sudden onset of the explosive fast phase to be either a jump in the breakout reconnection rate or the onset of runaway tether-cutting reconnection, or both.
Author
Extreme Ultraviolet Radiation; Imaging Techniques; Soho Mission; X Ray Telescopes; Astrophysics

20030069041 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
ASCA and Bepposax Observations of the Newly Discovered SNR RX J0852-4622
Oliversen, Ronald J., Technical Monitor; Slane, Patrick; September 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9106; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Grant supported analysis of X-ray data from the supernova remnant (SNR) G266.2-1.2, a newly discovered SNR in the direction of Vela. Our observations reveal that the X-ray emission from this remnant is nonthermal, making this the third shell-type SNR for which the X-ray emission is dominated by synchrotron processes. The interpretation is that the SNR is an efficient accelerator of cosmic rays, with direct evidence of electrons at energies approaching 100 TeV. Our spectral analysis indicates a higher absorption than for the Vela SNR, indicating that G266.2-1.2 is more distant. However, we conclude that the lack of high amounts of absorption place the remnant closer than the Vela molecular ridge at a distance of 1-2 kpc. We observe a compact X-ray source at the remnant center, surrounded by diffuse emission, which may be an associated neutron star.
Derived from text
X Ray Sources; Data Processing; Supernova Remnants; Spectrum Analysis

20030069044 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
The Sombrero: An Edge-On Spiral: Halo Dynamics, A Massive Dark Object and XRBS
Mushotzky, Richard F., Technical Monitor; Fabbiano, G.; September 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9984; No Copyright; Avail: CASI; A01, Hardcopy

We present an analysis of the XMM-Newton and Chandra ACIS-S observations of the LINER nucleus of the Sombrero galaxy and we discuss possible explanations for its very sub-Eddington luminosity by complementing the X-ray results with high angular resolution observations in other bands. The X-ray investigation shows a hard (Gamma=1.89) and moderately absorbed (N(sub H) = 1.8 x l0(exp 21)/sq cm) nuclear source of 1.5 x l0(exp 40) erg/s in the 2-10 keV band, surrounded by hot gas at a temperature of approx. 0.6 keV. The bolometric nuclear luminosity is at least approx. 200 times lower than expected if mass accreted on the supermassive black hole, that HST shows to reside at the center of this galaxy, at the rate predicted by the spherical and adiabatic Bondi accretion theory and with the high radiative efficiency of a standard accretion disc. The low luminosity, coupled to the observed absence of Fe-K emission in the nuclear spectrum, indicates that such a disc is not present. This nucleus differs from bright unobscured AGNs also for the lack of high flux variability and of prominent broad Halpha emission. However, it is also too faint for the predictions of simple radiatively inefficient accretion taking place at the Bondi rate; it could be too radio bright, instead, for radiatively inefficient accretion that includes strong mass outflows or convection. This discrepancy could be solved by the possible presence of nuclear radio jets. An alternative explanation of the low luminosity, in place of radiative inefficiency, could be unsteady accretion.
Author
Active Galactic Nuclei; Numerical Analysis; Emission Spectra; Gas Temperature; Halos

20030069050 NASA Marshall Space Flight Center, Huntsville, AL, USA
Particle Acceleration and Emission in Relativistic Jets
Nishikawa, K.; Hardee, P. E.; Richardson, G. A.; Preece, R. D.; Sol, H.; Fishman, G. J.; [2003]; 1 pp.; In English; Partucle Acceleration in Astrophysical Objects, 24-28 Jun. 2003, Cracow, Poland; No Copyright; Avail: Other Sources; Abstract Only

Shock wave acceleration is an ubiquitous phenomenon in astrophysical plasmas. Plasma waves and their associated instabilities (e.g., the Buneman instability, two-streaming instability, and the Weibel instability) created in the shocks are responsible for particle (electron, positron, and ion) acceleration. Using a 3-D relativistic electromagnetic particle (REMP) code, we have investigated particle acceleration associated with a relativistic jet front propagating through an ambient plasma with and without initial magnetic fields. We find only small differences in the results between no ambient and weak ambient magnetic fields. Simulations show that the Weibel instability created in the collisionless shock front accelerates particles perpendicular and parallel to the jet propagation direction. While some Fermi acceleration may occur at the jet front, the majority of electron acceleration takes place behind the jet front and cannot be characterized as Fermi acceleration. The simulation results show that this instability is responsible for generating and amplifying highly nonuniform, small-scale magnetic fields, which contribute to the electron's transverse deflection behind the jet head. The 'jitter' radiation from deflected electrons has different properties than synchrotron radiation which is calculated in a uniform magnetic field. This jitter radiation may be important to understanding the complex time evolution and/or spectral structure in gamma-ray bursts, relativistic jets, and supernova remnants.
Author
Relativistic Particles; Particle Acceleration; Shock Waves; Space Plasmas; Three Dimensional Models; Plasma Waves

20030071082 NASA Marshall Space Flight Center, Huntsville, AL, USA

Gas Scintillation Proportional Counters for High-Energy X-ray Astronomy

Gubarev, Mikhail; Ramsey, Brian; Apple, Jeffery; [2003]; 1 pp.; In English; X-Ray and Gamma-Ray Instrumentation for Astronomy XIII, 3-8 Aug. 2003, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

A focal plane array of high-pressure gas scintillation proportional counters (GSPC) for a balloon-borne hard-x-ray telescope is under development at the Marshall Space Flight Center. These detectors have an active area of approx. 20 sq cm, and are filled with a high pressure (10(exp 6) Pa) xenon-helium mixture. Imaging is via crossed-grid position-sensitive phototubes sensitive in the UV region. The performance of the GSPC is well matched to that of the telescopes x-ray optics which have response to 75 keV and a focal spot size of approx. 500 microns. The detector s energy resolution, 4% FWHM at 60 keV, is adequate for resolving the broad spectral lines of astrophysical importance and for accurate continuum measurements. Full details of the instrument and its performance will be provided.

Author

Focal Plane Devices; High Pressure; Scintillation Counters; Compressed Gas; X Ray Telescopes

20030071091 NASA Ames Research Center, Moffett Field, CA, USA

Formation and Survival of Amino Acids in Space

Bernstein, M. P.; Sandford, S. A.; Allamandola, L. J.; [2003]; 1 pp.; In English; Exobiology PI Meeting, Moffett Field, CA, USA

Contract(s)/Grant(s): NCC2-1178; No Copyright; Avail: Other Sources; Abstract Only

The detection of deuterium enrichments in meteoritic hydroxy and amino acids demonstrates that there is a connection between organic material in the interstellar medium and in primitive meteorites. It has generally been assumed that such molecules formed via reactions of small deuterium enriched insterstellar precursors in liquid water on a large asteroidal or cometary parent body. We have recently show that the W photolysis of interstellar/presolar ices can produce the amino acids alanine, serine, and glycine, as well as hydroxy acids, and glycerol, all of which have been extracted from the Murchison meteorite. Thus, some of the probiologically interesting organic compounds, compounds found in meteorites may have formed in presolar ice and have not solely been a product of parent body liquid water chemistry. We will report on our isotopic labeling studies of the mechanism of formation of these interesting compounds, and on astrophysically relevant kinetic studies UV photodecomposition of amino acid precursors in the solid state. This is our first year of exobiology funding on this project.

Author

Amino Acids; Space; Deuterium; Meteorites; Hydroxyl Compounds; Survival; Interstellar Matter

20030071104 Toledo Univ., OH, USA

The Evolution of Interstellar Gas: Massive Stars and the Dispersal of Neutral Material

Federman, Steven R.; [2003]; 4 pp.; In English

Contract(s)/Grant(s): NAG5-4957; No Copyright; Avail: CASI; A01, Hardcopy

We studied the effects of newly formed O and B stars on their surrounding interstellar material through a combination of observations and theoretical modeling. The observational data came from measurements of absorption seen in the spectra of background, newly formed stars. Particular attention was given to stellar radiation which converts molecular to atomic material. Laboratory data on absorption cross sections relevant to the analysis and interpretation of carbon monoxide formed part of the effort. The grant supported Postdoctoral Fellows, Drs. Min Yan and Yaron Sheffer, and a laboratory technician. Though the students themselves were not supported. one M.S. Thesis and two Ph.D. dissertations from the University of Toledo were based on the research done under the grant. The research accomplished under this grant led directly to other funded programs. An observing proposal to study the chemistry of diffuse molecular clouds in the Large and Small Magellanic Clouds with ESO s Very Large Telescope was another example of a successful outcome of my LTSA program.

Author

Stellar Radiation; Interstellar Gas; Evolution (Development); Carbon Monoxide

20030071105 NASA Marshall Space Flight Center, Huntsville, AL, USA

Improving the Science Observing Efficiency of the Chandra X-Ray Observatory via the Chandra Radiation Model

Virani, Shanil; Schwartz, Daniel; Cameron, Robert; Plucinsky, Paul; O'Dell, Stephen; Munow, Joseph; Blackwell, William; [2003]; 2 pp.; In English; X-Ray and Gamma-Ray Instrumentation for Astronomy XIII, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Chandra X-ray Observatory (CXO), NASA's latest 'Great Observatory', was launched on July 23, 1999 and reached

its final orbit on August 7, 1999. The CXO is in a highly elliptical orbit, approximately 140,000 km x 10,000 km, and has a period of approximately 63.5 hours (N 2.65 days). It transits the Earth's Van Allen belts once per orbit during which no science observations can be performed due to the high radiation environment. The Chandra X-ray Observatory Center currently uses the National Space Science Data Center's 'near Earth' AP-8/AE-8 radiation belt model to predict the start and end times of passage through the radiation belts. Our earlier analysis demonstrated that our implementation of the AP-8/AE-8 model (a simple dipole model of the Earth's magnetic field) does not always give sufficiently accurate predictions of the start and end times of transit of the Van Allen belts. This led to a change in our operating procedure whereby we 'padded' the start and end times of transit by 10 kiloseconds (ks) so that ACIS, the primary science instrument on-board Chandra, would not be exposed to the 'fringes' of the Van Allen belts on ingress and egress for any given transit. This additional 20 ks per orbit during which Chandra is unable to perform science observations sums to approximately 3 Ms of 'lost' science time per year and therefore reduces the science observing efficiency of the Observatory. To address the need for a higher fidelity radiation model appropriate for the Chandra orbit, the Chandra Radiation Model (CRM) was developed. The CRM is an ion model for the outer magnetosphere and is based on data from the EPIC/ICS instrument on-board the Geotail satellite as well as data from the CEPPAD/IPS instrument on-board the Polar satellite. With the production and Implementation of the CRM, we present the results of a study designed to investigate the science observing time that may be recovered by using the CRM as a function of the additional low-energy proton exposure to ACIS.
Author
X Rays; Geomagnetism; Elliptical Orbits; X Ray Astrophysics Facility

20030071109 Texas Univ., Austin, TX, USA
Time Series Analysis of the UV Flickering in AGN
Robinson, Edward L.; [2003]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-7002; No Copyright; Avail: CASI; A01, Hardcopy

Goals of the Research: Many active galactic nuclei (AGN) exhibit large-amplitude luminosity fluctuations on short timescales. The fluctuations lead to a profound conclusion: The size of the emitting region is remarkably small. This observational fact is one of the pillars supporting the AGN paradigm: Prodigious amounts of gravitational potential energy are liberated in an accretion disk around a supermassive black hole. The goals of the research were to extract from the IUE Archive the very best observational characterizations of AGN flickering, and to use these to test and develop models for AGN variability.
Derived from text
Black Holes (Astronomy); Active Galactic Nuclei; Accretion Disks

20030071264 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Origin of the Outer Solar System
Holman, Matthew J., Principal Investigator; Boyce, Joseph, Technical Monitor; September 2003; 6 pp.; In English
Contract(s)/Grant(s): NAG5-11977; No Copyright; Avail: CASI; A02, Hardcopy

Our ongoing research program combines extensive deep and wide-field observations using a variety of observational platforms with numerical studies of the dynamics of small bodies in the outer solar system in order to advance the main scientific goals of the community studying the Kuiper belt and the outer solar system. These include: (1) determining the relative populations of the known classes of KBOs as well as other possible classes; (2) determining the size distributions or luminosity function of the individual populations or the Kuiper belt as a whole; (3) determining the inclinations distributions of these populations; (4) establishing the radial extent of the Kuiper belt; (5) measuring and relating the physical properties of different types of KBOs to those of other solar system bodies; and, (6) completing our systematic inventory of the satellites of the outer planets.
Author
Gas Giant Planets; Planetary Evolution; Research Projects; Celestial Bodies

20030071660 Hawaii Univ., Honolulu, HI, USA
Search for X-Ray Emission in the Nearest Known Brown Dwarf
Martin, Eduardo; [2003]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9992; No Copyright; Avail: CASI; A01, Hardcopy

The XMM observation were obtained on 2001 January 07-08 for 51767 s. The Optical Monitor (OM) was used with the V filter for 4 exposures of 5000 s each in imaging mode. We used the data given by the OM to confirm the presence of the

source in the field of view. The European Photon Imaging Camera (EPIC) MOS 1 and MOS2 were used 48724 s each in prime full window mode with 2.5 s time resolution. The EPIC PN was used 46618 s in prime full window mode with 73.4 ms time resolution. The X-ray source closest to the expected position of our target is offset by delta R.A=2.5 arcsec and delta Dec=-28.37 arcsec. This offset is high in comparison with the 0.4 arcsec observed with the optical data. So at this point we already knew that the target was not detected. To confirm that conclusion, we performed the identification of all X-ray sources in the field of view by comparing source to source our image with the one obtained by Rutledge et al. with Chandra. This allowed us to identify all the X-ray sources in our field of view in an area of 20 arcsec times 10 arcsec centered on the expected coordinates of LP944-20. We were then able to conclude that the target was not detected during this observation. This result allowed us to determine a new and better 3 sigma upper limit of X-Ray emission for this object. We have also derived duty cycles for X-ray flares as a function of X-ray luminosity by comparing the XMM data with Chandra and ROSAT data. One student has been supported with the grant during four months (Herve Bouy). A Sun workstation was purchased for him.
Author
X Ray Astronomy; Emission; Brown Dwarf Stars; X Ray Sources

20030073556 Lunar and Planetary Inst., Houston, TX, USA
Workshop on Cometary Dust in Astrophysics
2003; ISSN 0161-5297; 157 pp.; In English; Workshop on Cometary Dust in Astrophysics, 10-15 Aug. 2003, Crystal Mountain, WA, USA; See also 20030073557 - 20030073620
Contract(s)/Grant(s): NASW-4574; NCC5-679
Report No.(s): LPI-Contrib-1182; No Copyright; Avail: CASI; A08, Hardcopy

The paper include contribution of each Lunar and Planetary Institute. Contents include the following: Mass flux in the ancient Earth-Moon system and benign implications for the origin of life on Earth. In-situ analysis of complex organic matter in cometary dust by ion microprobe. Pristine presolar silicon carbide. Infrared spectra of melilite solid solution. Comet observations with SIRTF. Ice and carbon chemistry in comets. The nature in interstellar dust. Modeling the infrared emission from protoplanetary dust disks.
CASI
Silicon Carbides; Organic Materials; Life Sciences; Interstellar Matter; Infrared Spectra; Infrared Radiation; Biological Evolution

20030073558 State Univ. of New York, Plattsburgh, NY, USA
A Synchrotron-based Facility for the In-Situ Chemical and Mineralogical Analysis of -10 micron Particles in Aerogel
Flynn, G. J.; Sutton, S. R.; Lanzirotti, A.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 30; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Aerogel is an effective capture medium for hypervelocity particles. Aerogel particle collectors were employed on the MIR Space Station to collect orbital debris and interplanetary dust particles (IDPs), and are being employed on the NASA Stardust mission to collect dust during a fly-through of the Comet Wild-2 coma. Discovery class sample return missions hold the promise of high scientific return for. low cost, so future missions using Stardust-like collection techniques are likely to be proposed. Aerogel collection has been proposed for the Sample Collection for Investigation of Mars mission to collect Mars atmospheric dust in aerogel and return it to Earth.
Author
Stardust Mission; Aerogels; Interplanetary Dust

20030073559 Arizona State Univ., Tempe, AZ, USA
The Nature of Interstellar Dust
Huss, G. R.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 33; In English; See also 20030073556
Contract(s)/Grant(s): NAG5-11543; No Copyright; Avail: CASI; A01, Hardcopy

The STARDUST mission is designed to collect dust the coma of comet Wild 2 and to collect interstellar dust on a second set of collectors. We have a reasonable idea of what to expect from the comet dust collection because the research community has been studying interplanetary dust particles for many years. It is less clear what we should expect from the interstellar dust. This presentation discusses what we might expect to find on the STARDUST interstellar dust collector.
Derived from text
Cometary Atmospheres; Dust Collectors; Cosmic Dust; Stardust Mission

20030073560 California Univ., Los Angeles, CA, USA

The MegaSIMS: A New Instrument for the Isotopic Analysis of Captured Solar Wind

McKeegan, K. D.; Burnett, D. S.; Coath, C. D.; Jarzebinski, G.; Mao, P. H.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 47; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

With a few exceptions, the elemental abundances and isotopic compositions of average solar system material are inferred from laboratory analyses of carbonaceous chondrite meteorites because ^such measurements can usually be made with higher precision and accuracy than spectroscopic observations of the solar photosphere. However, this approach is problematic for volatile elements which are known to be fractionated, both elementally and isotopically, in various classes of primitive meteorites. The GENESIS Discovery mission will return captured solar wind for laboratory analyses to determine its elemental and isotopic compositions. Solar compositions would then be based on the analysis of solar materials. Since the Sun contains the bulk composition of the solar nebula, such data will provide an important constraint on the origins and evolution of cometary dust and other planetary materials.

Derived from text

Isotopic Labeling; Solar Wind; Spectroscopy; Planetary Composition; Photosphere

20030073562 Naval Research Lab., Washington, DC, USA

Focused Ion Beam Microscopy of Extraterrestrial Materials: Advances and Limitations

Stroud, R. M.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 72; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Introduction: Coordinated isotopic and structural studies of the same cometary, interstellar or presolar grains provide the best basis for determining the origin, and the formation and processing conditions of the grains. Until recently few of these coordinated studies were possible because of the destructive nature of the isotopic measurements, and the awkward grain size, i.e. too thick for direct analysis by transmission electron microscopy (TEM), but too small to microtome. The focused ion beam (FIB) workstation dramatically increases the possibility for conducting these coordinated studies by permitting the site selective preparation of ultrathin slices of dust grains as small as 100 nm. The FIB slices can be extracted from isolated dust grains dispersed on stubs or other supports, grain clusters, or even grains embedded in meteorites, before or after isotopic characterization.

Author

Ion Beams; Transmission Electron Microscopy; Extraterrestrial Matter; Grain Size

20030073565 NASA Johnson Space Center, Houston, TX, USA

Analysis of the Organic Matter in Interplanetary Dust Particles: Clues to the Organic Matter in Comets, Asteroids, and Interstellar Grains

Flynn, G. J.; Keller, L. P.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 29; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Reflection spectroscopy suggests the C- , P-, and D-types of asteroids contain abundant carbon, but these Vis-nearIR spectra are featureless, providing no information on the type(s) of carbonaceous matter. Infrared spectroscopy demonstrates that organic carbon is a significant component in comets and as grains or grain coatings in the interstellar medium. Most of the interplanetary dust particles (IDPs) recovered from the Earth s stratosphere are believed to be fragments from asteroids or comets, thus characterization of the carbon in IDPs provides the opportunity to determine the type(s) and abundance of organic matter in asteroids and comets. Some IDPs exhibit isotopic excesses of D and N-15, indicating the presence of interstellar material. The characterization of the carbon in these IDPs, and particularly any carbon spatially associated with the isotopic anomalies, provides the opportunity to characterize interstellar organic matter.

Derived from text

Organic Materials; Interplanetary Dust; Comets; Asteroids; Interstellar Matter

20030073567 Illinois Univ., Chicago, IL, USA

Prebiotic and Extraterrestrial Chemistry of Hydrogen Cyanide Polymers

Matthews, Clifford N.; Minard, Robert D.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 46; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Hydrogen cyanide polymer heterogeneous solids ranging in color from yellow to orange to brown to black - could be major components of the dark matter observed on many bodies of the outer solar system and beyond, including asteroids and comets, moons and planets. They are readily hydrolyzed to yield a-amino acids, possibly derived from

polyaminomalononitrile, a polyamidine structure built only from hydrogen cyanide. There is some evidence for peptidic substructures. Also, hydrolysis/pyrolysis gives rise to nitrogen heterocycles, including purines and pyrimidines found in nucleic acids today. Implications for prebiotic chemistry are profound. Through bolide bombardment or by photochemical reactions in a reducing atmosphere, the primitive earth may have been covered by HCN polymers and other organic compounds. Most significant would have been the parallel synthesis of polypeptides and polynucleotides arising from the dehydrating action of polyamidines on nucleotides. On our dynamic planet, this polypeptide- polynucleotide symbiosis mediated by polyamidines may have set the pattern for the evolution of protein-nucleic acid systems controlled by enzymes and ribozymes, the mode characteristic of life on Earth today.
Derived from text
Hydrogen; Cyanides; Polymer Chemistry; Gas Giant Planets; Dark Matter

20030073570 Calgary Univ., Alberta, Canada
The Synthesis of Inorganic and Organic Compounds in AGB and Post-AGB Stars
Kwok, Sun; Workshop on Cometary Dust in Astrophysics; 2003, pp. 41; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Introduction: The chemical element carbon is produced by triple-alpha reactions and dredged up from the helium-burning shell above the core to the surface during the asymptotic giant branch (AGB) phase df stellar evolution. Some time later, the star undergoes large scale mass loss in the form of a stellar wind. When the entire hydrogen envelope of the star is depleted by this mass loss process, the stellar core is exposed and the surface temperature of the star gradually increases. When the surface temperature exceeds 30,000 K, the ultraviolet photons emitted by the star begin to photoionize the circumstellar material, creating a planetary nebula.
Derived from text
Organic Compounds; Carbon; Chemical Composition; Surface Temperature

20030073575 Osservatorio Astronomico, Naples, Italy
Laboratory Astrophysics of Silicates
Brucato, J. R.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 15; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

It is commonly accepted that small objects in the outer part of the Solar System, as comets and Trans Neptunian Objects (TNOs) are a reservoir of partially uncontaminated primordial material from which the Solar System formed about 4.5 billions years ago. Actually, the composition, the physical and structural properties of these objects depend on the formation mechanisms and evolution processes experienced since their accretion. The study of the formation and evolution of comets requires the knowledge of the dynamical evolution of the protosolar nebula where they formed. Infrared (IR) signatures observed both by ground observations and by the Infrared Space Observatory (ISO) have successfully been used for the identification of the types of minerals present in Oort cloud comets and have attracted recently a wide interest of astrophysicists due to the increasing amount and quality of observational data. These observations have posed clear constraints on the chemical composition of silicates, showing that crystalline olivine and pyroxene are abundant. The presence of crystalline grains in Oort comet spectra and the absence or un-observability of crystal signatures in the ISO spectra of dense and diffuse interstellar medium (ISM) raises the question: does the material present in small objects from the external Solar System reflect the physical and chemical properties of the proto-solar nebula? In fact, many competitive processes experienced by the dust affect the physical and chemical evolution of the grains before and after their coagulation in larger objects. In particular, amorphous and crystalline silicates are separated by an energetic gap which has to be overcome by the atoms to move from one structural configurations to the other. Information on possible transformations suffered by the dust may provide evidence for the links between chemical-physical properties of small objects of the Solar System and those of dust in the ISM and around evolved stars. To understand what the main components of comets are, and what processes affected their nature, dedicated laboratory experiments have been performed. The knowledge of cometary silicate properties is strictly related to the study in the laboratory of the possible formation and transformation mechanisms they experience. The application of production and processing methods, capable to reproduce space conditions, together with the use of analytical techniques to investigate the nature of the material samples, form a subject of a complex laboratory experimental approach directed to the understanding of cosmic matter. The present review is dedicated to the experimental methods applied in various laboratories to simulate and characterize cosmic silicate analogues.
Author
Silicates; Solar System Evolution; Interstellar Matter; Crystallinity; Solar Nebula; Simulation

20030073576 George Mason Univ., Fairfax, VA, USA
Migration of Dust Particles from Comet 2P Encke
Ipatov, S. I.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 34; In English; See also 20030073556
Contract(s)/Grant(s): NAG5-10776; INTAS-00-240; RFBR-01-02-17540; No Copyright; Avail: CASI; A01, Hardcopy

We investigated the migration of dust particles under the gravitational influence of all planets (except for Pluto), radiation pressure, Poynting-Robertson drag and solar wind drag for Beta equal to 0.002, 0.004, 0.01, 0.05, 0.1, 0.2, and 0.4. For silicate particles such values of Beta correspond to diameters equal to about 200, 100, 40, 9, 4, 2, and 1 microns, respectively. We used the Bulirsh-Stoer method of integration, and the relative error per integration step was taken to be less than lo-'. Initial orbits of the particles were close to the orbit of Comet 2P Encke. We considered initial particles near perihelion (runs denoted as Delta tsub o, = 0), near aphelion (Delta tsub o, = 0.5), and also studied their initial positions when the comet moved for Pa/4 after perihelion passage (such runs are denoted as Delta tsub o, =i 0.25), where Pa is the period of the comet. Variations in time T when perihelion was passed was varied with a step 0.1 day for series 'S' and with a step 1 day for series 'L'. For each Beta we considered N = 101 particles for 'S' runs and 150 particles for 'L' runs.
Author
Cosmic Dust; Particle Motion

20030073577 Australian National Univ., Canberra, Australia
SHRIMP Instrumental Developments for Sample Return Missions
Ireland, T. R.; Clement, S. W.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 35; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The development of ion microprobes for terrestrial applications has led to compromises in performance in some regimes. In effect, it is difficult to design an instrument that has ideal capabilities for all applications. We are in the process of designing a new instrument for dedicated stable isotope analysis that will have a major initial emphasis on materials from sample return missions and so specific capabilities can be designed from the outset.The new SHRIMP-SI capabilities will be important for the GENESIS mission in particular. With an expected concentration of oxygen of only 170 ppm, contamination from vacuum contaminants and surface contaminants must be kept to a minimum. SIMS is well suited to surface analysis, and in particular where the element of interest is implanted into the substrate away from the surface. Sputter precleaning and laser ablation should enable extremely clean surfaces to be maintained during analysis.
Author
Mars Sample Return Missions; Isotope Ratios

20030073580 NASA Johnson Space Center, Houston, TX, USA
Silicate Stardust from Comets
Messenger, S.; Keller, L. P.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 48; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Interplanetary dust particles (IDPs) collected in the Earth s stratosphere are 5-50 pm fragments of asteroids and comets. Anhydrous IDPs have escaped significant parent body hydrothermal alteration and are further distinct from meteorites in their greater abundances of volatile elements and C, fine grained (l00 - 500 nm) textures, and unequilibrated mineralogies. Many anhydrous IDPs contain high abundances interstellar organic compounds and grains of silicate stardust. These observations are consistent with properties of comets inferred from remote astronomical observations. Comets have been thought to be pristine aggregates of interstellar materials. However, spectroscopic observations of crystalline silicates in comets has challenged this notion, given their apparent absence in the interstellar medium.
Derived from text
Silicates; Stardust Mission; Comets; Cosmic Dust; Crystallinity; Interplanetary Dust

20030073587 NASA Johnson Space Center, Houston, TX, USA
Comprehensive Study of Hydrated IDPs: X-Ray Diffraction, IR Spectroscopy and Electron Microscopic Analysis
Nakamura, K.; Keller, L. P.; Nakamura, T.; Noguchi, T.; Nozaki, W.; Tomeoka, K.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 53; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Chondritic hydrated interplanetary dust particles (IDPs) comprise up to 50% of all IDPs collected in the stratosphere(1). Although much is known about the mineralogy, chemistry and carbon abundance of hydrated IDPs (2-4) controversies still exist regarding their formation, history, and relationship to other primitive solar system materials. Hydrated IDPs are generally believed to be derived from asteroidal sources that have undergone some degree of aqueous alteration. However, the high C

contents of hydrated IDPs (by 2 to 6X CI levels (3,4) indicate that they are probably not derived from the same parent bodies sampled by the known chondritic meteorites. We report the comprehensive study of individual hydrated IDPs. The strong depletion in Ca (I) has been used as a diagnostic feature of hydrated IDPs. The particles are embedded in elemental sulfur or low viscosity epoxy and ultramicrotomed thin sections are observed using a transmission electron microscope (TEM) equipped with an energy-dispersive X-ray detector (EDX) followed by other measurements including: 1) FTIR microspectroscopy to understand the significant constraints on the organic functionality and the nature of the C-bearing phases and 2) powder X-ray difiaction using a synchrotron X-ray source to understand the bulk mineralogy of the particles.
Author
Interplanetary Dust; Microanalysis; Mineralogy

20030073590 Museum of Natural History, London, UK
FT-IR Spectroscopy of Fine-grained Planetary Materials
Morlok, A.; Jones, G. C.; Grady, Monica M.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 52; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Dust is the basic building block of all larger bodies formed in the Solar System: planets, their satellites, comets and asteroids. Some of these dust grains have survived 4.56 Gyr of processing, and occur as interplanetary dust particles (IDPs), GEMS (Glass with embedded sulphides) within IDPs and presolar grains in meteorites. Primitive meteorites can also be regarded as aggregations of relatively unprocessed dust. Dust particles from these sources are analyzed in laboratories by planetary scientists; most of the presolar grains are carbonaceous (SiC, graphite, diamond), and only few interstellar silicates have been measured. A complementary source of information about dust comes from a different scientific community, and is obtained by astronomical observations from both ground- and space-based observatories of dust in a variety of astrophysical environments. In this case, IR spectra provide information e.g. about mineral composition and structure of the dust particles, which have mainly been identified as silicates. In order to relate direct and astronomical measurements of dust grains, IR spectra of 'pure' minerals are required. So far, mainly amorphous glasses or fine grained smokes have been used as standard materials, rather than natural minerals. These studies also mostly concentrated on pure end members, which are rare in nature. Minerals from meteorites are probably a better comparison for the astronomical analyses, since they formed in a similar environment to the dust grains. The aim of this project is to provide a database of infrared and optical spectra of well characterized minerals from representative meteorites, to assist with more detailed characterization of astrophysical dust.
Author
Planetary Composition; Interplanetary Dust; Amorphous Materials; Infrared Spectroscopy

20030073593 Kapteyn Astronomical Lab., Groningen, Netherlands
The Lifecycle of Interstellar Dust
Tielens, A. G. G. M.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 73; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Interstellar dust is an important component of the interstellar medium. Dust grains are the dominant opacity source and thus regulate the radiative transfer in the interstellar medium. Besides the spectral characteristics of sources, dust therefore influences directly the molecular composition of clouds through photodissociation and the heating of the gas through the photoelectric effect. Furthermore, dust grains also provide surfaces for active chemistry. This talk will review the lifecycle of interstellar dust from their birthsites to their possible incorporation into budding planetary systems with an emphasis on processes involved and their influence on the physical characteristics. Interstellar dust is affected by a variety of processes. Stars in the late stages of their evolution form dust grains by chemical nucleation and growth and injected them into the ISM. Grains in the ISM are processed by strong shock waves which ao sputter, vaporize, and shatter them. The physics of interstellar shock waves and of these destruction processes will be reviewed. The ISM is organized in a number of phases: HI and molecular clouds, warm (neutra/ionized) intercloud medium, and coronal gas. Dust destruction is dominated by supernova shock waves in the intercloud medium.Because of rapid exchange of dust and gas between the phases, the effects of this are felt through all phases. Further processing will occur in the protostellar nebulae and these processed materials may be dispersed again through the ISM. This will be briefly discussed.
Author
Interstellar Matter; Origins

20030073598 NASA Ames Research Center, Moffett Field, CA, USA
Interstellar Deuterium Chemistry
Sandford, S. A.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 64-65; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The presence of isotopic anomalies is the most unequivocal demonstration that meteoritic material contains circumstellar or interstellar components. In the case of organic compounds in meteorites and interplanetary dust particles (IDPs), the most useful isotopic tracer of interstellar components has been deuterium (D) excesses. In some cases these enrichments are seen in bulk meteoritic materials, but D enrichments have also been observed in meteoritic subfractions and even within specific classes of molecular species, such as amino and carboxylic acids. These anomalies are not thought to be the result of nucleosynthetic processes, but are instead ascribed to chemical and physical processes occurring in the interstellar medium (ISM). The traditional explanation of these D excesses has been to invoke the presence of materials made in the ISM by low temperature gas phase ion-molecule reactions. Indeed, the DM ratios seen in the simple interstellar gas phase molecules in cold dense clouds amenable to measurement using radio spectral techniques are generally considerably higher than the values seen in enriched Solar System materials. However, the true linkage between the DM ratios in interstellar and meteoritic materials is obscured by several effects. First, current observations of D enrichment in the ISM have been made of only a few simple molecules, molecules that are not the main carriers of D in Solar System materials. Second, some of the interstellar D enrichment is likely to reside on labile moieties that will have exchanged to some degree with more isotopically normal material during incorporation into the warm protosolar nebula, parent body processing, delivery, recovery, and analysis. Third, ion-molecule reactions represent only one of at least four processes that can produce strong D-H fractionation in the ISM.
Author
Interstellar Chemistry; Deuterium; Interstellar Matter; Meteoritic Composition; Molecular Interactions

20030073602 NASA Johnson Space Center, Houston, TX, USA
Robust Extraction and Multi-Technique Analysis of Micrometeoroids Captured in Low Earth Orbit
Westphal, A. J.; Graham, G. A.; Bench, G.; Brennan, S.; Luening, K.; Pianetta, P.; Keller, L. P.; Flynn, G. J.; Snead, C.; Dominquez, G., et al.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 77; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The use of low-density silica aerogel as the primary capture cell technology for the NASA Discovery mission Stardust to Comet Wild-2 [1] is a strong motivation for researchers within the Meteoritics community to develop techniques to handle this material. The unique properties of silica aerogel allow dust particles to be captured at hypervelocity speeds and to remain partially intact. The same unique properties present difficulties in the preparation of particles for analysis. Using tools borrowed from microbiologists, we have developed techniques for robustly extracting captured hypervelocity dust particles and their residues from aerogel collectors[2-3]. It is important not only to refine these extraction techniques but also to develop protocols for analyzing the captured particles. Since Stardust does not return material to Earth until 2006, researchers must either analyze particles that are impacted in the laboratory using light-gasgun facilities [e.g. 41 or examine aerogel collectors that have been exposed in low-Earth orbit (LEO) [5]. While there are certainly benefits in laboratory shots, i.e. accelerating known compositions of projectiles into aerogel, the LEO capture particles offer the opportunity to investigate real particles captured under real conditions. The aerogel collectors used in this research are part of the NASA Orbital Debris Collection Experiment that was exposed on the MIR Space Station for 18 months [5]. We have developed the capability at the UCB Space Sciences Laboratory to extract tiny volumes of aerogel that completely contain each impact event, and to mount them on micromachined fixtures so that they can be analyzed with no interfering support (Fig.1). These aerogel keystones simultaneously bring the terminal particle and the particle track to within 10 m (15 g cm-) of the nearest aerogel surface. The extracted aerogel wedges containing both the impact tracks and the captured particles have been characterized using the synchrotron total external reflection X-ray fluorescence (TXRF) microprobe at SSRL, the Nuclear Microprobe at LLNL, synchrotron infrared microscopy at the ALS facility at LBL and the NSLS at BNL, and the Total Reflection X-ray Fluorescence (TXRF) facility at SLAC.
Author
Aerogels; Micrometeoroids

20030073604 Washington Univ., Saint Louis, MO, USA
Analysis of Submicron Presolar Oxide Grains by Single Grain Analysis and Multi-Detection Raster Imaging
Nguyen, A.; Zinner, E.; Lewis, R. S.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 54; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Oxygen isotopic measurements of grains from the spinel-rich Murray residues CF and CG, having average sizes of 0.15 microns and .45 microns, respectively, have been performed with the NanoSIMS. Zinner et al analyzed individual grains that were well dispersed from one another in a gold foil and found that the smaller grain size fraction CF and a higher abundance of presolar spinel than the fraction CG (15/628 vs. 9/753). For these analyses, the primary ion beam was deflected successively onto single grains. Subsequently we determined the oxygen isotopic compositions of grains from the same residues using

multi-detection raster ion imaging of densely packed areas on the grain dispersion mount. Using this technique, we identified 81 presolar spinel and 3 presolar corundum grains out of approximately 51, 700 analyzed CF grains. In addition, we identified 171 presolar spinel and 29 presolar corundum grains among approximately 21,500 CG grains. While both methods prove to be effective in analyzing very small grains, raster ion imaging is more efficient for locating anomalous grains among many isotopically normal grains
Derived from text
Imaging Techniques; Detection; Minerals; Granular Materials; Oxides; Raster Scanning

20030073605 NASA, Washington, DC, USA
A Participating Scientist Program for the STARDUST Mission
Morgan, T. H.; Geldazhler, B. G.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 51; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

It is the Policy of NASA s Office of Space Science to emphasize and encourage the addition of Participating Scientist Programs (PSP s) to broaden the scientific impact of missions. A Participating Scientist Program for the STARDUST Mission: STARDUST is the fourth Discovery mission, and it is the first sample return mission selected within the Discovery Program. The STARDUST Spacecraft will fly through the coma of comet PIwildt-2 in early January 2004, and return the samples to the Earth in January 2006. The Principal Investigator of the STARDUST mission, Dr. Donald Brownlee, has generously requested the implementation of a PSP for STARDUST in order to provide more community participation in the initial characterization and analysis of the samples from PIwildt-2. In particular participating scientists will fill out the membership of the Preliminary Examination Team (PET) called for in the original 1994 STARDUST proposal accepted by NASA in 1995. The work of the PET will be organized around major subdiscipline areas such as mineralogy and petrology, isotopic abundances, and elemental composition. There will be leaders for each of these areas, and also a number of team members within each. Support will be commensurate with the level of participation.
Author
Stardust Mission; Scientists

20030073606 Universitat Jaume-I, Castello, Spain
Cometary Dust Characteristics Derived from Leonid Meteor Shower Multi-Instrument Observations
Trigo-Rodriquez, J. M.; Llorca, J.; Rietmeijer, Frans J. M.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 74; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Meteor storms are usually produced by long period comets with high inclination orbits that produce violent encounters of the meteoroids with the terrestrial atmosphere. Not all meteor outbursts during the last decades were produced by high-velocity material. For example on 27-28 June 1998 an important 7-hour outburst was produced by meteoroids ejected from comet P/Pons-Winnecke. On 8 October 1998 other interesting outburst is produced by Giacobinni-Zinner meteoroids. Both low velocity encounters can allow this matter to deposit into the atmosphere with minimum degradation compared to high-velocity meteoroids. The study of these outbursts can provide us excellent opportunities to collect stratospheric dust from short-period comets.
Derived from text
Interplanetary Dust; Meteoroid Showers; Leonid Meteoroids

20030073610 Argonne National Lab., IL, USA
'DUST BUSTER' - A Single Photon Ionization TOF MS for Cometary Dusts
Chen, C.-Y.; Calaway, W. F.; Lee, Typhoon; Moore, J. F.; Pellin, M. J.; Veryovkin, I. V.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 18; In English; See also 20030073556
Contract(s)/Grant(s): W-31-109-eng-38; NASA Order W-19895; NASA Order W-10091; No Copyright; Avail: CASI; A01, Hardcopy

It is hard to predict the properties and composition of dust that will be returned by STARDUST from WED- 2. The most interesting but challenging case would be grains, pg to fg in weight, each carrying its own isotopic signature characteristic of its source zones in a variety of stars. How do we extract the maximum amount of science from such grains? Clearly, the best that can be accomplished is to measure every atom in each grain.Academia Sinica and Argonne National Laboratory (ANL) have entered into a collaboration to develop a SPI TOF MS instrument for analysis of stardust grains. A new instrument will be built at Academia Sinica based on the new TOF mass spectrometer design developed, built and operating at ANL. The instrument is intended for SPI TOF MS analysis of elements from Ca to Cu plus Li after first using SIMS to measure H, C,

N, 0, Si, and S. There are still technical challenges facing the technique. We will need to improve submicrometer sample handling, avoid the effects of space charge, and increase the Mamie range of the detector. The most difficult obstacle to overcome may be the fact that the flux density of present high repetition rate, WV lasers is below the level needed to ensure full ionization (saturation) in the source region, which must be several mm in size to achieve the high useful yield needed for analysis of small stardust grains. A potential breakthrough effort is to exploit the novel free electron laser being pioneered at ANL. In principle, this FEL can reach ionization saturation and is tunable up to photon energies of 25 eV, which is higher than the ionization potential of any element.
Derived from text
Cosmic Dust; Mass Spectrometers; Ionization

20030073615 Arizona State Univ., Tempe, AZ, USA
Can Processes Used to Extract Presolar Grains from Meteorites be Used to Process Grains Trapped in Aerogel?
Huss, G. R.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 32; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Over the years, an extensive set of procedures based on chemical and physical properties of minerals have been developed to separate the known types of presolar materials from chondritic meteorites [e.g., 1-41. While these procedures can be likened to burning down the haystack to find the needle, some aspects may be useful for handling samples trapped in aerogel. The utility of these methods will depend on the chemical resistance of the particle of interest, which could be determined in advance by nondestructive X-ray analysis or a related technique. Depending on the nature of the material trapped in the aerogel, it may be feasible to dissolve away the aerogel and leave the particle behind. HF is particularly effective at breaking silicate bonds, converting SiOl to SiF4, which is a gas at room temperature. In meteorite studies, a relatively large amount of acid is used in many cycles, with the used acid removed by decanting or by pipette.The surface properties of materials become increasingly important in governing the behavior of particles as grain size decreases. For example, micron-sized grains will stick tenaciously to a substrate via Van der Waals forces. Once, to my horror, I inadvertently dropped one of my carefully mapped grain mounts (a stainless-steel bullet with a gold foil pressed into the top to hold the sample) and watched it bounce across the table. The grains had been deposited from a liquid and were not pressed into the foil. I put the mount back in SEM and found that none of the grains had moved from its previous location! Surface properties might be utilized to separate components of a trapped particle or simply to transfer the particle from place to place.
Author
Aerogels; Extraterrestrial Matter; Dust

20030073616 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Infrared Spectroscopy of the Dust in Comets and Relationships to Interstellar Dust
Hanner, Martha S.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 31; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Infrared spectroscopy of the dust in comets reveals a complex mix of silicate materials, including both crystalline and non-crystalline components of both olivine (forsterite) and pyroxene composition. These various components do not necessarily share a common origin. Since comets formed in cold regions of the solar nebula, pre-solar grains in the nebula could have been accreted into comets with little alteration. Some of the cometary silicates may be of circumstellar (formed in circumstellar outflows of evolved stars) or interstellar (formed in dense region of the interstellar medium) origin. Spectral similarities to both circumstellar and interstellar silicates are seen in comet spectra. the short-period Kuiper Belt comets) show weak or no spectral features. The lack of features is generally explained as a particle size effect: the small silicate grains are embedded in larger, optically thick particles. However, compositional differences cannot be ruled out. For example, no unambiguous signature of forsterite has yet been seen in the spectrum of a short-period comet. Thus, the Stardust sample from short-period comet P/Wild 2 will be extremely valuable. Not only grain by grain composition and isotopic ratios but also grain morphology, irradiation history, and evidence of organic refractory mantles are important for understanding their origin. The relative abundance and distinguishing characteristics of the various crystalline and non-crystalline silicate components needs to be established. While some comets, such as Hale-Bopp, display a rich infrared spectrum, others (particularly
Author
Stardust Mission; Cosmic Dust; Infrared Spectroscopy

20030073618 Schneck (Therese), USA
Spectromicroscopy
Schneck, Therese S.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 68; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Ulysses dust detector has identified and measured, recently at GPS and atomic clocks accuracies, stable within one second in thirty two thousands years, the interstellar dust beyond Mars at 1.8 AU. The Tagish Lake low albedo meteorite, reflect infrared light better than visible light. The pristine carbonaceous chondrite, originated beyond the interstellar dust boundary between Mars and Jupiter, has abundance of atmospheric oxygen isotope feature from its anhydrous precursors, high temperature olivine dominant source of CO2 and low temperature carbonate. The silicate ten micron feature, interpreted as a gap between Aromatic Features in Emission, appeared in warmer meteorite than the interstellar medium. Polycyclic aromatic hydrocarbons dominate the spectrum of Kuiper Belt Objects, they are frequently produced in the highest concentrations in the meteorite regions rich in carbonates which have high optical density.
Author
Albedo; Carbonaceous Chondrites; Cosmic Dust; Interstellar Matter; Spectroscopic Analysis; Microscopes; Mars (Planet)

20030073619 Colorado Univ., Boulder, CO, USA
Constraints on the Composition of Interstellar Dust from Astronomical Observations
Snow, Theodore P.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 69; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Astronomers infer the composition of interstellar dust by indirect means. Constraints on the composition come from studies of the light-scattering and absorption properties of the dust (Le., interstellar extinction), and from optical and ultraviolet absorption line measures of the interstellar gas. Further information comes from X-ray spectra of absorption features and from in situ measurements of interstellar grains entering the solar system. Extinction data provide constraints on dust particle sizes and also yield some information on grain composition (e.g., the well known ultraviolet extinction 'bump' which is likely created by graphitic carbon). Analyses of optical and ultraviolet atomic absorption lines in the interstellar gas reveal underabundances or 'depletions' of certain elements which are therefore thought to reside primarily in the dust. The use of depletions to infer dust grain composition relies on an assumed cosmic abundance pattern, a source of uncertainty that will be discussed. X ray absorption lines and ionization edges (arising from inner-shell electronic transitions) can provide total line-of-sight abundances from which the grain composition can be inferred, while spacecraft detections of incoming interstellar grains can provide unique information on the particle size and mass distribution in the local ISM. This review will provide an overview of these astronomical observational methods and results, and will summarize the current state of knowledge of depletions and the inferred composition of interstellar dust grains. The review will conclude with remarks on the comparison between the inferred composition of interstellar dust and the composition of IDP inclusions such as the GEMS that may be of interstellar origin.
Author
Interstellar Matter; Cosmic Dust; Interstellar Gas; Light Scattering; Mass Distribution

20030075720 Arizona State Univ., Tempe, AZ, USA
Volcanism on the Red Planet: Mars, Chapter 4
Greeley, Ronald; Bridges, Nathan T.; Crown, David A.; Crumpler, Larry S.; Fagents, Sarah A.; Mouginis-Mark, Peter J.; Zimbelman, James R.; Environmental Effects on Volcanic Eruptions: From Deep Oceans to Deep Space; 2000, pp. 75-112; In English
Contract(s)/Grant(s): NAG5-11787
Report No.(s): ASU-PVA-6600/TE; Copyright; Avail: Other Sources

Of all the planets in the Solar System, Mars is the most Earthlike in its geological characteristics. Like Earth, it has been subjected to exogenic processes, such as impact cratesing and erosion by wind and water, as well as endogenic processes, including tectonic deformation of the crust and volcanism. The effects of these processes are amply demonstrated by the great variety of surface features, including impact craters, landslides, former river channels, sand dunes, and the largest volcanoes in the Solar System. Some of these features suggest substantial changes in Mars' environment during its history. For example, as reviewed by Carr, today Mars is a cold, dry desert with an average atmospheric pressure of only 5.6 mbar which does not allow liquid water to exist on the surface. To some planetary scientists, the presence of the channels bespeaks a time when Mars was warmer and wetter. However, others have argued that these features might have formed under current conditions and that there might not have been a shift in climate. Could the morphology of volcanoes and related features provide clues to past Martian environments? What role is played by atmospheric density in the styles of eruptions on Mars and resulting landforms? If these and related questions can be answered, then we may have a means for assessing the conditions on Mars' surface in the past and comparing the results with models of Martian evolution. In this chapter, we outline the sources of information available for volcanism on Mars, explore the influence of the Martian environment on volcanic processes, and

describe the principal volcanic features and their implications for understanding the general evolution of the Martian surface. Author

Mars Volcanoes; Planetary Geology; Mars Surface; Volcanology

20030079969 Johns Hopkins Univ., Baltimore, MD, USA

Search for X-ray Spectral Features in Two BL Lac Objects

[2003]; 1 pp.; In English

Contract(s)/Grant(s): NAG5-10304; No Copyright; Avail: CASI; A01, Hardcopy

This grant covered the analysis and interpretation of astrophysical data obtained with the XMM-Newton satellite mission. BL Lac objects are active galactic nuclei that exhibit unusually strong polarization and variability, and are also missing the usual strong optical/ultraviolet emission lines. They are typically strong X-ray sources, but this is the first survey gathering high-quality spectral data from a significant number of these objects. The observations were successful, and all data (for objects in this proposal as well as that of Dr. Perlman s) were of very good quality, as expected. We find that the X-ray spectra of most of these objects are well described by a power-law after allowing for low-energy absorption that can be attributed to neutral gas in the line of sight, presumably located in our own Galaxy. However, in some cases we see indications of a deviation from power-law behavior in the sense that the spectrum appears to be steepening (softening) to higher energies. We are developing a theoretical model in which the steepening is a result of energy-dependent cooling of the radiating particles.We searched for discrete spectral features that might be intrinsic to the objects or their host galaxies, but we found none at the level of sensitivity provided by these data. These are interestingly strong upper bounds.

Derived from text

Active Galactic Nuclei; Ultraviolet Emission; X Ray Spectra; Emission Spectra; Bl Lacertae Objects

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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*.

20030069026 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA

Interstellar Precursors of Meteoritic Organics

Charnley, S. B.; [2003]; 1 pp.; In English; Exobiology PI Meeting, 25-29 Aug. 2003, Moffett Field, CA, USA

Contract(s)/Grant(s): NCC2-1162; No Copyright; Avail: Other Sources; Abstract Only

The organic inventory initially available to protostellar disks is the first step on the long chemical path to the development of Life. The early earth may have obtained most its volatile material from the arrival of meteorites and comets at its surface. Determining the most likely distribution of meteoritic and cometary organic molecules that could seed primitive planets is a major goal since it sets the initial conditions for, at least part of, the phase of prebiotic chemical evolution. Observations and measurements of the chemical composition of primitive Solar System organics, and of dense molecular clouds, should allow the construction of coherent theoretical picture of the development of organic complexity from interstellar biogenic material to the beginning of prebiotic evolution.

Author

Interstellar Chemistry; Chemical Composition; Chemical Evolution; Protostars; Comets

20030069032 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA

Radioastronomical Searches for Instellar Biomolecules

Kuan, Y.-J.; Huang, H.-C.; Charnley, S. B.; Markwick, A.; Botta, O.; Ehrenfreund, P.; Kisiel, Z.; Butner, H. M.; [2003]; 1 pp.; In English; Exobiology PI Meeting, 25-29 Aug. 2003, Moffett Field, CA, USA

Contract(s)/Grant(s): NCC2-1162; Copyright; Avail: Other Sources; Abstract Only

Impacts of comets and asteroids could have delivered large amounts of organic matter to the early Earth. to retain a significant interstellar signature; observations of recent bright comets indicate that they have a molecular inventory consistent with their ices being largely unmodified interstellar material. Many simple organic molecules with biochemical significance observed in circumstellar envelopes and in molecular clouds, similar to that from which the Solar System formed, may have acted as the precursors of the more complex organics found in meteorites. Therefore, there is potentially a strong link between

interstellar organics and prebiotic chemical evolution. Radioastronomical observations, particularly at millimeter wavelengths, allow us to determine the chemical composition and characteristics of the molecular inventory in interstellar space. Here we report some of our recent results from extensive astronomical searches for astrobiologically-important interstellar organics. Author

Radio Astronomy; Biochemistry; Interstellar Space; Organic Materials; Molecular Clouds

20030071092 NASA Ames Research Center, Moffett Field, CA, USA

Antarctic Astrobiology

McKay, Christopher P.; [2003]; 1 pp.; In English; Canadian Committee for Antarctic Research, 26-28 Sep. 2003, Edmunton, Alberta, Canada

Contract(s)/Grant(s): RTOP 344-53-21; No Copyright; Avail: Other Sources; Abstract Only

Stars may be cold and dry today but there is compelling evidence that earlier in its history Mars did have liquid water. This evidence comes from the images taken from orbital spacecraft. The dry valleys of Antarctica comprise the largest ice-free region on that continent. The valleys are a cold desert environment with mean annual temperatures of -20 C. The lakes in the dry valleys of Antarctica provide an example of the physical processes that can maintain large bodies of liquid water under mean annual temperatures well below freezing. Biologically these lakes are also important analogs because of the plankton and benthic communities of microorganisms that thrive there. Life could have existed in lakes on Mars an ecological similar conditions.

Author

Drying; Exobiology; Microorganisms; Plankton; Valleys; Mars (Planet)

20030071095 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Localized Gravity/Topography Admittance and Correlation Spectra on Mars: Implications for Regional and Global Evolution

McGovern, Patrick J.; Solomon, Sean C.; Smith, David E.; Zuber, Maria T.; Simons, Mark; Wieczorek, Mark A.; Phillips, Roger J.; Neumann, Gregory A.; Aharonson, Oded; Head, James W.; Journal of Geophysical Research; 2002; ISSN 0148-0227; Volume 107, No. E12, pp. 19-1 - 19-25; In English

Contract(s)/Grant(s): NAG5-4436; NAG5-4077; NAG5-10165; NASW-4574

Report No.(s): LPI-Contrib-1121; Copyright; Avail: Other Sources

[i] From gravity and topography data collected by the Mars Global Surveyor spacecraft we calculate gravity/topography admittances and correlations in the spectral domain and compare them to those predicted from models of lithospheric flexure. On the basis of these comparisons we estimate the thickness of the Martian elastic lithosphere (T(sub e)) required to support the observed topographic load since the time of loading. We convert T(sub e) to estimates of heat flux and thermal gradient in the lithosphere through a consideration of the response of an elastic/plastic shell. In regions of high topography on Mars (e.g., the Tharsis rise and associated shield volcanoes), the mass-sheet (small-amplitude) approximation for the calculation of gravity from topography is inadequate. A correction that accounts for finite-amplitude topography tends to increase the amplitude of the predicted gravity signal at spacecraft altitudes. Proper implementation of this correction requires the use of radii from the center of mass (collectively known as the planetary shape) in lieu of topography referenced to a gravitational equipotential. Anomalously dense surface layers or buried excess masses are not required to explain the observed admittances for the Tharsis Montes or Olympus Mons volcanoes when this correction is applied. Derived T, values generally decrease with increasing age of the lithospheric load, in a manner consistent with a rapid decline of mantle heat flux during the Noachian and more modest rates of decline during subsequent epochs.

Derived from text

Mars Surface; Mars Global Surveyor; Gravitational Fields; Topography

20030071102 Lunar and Planetary Inst., Houston, TX, USA

The Nakhla Martian Meteorite is a Cumulate Igenous Rock. Comment on 'Glass-Bearing Inclusions in Nakhla (SNC Meteorite) Augite: Heterogeneously Trapped Phases'

Treiman, A. H.; Mineralogy and Petrology; January 2003; Volume 77, pp. 271-277; In English

Contract(s)/Grant(s): NASW-4574; NAG5-8270

Report No.(s): LPI-Contrib-1132; Copyright; Avail: Other Sources

All the properties of the Nakhla Martian meteorite suggest that it is a cumulate igneous rock, formed from a basaltic parental magma. Anomalous magmatic inclusions in Nakhla s augite grains can be explained by disequilibrium processes

during crystal growth, and have little significance in the geological history of the meteorite.
Author
Meteoritic Composition; Igneous Rocks

20030071113 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Mundrabilla Meteorite in Three-Dimensions
Gillies, D. C.; Carpenter, P. K.; Engel, H. P.; [2003]; 1 pp.; In English; National Museum of Natural History, 18 Jul. 2003, Washington, DC, USA; No Copyright; Avail: Other Sources; Abstract Only

Computed tomography (CT) using gamma radiation has revealed the interior structure of the anomalous iron meteorite, Mundrabilla. This meteorite is composed of 25 volume percent of iron sulfide with the remainder being iron-nickel. Both phases have been shown to be contiguous, and three dimensional models have been constructed using rapid prototyping techniques.
Author
Computer Aided Tomography; Gamma Rays; Iron Meteorites; Meteoritic Composition

20030071123 NASA Ames Research Center, Moffett Field, CA, USA
Hydrothermal Origin for Carbonate Globules in Martian Meteorite ALH84001: A Terrestrial Analogue from Spitsbergen (Norway)
Treiman, Allan H.; Amundsen, Hans E. F.; Blake, David F.; Bunch, Ted; Earth and Planetary Science Letters; 2002; ISSN 0012-821X; Volume 204, pp. 323-332; In English
Contract(s)/Grant(s): NASW-4574; NAG5-8270; NCC2-1184
Report No.(s): LPI-Contrib-1143; Copyright; Avail: Other Sources

Carbonate minerals in the ancient Martian meteorite ALH84001 are the only known solid phases that bear witness to the processing of volatile and biologically critical compounds (CO2, H2O) on early Mars. Similar carbonates have been found in xenoliths and their host basalts from Quaternary volcanic centers in northern Spitsbergen (Norway). These carbonates were deposited by hot (i.e., hydrothermal) waters associated with the volcanic activity. By analogy with the Spitsbergen carbonates, the ALH84001 carbonates were probably also deposited by hot water. Hydrothermal activity was probably common and widespread on Early Mars, which featured abundant basaltic rocks, water as ice or liquid, and heat from volcanos and asteroid impacts. On Earth, descendants of the earliest life forms still prefer hydrothermal environments, which are now shown to have been present on early Mars.
Author
Mars Atmosphere; Carbon Dioxide; Carbonates; Water

20030071135 Lunar and Planetary Inst., Houston, TX, USA
Electrically Conducting, Ca-Rich Brines, Rather Than Water, Expected in the Martian Subsurface
Burt, D. M.; Knauth, L. P.; Journal of Geophysical Research; 2003; ISSN 0148-0227; Volume 108, No. E4, pp. 7-1 - 7-6; In English
Contract(s)/Grant(s): NASW-4574; NAG5-9430
Report No.(s): LPI-Contrib-1126; Copyright; Avail: Other Sources

If Mars ever possessed a salty liquid hydrosphere, which later partly evaporated and froze down, then any aqueous fluids left near the surface could have evolved to become dense eutectic brines. Eutectic brines, by definition, are the last to freeze and the first to melt. If CaC12-rich, such brines can remain liquid until temperatures below 220 K, close to the average surface temperature of Mars. In the Martian subsurface, in intimate contact with the Ca-rich basaltic regolith, NaC1-rich early brines should have reacted to become Ca-rich. Fractional crystallization (freezing) and partial melting would also drive brines toward CaC12-rich compositions. In other words, eutectic brine compositions could be present in the shallow subsurface of Mars, for the same reasons that eutectic magma compositions are common on Earth. Don Juan Pond, Antarctica, a CaC12-rich eutectic brine, provides a possible terrestrial analog, particularly because it is fed from a basaltic aquifer. Owing to their relative density and fluid nature, brines in the Martian regolith should eventually become sandwiched between ice above and salts beneath. A thawing brine sandwich provides one explanation (among many) for the young gullies recently attributed to seepage of liquid water on Mars. Whether or not brine seepage explains the gullies phenomenon, dense, CaC12-rich brines are to be expected in the deep subsurface of Mars, although they might be somewhat diluted (temperatures permitting) and of variable

salt composition. In any case, they should be good conductors of electricity.
Author
Electricity; Calcium; Mineral Deposits; Planetary Geology; Mars Surface

20030071143 Massachusetts Univ., Amherst, MA, USA
Age of the Mars Global Northerly Slope: Evidence From Utopia Planitia
McGill, George E.; [2002]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-8184; No Copyright; Avail: CASI; A01, Hardcopy

Recent results from the Mars Orbiter Laser Altimeter (MOLA) experiment on Mars Global Surveyor (MGS) indicate that most of Mars is characterized by a very gentle, roughly northerly slope. Detailed mapping in north-central Arabia Terra combined with superposition relations and crater counts indicate that, in that region at least, this northerly slope must have been formed no later than Late Hesperian, with the most likely time of formation being Late Hesperian. Current research in Utopia Planitia intended as a test of extant models for the formation of giant polygons has turned up good evidence for a Late Hesperian age for the northerly tilt in this region as well, as will be discussed.
Derived from text
Laser Altimeters; Mars Global Surveyor; Slopes; Geochronology; Planetary Geology; Topography

20030071156 Massachusetts Univ., Amherst, MA, USA
Mola Topography Supports Drape-Folding Models for Polygonal Terrain of Utopia Planitia, Mars
McGill, George E.; Buczkowski, D. L.; [2002]; 2 pp.; In English; Lunar and Planetary Science XXXIII, 2002, Houston, TX, USA
Contract(s)/Grant(s): NAG5-8184; No Copyright; Avail: CASI; A01, Hardcopy

One of the most important questions we ask about Mars is whether or not there have ever been large bodies of standing water on the surface. The polygonal terrains of Utopia and Acidalia Planitiae are located in the lowest parts of the northern lowlands, the most logical places for water to pond and sediments to accumulate. Showing that polygonal terrain is sedimentary in origin would represent strong evidence in favor of a northern ocean. A number of hypotheses for the origin of the giant martian polygons have been proposed, from the cooling of lava to frost wedging to the desiccation of wet sediments, but Pechman showed that none of these familiar processes could 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 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. However, both models require an additional source of extensional strain to produce the total strain needed to produce the observed troughs.
Derived from text
Topography; Polygons; Models; Terrain; Mars Surface; Water

20030071167 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Strategies to Support Exploration of Mars' Surface
Kirkland, L.; Sykes, M.; Farr, T.; Adams, J.; Blaney, D.; Eos, Transactions, American Geophysical Union; April 22, 2003; ISSN 0096-3941; Volume 84, No. 16, pp. 148, 153; In English
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1161; Copyright; Avail: Other Sources

Surface Visible infrared spectroscopy has a long history of providing fundamental compositional discoveries in the solar system. However, we are entering a new era of Mars exploration in which missions will take place nearly every 2 years.The visible infrared spectral community thus faces a more rapid influx in data volume and variety than it has previously handled.Visible- infrared instruments are on the 1996 Mars Global Surveyor, 2001 Mars Odyssey 2003 Mars Exploration Rovers, 2003 Mars Express, 2005 Mars Reconnaissance Orbiter; and likely on the 2007 and 2009 missions. Interpretations of those data sets provide a critical foundation for geologic and climatic interpretations as well as an opportunity to select landing sites.
Derived from text
Infrared Instruments; Infrared Spectroscopy; Infrared Radiation; Mars Surface; Solar System; Spectra

20030071217 NASA Ames Research Center, Moffett Field, CA, USA

Constraint Maintenance with Preferences and Underlying Flexible Solution

Bresina, John; Jonsson, Ari; Morris, Paul; Rajan, Kanna; [2003]; 5 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

This paper describes an aspect of the constraint reasoning mechanism. that is part of a ground planning system slated to be used for the Mars Exploration Rovers mission, where two rovers are scheduled to land on Mars in January of 2003. The planning system combines manual planning software from JPL with an automatic planning/scheduling system from NASA Ames Research Center, and is designed to be used in a mixed-initiative mode. Among other things, this means that after a plan has been produced, the human operator can perform extensive modifications under the supervision of the automated. system. For each modification to an activity, the automated system must adjust other activities as needed to ensure that constraints continue to be satisfied. Thus, the system must accommodate change in an interactive setting. Performance is of critical importance for interactive use. This is achieved by maintaining an underlying flexible solution to the temporal constraints, while the system presents a fixed schedule to the user. Adjustments are then a matter of constraint propagation rather than completely re-solving the problem. However, this begs the important question of which fixed schedule (among the ones sanctioned by the underlying flexible solution) should be presented to the user.Our approach uses least-change and other preferences as a prism through which the user views the flexible solution.

Author

Mars Exploration; Automation

20030071231 Lunar and Planetary Inst., Houston, TX, USA

Geologic Settings of Martian Gullies: Implications for Their Origins

Treiman, Allan H.; Journal of Geophsical Research; March 8, 2003; ISSN 0148-0227; Volume 108, No. E4, pp. 12-1 - 12-13; In English

Contract(s)/Grant(s): NASW-4574

Report No.(s): LPI-Contrib-1147; Copyright; Avail: Other Sources

Martian gullies are found on steep slopes of all origins, on all sorts of terrains of all ages, scattered across nearly all of Mars. Gullies are observed on all manner of substrates (layered, massive, shattered, rubble), with or without nearby mantling deposits. Gullies are most common in the southern midlatitudes but also occur in the northern hemisphere, in near polar terrain, on equatorial volcanoes, and on northern plains. Most gullies in the southern hemisphere are on south-facing slopes, but they occur on slopes of all orientations. Gullies are among the youngest features on Mars but locally are overlain by eolian deposits and cut by faults. Old or eroded gullies are rare, and those found have been partially stripped from slopes, leaving no rock debris behind. Most gully deposits contain no detectable rocks. These data are inconsistent with published hypotheses of gully formation, including seeps and breakouts of water or brine, hydrothermal activity, cryovolcanism, and breakouts from liquid carbon dioxide. The data are consistent with gullies being dry flows of eolian material (dust and silt), comparable to climax snow avalanches on Earth. Eolian sedimentation should be correlated little with underlying geology: cause of slope, age of terrain, type of terrain, or the nature of the rocks. Eolian sedimentation should be correlated with wind deceleration (which will cause suspended sediment to drop), and areas with common gullies are those with strong wind deceleration (predicted by global circulation model). In such areas, sediment will be deposited preferentially in the lee of obstacles; for the gully-rich areas of the southern midlatitudes, winds blow from the NNW, so that sediment is deposited on SSE-facing slopes (i.e., poleward). These predictions are in accord with observations.

Author

Mars Surface; Planetary Geology; Atmospheric Circulation; Atmospheric Models; Erosion

20030071244 NASA Ames Research Center, Moffett Field, CA, USA

Aeolian Processes and their Effects on Understanding the Chronology of Mars

Greeley, Ronald; Kuzmin, Ruslan O.; Haberle, Robert M.; Space Science Reviews; 2001; Volume 96, pp. 393-404; In English

Contract(s)/Grant(s): NAG5-8453; Copyright; Avail: Other Sources; Abstract Only

Aeolian (wind) processes can transport particles over large distances on Mars, leading to the modification or removal of surface features, formation of new landforms, and mantling or burial of surfaces. Erosion of mantling deposits by wind deflation can exhume older surfaces. These processes and their effects on the surface must be taken into account in using impact crater statistics to derive chronologies on Mars. In addition, mapping.the locations, relative ages. and orientations of aeolian features can provide insight into Martian weather, climate, and climate history.

Author

Geochronology; Mars Surface; Planetary Geology; Aeolian Tones; Climatology

20030071263 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Aeolin Features and Processes at the Mars Pathfinder Landing Site

Greeley, Ronald; Kraft, Michael; Sullivan, Robert; Wilson, Gregory; Bridges, Nathan; Herkenhoff, Ken; Kuzmin, Ruslan; Malin, Michael; Ward, Wes; Journal of Geophysical Research; April 25, 1999; ISSN 0148-0227; Volume 104, No. E4, pp. 8573; In English

Contract(s)/Grant(s): NAG5-8948

Report No.(s): Paper 98JE02553; Copyright; Avail: Other Sources; Abstract Only

The Mars Pathfinder landing site contains abundant features attributed to aeolian, or wind, processes. These include wind tails, drift deposits, duneforms of various types, ripplelike features, and ventifacts (the first clearly seen on Mars). Many of these features are consistant with formation involving sand-size particles. Although some features, such as dunes, could develop from saltating sand-size aggregates of finer grains, the discovery of ventifact flutes cut in rocks strongly suggests that at least some of the grains are crystalline, rather than aggregates. Excluding the ventifacts, the orientations of the wind-related features correlate well with the orientations of bright wind steaks seen on Viking Orbiter images in the general area. They also correlate with wind direction predictions from the NASA-Ames General Circulation Model (GCM) which show that the strongest winds in the area occur in the northern hemisphere winter and are directed toward 209 degrees.

Author

Landing Sites; Mars Pathfinder; Mars Surface; NASA Space Programs; Wind (Meteorology); Geophysics

20030071265 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, Arizona State Univ., Tempe, AZ, USA

Terrestrial Analogs to Wind-Related Features at the Viking and Pathfinder Landing Sites on Mars

Greeley, Ronald; Bridges, Nathan T.; Kuzmin, Ruslan O.; Laity, Julie E.; Journal of Geophysical Research; [2002]; ISSN 0148-0227; Volume 107, No. E1, pp. 5-1; In English

Contract(s)/Grant(s): NAG5-8453; Copyright; Avail: Other Sources; Abstract Only

Features in the Mojave Desert and Iceland provide insight into the characteristics and origin of Martian wind-related landforms seen by the Viking and Pathfinder landers. The terrestrial sites were chosen because they exhibit diverse wind features that are generally well understood. These features have morphologies comparable to those on Mars and include origins by deposition and erosion, with erosional processes modifying both soils and rocks. Duneforms and drifts are the most common depositional features seen at the Martian landing sites and indicate supplies of sand-sized particles blown by generally unidirectional winds. Erosional features include lag deposits, moat-like depressions around some rocks, and exhumed soil horizons. They indicate that wind can deflate at least some sediments and that this process is particularly effective where the wind interacts with rocks. The formation of ripples and wind tails involves a combination of depositional and erosional processes. Rock erosional features, or ventifacts, are recognized by their overall shapes, erosional flutes, and characteristic surface textures resulting from abrasion by windblown particles. The physics of saltation requires that particles in ripples and duneforms are predominantly sand-sized (60-2000 microns). The orientations of duneforms, wind tails, moats, and ventifacts are correlated with surface winds above particle threshold. Such winds are influenced by local topography and are correlated with winds at higher altitudes predicted by atmospheric models.

Author

Landing Sites; Mars Landing; Mars Surface; Viking Lander Spacecraft; Viking Mars Program; Wind (Meteorology); Analogs

20030071273 Arizona State Univ., Tempe, AZ, USA

Impact-Mobilized Dust in the Martian Atmosphere

Nemtchinov, I. V.; Shuvalov, V. V.; Greeley, R.; Journal of Geophysical Research; 2002; ISSN 0148-0227; Volume 104, No. B12, pp. 5134; In English

Contract(s)/Grant(s): NAG5-8948; ASU-PVA-6566/TE; Copyright; Avail: Other Sources

We consider dust production and entrainment into the atmosphere of Mars by impacts. Numerical simulations based on the multidimensional multimaterial hydrocode were conducted for impactors 1 to 100 m in size and velocities 11 and 20 kilometers per second. The size distribution of particles was based on experimentrr wing TNT explosions. Dust can be mobilized even when the impactor does not reach the ground through the release of energy in the atmosphere, We found that the blast produced winds entrained dust by a mechanism similar to boundary layer winds as determined from the wind-tunnel tests. For a l-m radius stony asteroid releasing its energy in the atmosphere the lifted mass of dust is larger than that in a typical dust devil and could trigger local dust storms, For a 100-m-radius meteoroid the amount of injected dust is comparable with the tota! mass of a global dust storm.

Author

Dust Storms; Mars Atmosphere; Planetary Geology; Planetology; Mathematical Models; Geophysics

20030071467 NASA Ames Research Center, Moffett Field, CA, USA

Assessing the Martian Surface Distribution of Aeolian Sand using a Mars General Circulation Model

Anderson, F. S.; Greeley, R.; Xu, P.; Lo, E.; Blumberg, D. G.; Haberle, R. M.; Murphy, J. R.; Journal of Geophysical Research; August 26, 1999; Volume 104, No. E8, pp. 18,991-19,002; In English

Contract(s)/Grant(s): NAG5-8453; Copyright; Avail: Other Sources

A sand transport model using White's sand flux equation and the Mars beneral circulation model was developed to understand the erosional sources, transport pathways, and depositional sinks of windblown sand on Mars. An initially uniform distribution of sand (4 mm over the entire surface) is reeionally transported based on wind stress, saltation threshold, and percentage of topogaphic trapping. Results are consistsnt with the , observed polar and Hellespontus dunes and Christensen's madeled block size distribution, butonly for an extremely law saltation threshold (0.024 N/sq m): Low thresholds generally result in transport of sand-sized particles originating in the northern mid latitudes to the north pole, and transport from the northern lower latitudes to the southern hemisphere. Our results indicate that the polar dune fields could form in 50,000 years, consistent with the active polar dunes and lack of longitudinal dunes observed on the surface of Mars.

Author

Mars Surface; Sands; Atmospheric Circulation; Wind Effects; Size Distribution

20030071639 Arizona State Univ., Tempe, AZ, USA

Rootless Cones on Mars: A Consequence of Lava-Ground Ice Interaction

Fagents, S. A.; Greeley, R.; Lanagan, P.; Volcano-Ice Interaction on Earth and Mars: Special Publications; 2002, No. 202, pp. 295-317; In English

Contract(s)/Grant(s): NAG5-11787; Copyright; Avail: Other Sources

Fields of small cratered cones on Mars are interpreted to have formed by rootless eruptions due to explosive interaction of lava with ground ice contained within the regolith beneath the flow. Melting and vaporization of the ice, and subsequent explosive expansion of the vapour, act to excavate the lava and construct a rootless cone around the explosion site. Similar features are found in Iceland, where flowing lava encountered water-saturated substrates. The martian cones have basal diameters of c. 30-1000 m and are located predominantly in the northern volcanic plains. High-resolution Mars Orbiter Camera images offer significant improvements over Viking data for interpretation of cone origins. A new model of the dynamics of cone formation indicates that very modest amounts of water ice are required to initiate and sustain the explosive interactions that produced the observed features. This is consistent with the likely low availability of water ice in the martian regolith. The scarcity of impact craters on many of the host lava flows indicates very young ages, suggesting that ground ice was present as recently as less than 10 - l00 Ma, and may persist today. Rootless cones therefore act as a spatial and temporal probe of the distribution of ground ice on Mars, which is of key significance in understanding the evolution of the martian climate. The location of water in liquid or solid form is of great importance to future robotic and human exploration strategies, and to the search for extraterrestrial life.

Author

Ice; Lava; Mars Surface; Mars Volcanoes; Planetary Geology; Regolith

20030071675 Lunar and Planetary Inst., Houston, TX, USA

Mass Flux in the Ancient Earth-Moon System and Benign Implications for the Origin of Life on Earth

Ryder, Graham; Journal of Geophysical Research; 2002; Volume 107, No. E4, pp. 6-1 - 6-14; In English

Contract(s)/Grant(s): NASW-4574

Report No.(s): LPI-Contrib-1118; No Copyright; Avail: CASI; A02, Hardcopy

The origin of life on Earth is commonly considered to have been negatively affected by intense impacting in the Hadean, with the potential for the repeated evaporation and sterilization of any ocean. The impact flux is based on scaling from the lunar crater density record, but that record has no tie to any absolute age determination for any identified stratigraphic unit older than approx. 3.9 Ga (Nectaris basin). The flux can be described in terms of mass accretion, and various independent means can be used to estimate the mass flux in different intervals. The critical interval is that between the end of essential crustal formation (approx. 4.4 Ga) and the oldest mare times (approx. 3.8 Ga). The masses of the basin-forming projectiles during Nectarian and early Imbrian times, when the last 15 of the approx.45 identified impact basins formed, can be reasonably estimated as minima. These in sum provide a minimum of 2 x 10(exp 21)g for the mass flux to the Moon during those times. If the interval was 80 million years (Nectaris 3.90 Ga, Orientale 3.82 Ga), then the flux was approx. 2 x 10(exp 13) g/yr over this period. This is higher by more than an order of magnitude than a flux curve that declines continuously and uniformly from lunar accretion to the rate inferred for the older mare plains. This rate cannot be extrapolated back increasingly into pre-Nectarian times, because the Moon would have added masses far in excess of itself in post-crust-formation time. Thus this

episode was a distinct and cataclysmic set of events. There are approx. 30 pre-Nectarian basins, and they were probably part of the same cataclysm (starting at approx. 4.0 Ga?) because the crust is fairly intact, the meteoritic contamination of the pre-Nectarian crust is very low, impact melt rocks older than 3.92 Ga are virtually unknown, and ancient volcanic and plutonic rocks have survived this interval. The accretionary flux from approx. 4.4 to approx. 4.0 Ga was comparatively benign. When scaled to Earth, even the late cataclysm does not produce oceane vaporating, globally sterilizing events. The rooted concept that such events took place is based on the extrapolation of a nonexistent lunar record to the Hadean. The Earth from approx. 4.4 to approx. 3.8 Ga was comparatively peaceful, and the impacting itself could have been thermally and hydrothermally beneficial. The origin of life could have taken place at any time between 4.4 and 3.85 Ga, given the current impact constraints, and there is no justification for the claim that life originated (or re-originated) as late as 3.85 Ga in response to the end of hostile impact conditions.
Author
Mass; Flux (Rate); Biological Evolution; Earth-Moon System; Life Sciences; Planetary Evolution

20030071681 Arizona State Univ., Tempe, AZ, USA
Geology of Potential Landing Sites for Martian Sample Returns
Greeley, Ronald; [2003]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9773; No Copyright; Avail: CASI; A01, Hardcopy
This project involved the analysis of potential landing sites on Mars. As originally proposed, the project focused on landing sites from which samples might be returned to Earth. However, as the project proceeded, the emphasis shifted to missions that would not include sample return, because the Mars Exploration Program had deferred sample returns to the next decade. Subsequently, this project focused on the study of potential landing sites for the Mars Exploration Rovers.
Author
Landing Sites; Mars (Planet); Sample Return Missions

20030071683 NASA Ames Research Center, Moffett Field, CA, USA
Wind-Related Modification of Some Small Impact Craters on Mars
Kuzmin, Ruslan O.; Greeley, Ronald; Rafkin, Scot C. R.; Haberle, Robert; Icarus; 2001; Volume 153, pp. 61-70; In English
Contract(s)/Grant(s): NAG5-8453; Copyright; Avail: Other Sources
Inferred wind-related modifications of impact craters are observed in the vicinity of the Mare Pathfinder (MPF) site and in other regions of Mars. Mars Orbiter Camera (MOC) images show three types of inferred wind-modified morphologies for craters 0.3-1 km in diameter Such modifications could be related to seasonal variations of the strongest winds and a possible paleowind regime. Geomorphic mapping of Big Crater at the MPF shows evidence of former aeolian modification of the crater rim and interiors similar to smaller craters in the area. The morphologic patterns are in good agreement with the results from the Mars Regional Atmospheric Modeling Simulation (MRAMS) of topographically forced wind circulation and atmosphere surface interactions generated by flow over small craters. Simulations show that the maximum surface stress is on the downwind crater rim, consistent with inferred wind modification of the crater rim seen in MOC images. The trend of the Inferred paleowind regime at the MPF site cannot be explained by a change In the global atmospheric circulation resulting ~ from changes in Mars obliquity. We suggest that this wind regime could be associated with a regional meteorological pattern that is not modeled by global scale circulation, An alternative explanation is that Mars spin axis was in a different geographic position than it is at present.
Author
Wind Direction; Mars Craters; Geomorphology; Atmospheric Circulation

20030071695 Arizona State Univ., Tempe, AZ, USA
Saltation Impact as a Means for Raising Dust on Mars
Greeley, Ronald; Planetary and Space Science; 2002; ISSN 0032-0633; Volume 50, pp. 151-155; In English
Contract(s)/Grant(s): NAG5-8948; Copyright; Avail: Other Sources; Abstract Only
Experiments were conducted under atmospheric pressures appropriate for Earth and Mars to determine the efficiency of sand in saltation as a means for raising dust into the atmosphere under wind speeds which would otherwise be too low for dust entrainment. Experiments involving intimate mixtures of sand and dust (1:1 ratio by mass) showed that after an initial flurry of activity of a few seconds duration, the bed stabilized with little movement of either sand or dust. In contrast, sands set into saltation upwind fro= dust beds were efficient in injecting the dust into suspension, with low-pressure Martian conditions being some five times more efficient than terrestrial conditions. This result is attributed to the higher kinetic

energies of the saltating grains on Mars, which is a consequence of the higher velocities of the grains. These results suggest that sands saltating across dust beds on Mars are an effective means for setting dust into suspension.
Author
Dust Storms; Mars Atmosphere; Mars Environment; Mars Surface; Wind Effects

20030071709 Arizona State Univ., Tempe, AZ, USA
Icelandic Pseudocraters as Analogs to some Volcanic Cones on Mars
Greeley, Ronald; Fagents, Sarah A.; Journal of Geophysical Research; [2003]; ISSN 0148-0227; Voume 106, No. E9, pp. 20,527-20,546; In English
Contract(s)/Grant(s): NAG5-11787
Report No.(s): Paper-2000JE001378; Copyright; Avail: Other Sources

Pseudocraters are rootless vents formed by the interaction of lava flows with surface or near-surface water. This interaction can produce mild explosions and the accumulation of scoria and spatter into small constructs. Pseudocraters in several localities in Iceland were examined in the field and compared to similar appearing features observed on Mars. The Icelandic pseudocrater cones in this study range in size from 6 to 70 m in diameter, have summit craters which range from 2 to 28 m in diameter (many cones lack craters entirely), and have flanks that am either concave- up or convex-up. The size and spacing of Icelandic pseudo-craters might be a function of the availability of water, in which larger, closely spaced features result from efficient lava-water interaction, as suggested by the environments in which the features formed. Possible Martian pseudocrater cones in Amamnis Planitia range in diameter from 30 to 180 m and have craters 12 to 80 m in diameter. A numerical model for volcanic explosions was adapted to study the formation of pseudocraters under terrestrial and Martian conditions. The results suggest that explosions forming Martian cones require significantly less water (calculated masses am less by a factor of 4 to 16) than those forming Icelandic pseudokers, despite their larger sizes, This is attributed to the low gravity and atmospheric pressure in the Mars environment and is consistent with the likely lower abundance of water, which might be present as interstitial ice at shallow depths in the regolith. Locations of potential pseudocraters on Mars at latitudes as low as approximately 8 degrees N, imply the presence of crustal ice stores at the time of their formation.
Author
Iceland; Mars Craters; Mars Surface; Mathematical Models; Planetary Geology; Volcanology; Cones

20030073471 NASA Ames Research Center, Moffett Field, CA, USA
Martian Dust Devils: Laboratory Simulations of Particle Threshold
Greeley, Ronald; Balme, Matthew R.; Iverson, James D.; Metzger, Stephen; Mickelson, Robert; Phoreman, Jim; White, Bruce; Journal of Geophysical Research; 2003; ISSN 0148-0227; Volume 108, No. E5, pp. 7-1; In English
Contract(s)/Grant(s): NCC2-1109
Report No.(s): ASU-PVA-6554/TE; Copyright; Avail: Other Sources; Abstract Only

An apparatus has been fabricated to simulate terrestrial and Martian dust devils. Comparisons of surface pressure profiles through the vortex core generated in the apparatus with both those in natural dust devils on Earth and those inferred for Mars are similar and are consistent with theoretical Rankine vortex models. Experiments to determine particle threshold under Earth ambient atmospheric pressures show that sand (particles > 60 micron in diameter) threshold is analogous to normal boundary-layer shear, in which the rotating winds of the vortex generate surface shear and hence lift. Lower-pressure experiments down to approx. 65 mbar follow this trend for sand-sized particles. However, smaller particles (i.e., dust) and all particles at very low pressures (w 10-60 mbar) appear to be subjected to an additional lift function interpreted to result from the strong decrease in atmospheric pressure centered beneath the vortex core. Initial results suggest that the wind speeds required for the entrainment of grains approx. 2 microns in diameter (i.e., Martian dust sizes) are about half those required for entrainment by boundary layer winds on both Earth and Mars.
Author
Space Environment Simulation; Dust Storms; Mars Environment; Cosmic Dust; Mars Surface; Wind Effects; Mars Atmosphere; Planetary Meteorology; Wind (Meteorology)

20030073563 NASA Johnson Space Center, Houston, TX, USA
Curation and Preliminary Characterization of Stardust Samples
Zolensky, Michael E.; Allen, Carlton C.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 79; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The Stardust Mission is on the verge of sampling activities at comet Wild-II; this will occur Jan 1,2004. As this critical

date approaches the science team for the mission has begun to make firm plans for the preliminary characterization and analysis of the returned cometary and interstellar dust samples. We expect to return 1000's of 5-20 microns sized cometary grains, and on the order of 100 interstellar grains to Earth, all collected in blocks of special silica aerogel. A description of the curation and preliminary characteristics of the Stardust samples are given.
CASI
Cosmic Dust; Isotope Ratios; Stardust Mission; Interstellar Matter; Characterization; Sampling

20030073566 Search for Extraterrestrial Intelligence Inst., Mountain View, CA, USA
Comet Dust from Airborne Leonid Storm Observations
Jenniskens, Peter; Workshop on Cometary Dust in Astrophysics; 2003, pp. 36; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

For the past five years, rare Leonid meteor storms offered unique access to cometary dust by spectacular manifestations of recently ejected dust grains, which could be observed by exceptional meteor observing techniques. The final storms, those of November 19, 2002, measured the dust distribution in a comet dust trail far from the position of the comet itself. The measured spatial and particle size distribution of dust still reflect the conditions of ejection and the influence of radiation pressures on the grains, and provide unique insight into the dust-to-ice ratio in cometary matter. The meteor observations also provide data on meteoroid composition and morphology for grains of mm-cm size that are larger than studied by Stardust. The meteoroids derive from comet 55P/Tempel-Tuttle and were ejected in 1866 and 1767, respectively, only 4 and 7 orbits ago. Both meteor storms were well observed from two research aircraft operated by NASA and USAF. This final mission in the Leonid Multi-Instrument Aircraft Campaign provided an international team of 38 researchers prime viewing without interference of moonlight and with a radiant position high in the sky. En route from Madrid, Spain, to Omaha, Nebraska, the storms were observed to peak at 04:06 UT and 10:47 UT, respectively. A range of spectroscopic and imaging techniques was used to measure the physical properties and composition of the meteors. Apart from accurate flux profiles, highlights include the first near-IR spectra of meteors, high frame-rate (l000/s) images, mid-IR spectra of persistent trains, as well as spectacular video images with a background of aurora.
Author
Dust Storms; Cometary Atmospheres; Spatial Distribution; Particle Size Distribution

20030073568 Osaka Univ., Toyonaka, Japan
Tomographic Studies on Three-Dimensional Structures of Micrometeorites and Future Application to IDP and Cometary Dust
Tsuchiyama, A.; Okazawa, T.; Nakamura, K.; Yano, H.; Noguchi, T.; Uesugi, K.; Takeuchi, A.; Nakano, T.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 75; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

X-ray computed tomography (CT) is a method to obtain internal structures of objects without damaging the samples using X-ray attenuation and provide 3-D structures by stacking successive sliced images. Synchrotron radiation (SR) source provides monochromatized and collimated X-ray beams useful for X-ray CT technique. An X-ray mictotomographic system using SR at SPring-8 has been applied to micrometeorites to examine their 3-D structures and densities. In this abstract, we report the CT system, the results of the previous studies on micrometeorites and development of a new tomographic system with higher spatial resolution available for IDPs and cometary dust.
Derived from text
Micrometeorites; Interplanetary Dust; Computer Aided Tomography; Tomography; Three Dimensional Models; Cometary Atmospheres

20030073569 Tokyo Univ., Japan
Successful Launch and Scientific Premises of 'Hayabusa' Asteroid Sample Return Mission
Yano, H.; Fujiwara, A.; Kawaguchi, J.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 78; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

At 13:29:25 on the 9th May 2003 JST, ISAS's engineering test spacecraft 'MUSES-C' was successfully launched with the full-stage solid fuel rocket M-V-5, from the ISAS Kagoshima Space Center at Uchinoura. After confirming deployment of its solar array paddles and sampling horn as well as the proper attitude control through the telemetry received by the Deep Space Network, the spacecraft was inserted to interplanetary trajectory and renamed as 'Hayabusa', or 'Falcon' from its resemblance with the bird that flies fast to its target, hovers to monitor, and catches its prey in 'touch & go' sequence. The Hayabusa has become the world s first sample return spacecraft to a near Earth object (NEO). The NEO 1998SF36 is its

mission target. By previous radar and multi-band optical observations, its orbital and physical characteristics were well understood; the size is (490+/-100)x(250+/-55)x(180+/-50) m with about 12-hour rotation period. It has a red-sloped S(IV)-type spectrum with strong 1- and 2-micron absorption bands, analogous to those measured for ordinary LL chondrites with space weathering effect.
Author
Sample Return Missions; Launching; Asteroid Missions; Near Earth Objects; Interplanetary Trajectories

20030073571 Arizona Univ., Tucson, AZ, USA
Volatile Trace-Element Abundances in Primitive Meteorites: Applications to Analysis of Cometary Particles
Lauretta, D. S.; Goreva, J.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 42; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

We are developing new techniques for the analysis of volatile trace elements in very small samples using inductively coupled plasma mass spectrometry (ICP-MS) in preparation for samples returned by the Stardust mission. The instruments that will serve as the bases of our experiments are the ELEMENT2 high-resolution ICP-MS and the Isoprobe multi-collector ICP-MS. The Isoprobe MC-ICP-MS is already installed and available for use. We are in the process of expanding this facility to add the ELEMENT2, making it the ideal place to perform both trace-element and isotopic analyses nearly simultaneously. We are developing techniques for introducing samples to the plasma. We are working on three areas of sample introduction: 1) Thermal heating of small particles under controlled atmospheres; 2) Laser ablation of small particles embedded in aerogel and other matrices; and 3) Direct injection of small particles into the plasma. In addition, we plan to investigate direct analysis of aerogel material with the goal of determining concentrations of volatile elements that may have recondensed on this material after sample collection. Trace-element Analysis: We are interested in the abundances of volatile elements in Stardust grains and along particle tracks in the aerogel used to collect these grains. The primary goals of this research are (1) to constrain the initial abundances of volatile elements in Stardust grains and use this information to interpret their origin and thermal history and (2) to determine the amount of heating experienced by Stardust grains during collection. The abundances and isotopic compositions of such elements in Stardust grains may reflect low-temperature gas-solid interactions in the outer, early solar system.
Derived from text
Composition (Property); Gas-Solid Interactions; Laser Ablation; Particle Tracks; Stardust Mission; Trace Elements

20030073572 Arizona State Univ., Tempe, AZ, USA
STARDUST Goes to Mars: The SCIM Mars Sample Return Mission
Leshin, L. A.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 43; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The technology developed for low-cost sample return by STARDUST and GENESIS, and the great advancement of laboratory capabilities to perform high precision analyses of very small samples, have resulted in an exciting concept for the first Mars sample return mission. This mission, called Sample Collection for Investigation of Mars (SCIM), is currently in Phase A competition for flight as the first Mars Scout mission. When SCIM delivers the first martian samples to Earth it will dramatically expand scientific horizons by enabling distinctly new and diverse measurements and engaging a new community of scientists in the exploration of Mars. By returning more than a thousand 10 pm diameter dust particles and a liter of atmospheric gas, SCIM will provide fundamental advances in our understanding of Mars' habitability, geology, and climate. Existing high-precision, cutting-edge terrestrial laboratory instruments will produce high accuracy analyses of SCIM samples, addressing high-priority Mars science.
Derived from text
Atmospheric Chemistry; Mars Sample Return Missions; Planetary Geology; Mars Surface

20030073573
On Polycyclic Aromatic Hydrocarbon Molecules in Comets
Li, Aigen; Workshop on Cometary Dust in Astrophysics; 2003, pp. 44; In English; See also 20030073556; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Polycyclic aromatic hydrocarbon (PAH) molecules might have been incorporated into comets if they are formed from relatively unprocessed interstellar material. The presence of PAHs in comets has been suggested by the 3.28 microns emission feature detected in some comets. More specifically, 3-ring PAH molecule - phenanthrene (C14H10) - has been proposed as the carrier for the 342- 375nm fluorescence bands seen in comet lP/Halley. We model the infrared emission process of

phenanthrene as well as 'generic' PAHs in cometary comae and obtain an upper limit on the coma PAH abundance based on the observed 3.28 microns emission feature and the absence of the 6.2, 7.7, 8.6, and 11.3 microns PAH emission features in coma spectra. We find that the lP/Halley 3.28 microns emission feature constrains the neutral phenanthrene production rate to be less than 10(exp -3) of the total dust mass production rate. It is also found that the mass production rate of 'generic' PAHs is only approx. less than 10(exp -3) of that of the dust. This is at least approx. 100 times smaller than the mass fraction of interstellar PAHs relative to the total interstellar dust in the diffuse interstellar medium. In order for the PAH production rate in nucleus surfaces increases to the level in agreement with the interstellar dust model expectation without violating observational constraints, PAHs should be photodissociated rapidly enough in comae (in a few seconds at a heliocentric distance of 1 AU) which is inconsistent with the photodissociation modelling results. Selective sublimation may be the process suppressing the coma PAH abundance.
Author
Polycyclic Aromatic Hydrocarbons; Cometary Atmospheres; Cosmic Dust; Halley's Comet

20030073574 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Stardust Mission
Brownlee, D. E.; Tsou, Peter; Workshop on Cometary Dust in Astrophysics; 2003, pp. 14; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The primary goal of the Stardust Mission is to collect >1000 particles >15 micron in diameter from comet Wild2 and return them to Earth in January 2006. The main samples will be captured by 6.1 km/s impact into low density silica aerogel and additional particles will crater into approx. 150 sq cm of 100 micron thick pure aluminum foil that covers the aerogel holding grid. It is expected that the impacts into the aerogel will produce tracks that range from deep narrow cones for non-fragmenting particles to shallower more complex tracks for particles that fragment. The impacts into aluminum foil will produce craters but a significant amount of projectile residue is expected to line the crater walls.
Derived from text
Stardust Mission; Aerogels; Sampling; Cosmic Dust; Metal Foils; Impact

20030073581 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Chemical Analysis of Primitive Objects Using a Slitless Ultraviolet Meteor Spectrometer (CAPO-SUMS)
Nuth, J. A.; Wdowiak, T.; Lowrance, J.; Carruthers, G.; Jenniskens, P.; Gerakines, P.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 58; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Measure the elemental composition in both random meteors and in the bolides forming specific meteor streams (these are traceable to specific small bodies in the solar system). These will yield the average chemical composition and degree of chemical variability in a statistically significant number of planetesimals. CAPO-SUMS is functionally equivalent to a series of multiple, small-body sample analysis missions, but provides much more analytical capability than is possible on any orbital or flyby mission due to the vaporization, ionization and ultraviolet emission from the ablating bolide as it enters the atmosphere. CAPO-SUMS will provide a chemical context from which the detailed analytical studies provided by a cometary or asteroidal lander mission can be interpreted.
Derived from text
Chemical Analysis; Ultraviolet Emission; Chemical Composition; Meteoroids

20030073596 NASA Johnson Space Center, Houston, TX, USA
Infrared Spectroscopy of Anhydrous Interplanetary Dust Particles
Keller, L. P.; Flynn, G. J.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 38-39; In English; See also 20030073556 Contract(s)/Grant(s): NAG5-4843; RTOP 344-31-40-07; No Copyright; Avail: CASI; A01, Hardcopy

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. These comparisons have been facilitated by the Infrared Space Observatory (ISO), which 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 anhydrous interplanetary dust particles (IDPs) are particularly important comparison materials because some IDPs contain carbonaceous material with non-solar D/H and N-15/N-14 ratios and amorphous and crystalline silicates with non-solar 0- isotopic ratios, demonstrating that these IDPs contain preserved interstellar material. Here, we report on micro- Fourier transform (FT) IR spectrometry of IDPs, focusing

on the inorganic components of primitive IDPs (FTIR spectra from the organic/carbonacecous materials in IDPs are described elsewhere).
Derived from text
Infrared Spectroscopy; Amorphous Materials; Interplanetary Dust; Carbonaceous Materials

20030073599 California Univ., Los Angeles, CA, USA
On the Crystallinity of Silicates in the Interstellar Medium
Kemper, F.; Vriend, W. J.; Tielens, A. G. G. M.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 40; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

We present a detailed study on the degree of crystallinity of the silicates in the interstellar medium (ISM), using infrared spectroscopy obtained with the short wavelength spectrometer (SWS) on board of the infrared space observatory (ISO). We focus on the line-of-sight toward the galactic centre (in particular to radio source Sgr A*) which is thought to be representative of the diffuse ISM. Determining the degree of crystallinity of the interstellar silicates is a subject of great astrophyiscal interest. On the one hand, many post- and pre-main-sequence stars exhibit crystalline silicates in their circumstellar dust shells. while on the other hand, crystalline silicates have not yet been detected in the diffuse ISM. Only one reliable detection of diopside is reported in a star forming region. It is striking that, although during the beginning and the end of the life cycle of dust silicates can be highly crystalline, silicates seem to be completely amorphous during the longest phase in their life time.
Derived from text
Crystallinity; Silicates; Interstellar Matter

20030073603 Centre de Recherches Petrographiques et Geochimiques, Nancy, France
In-Situ Analysis of Complex Organic Matter in Cometary Dust by Ion Microprobe
Aleon, J.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 11; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Based on the comparison with interplanetary dust particles (IDPs), the observation of abundant carbonaceous dust grains in the coma of comet Halley and the actual models of interstellar dust composition, it is believed that carbonaceous matter will be a major component of the Stardust returned samples. Given the importance of carbonaceous compounds in interstellar and nebular chemistry, in the formation of planetary atmospheres and in the potential delivery of prebiotic molecules to planetary surfaces, it is thus necessary to be able to provide a complete and accurate study of the carbonaceous components of cometary dust. Since carbonaceous units in this dust have a small micron to sub-micron size, only in-situ techniques with high lateral resolution will be useful to study these grains, such as synchrotron- based spectroscopies, high resolution transmission electron microscope and ion microprobe. Here I summarize the work done with a IMS 1270 ion microprobe to understand the composition of complex organic matter in IDPs of probable cometary origin and the possible processes responsible for its formation.
Derived from text
Cosmic Dust; Interplanetary Dust; Interstellar Matter; Ion Probes; In Situ Measurement; Organic Materials

20030073608 Carnegie Institution of Washington, Washington, DC, USA
Approaches to Establishing the Chemical Structure of Extraterrestrial Organic Solids
Cody, G. D.; Alexander, C. M. OD.; Wirick, Susan; Workshop on Cometary Dust in Astrophysics; 2003; 2 pp.; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

The majority of extraterrestrial organic matter in carbonaceous chondrites resides in a chemically complex, insoluble and perhaps macromolecular phase. We have been applying a series of independent solid state NMR experiments that are designed to provide a self consistent chemical characterization of this complex material. To date we have thoroughly analyzed 8 organic residues from different meteorites, including a CR2 (EET92042), CIl(Orgueil), CM2 (Murchison), Tagish Lake, CM2 (AlH83100), CM2 (Cold Bokkefeld), CM2 (Mighei), CM3 (Y86720). In fig 1. (1)H to (13)C cross polarization NMR spectra of four of these are shown. Note that there exists an enormous range in chemistry exhibited in organic solid [evident by the breadth of the spectral features both in the aliphatic region (sp(sup 3)) and the aromatic region (sp(sup 2))]. There is also considerable differences in the carbon chemistry across the meteorite groups.
Derived from text
Extraterrestrial Matter; Carbonaceous Chondrites; Meteoritic Composition

20030073612 NASA Johnson Space Center, Houston, TX, USA

Pristine Presolar Silicon Carbide

Bernatowicz, T. J.; Messenger, S.; Pravdivtseva, O.; Swan, P.; Walker, R. M.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 12-13; In English; See also 20030073556; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

In this talk we discuss a simple physical disaggregation technique coupled with an X-ray mapping procedure used to locate 81 micrometer-sized presolar SiC grains from the Murchison carbonaceous chondrite, that preserves them in their pristine state. We then describe pristine SiC surface characteristics and overall morphologies determined by high resolution field emission scanning electron microscopy (FESEM), and compare these features to those of presolar SiC grains that have been prepared using chemical dissolution techniques.

Derived from text

Silicon Carbides; Granular Materials; Murchison Meteorite; Crystal Morphology

20030073620 Carnegie Institution of Washington, Washington, DC, USA

Circumstellar Grains in Meteorites and IDPs: Isotopic Connections Between Stellar Generations

Nittler, L. R.; Workshop on Cometary Dust in Astrophysics; 2003, pp. 56; In English; See also 20030073556; No Copyright; Avail: CASI; A01, Hardcopy

Primitive meteorites and interplanetary dust particles (IDPs) contain tiny dust grains that condensed in outflows and explosions of ancient stars prior to the birth of our solar system. These presolar or circumstellar grains are solid samples of stellar matter that trace a diversity of processes including stellar evolution and nucleosynthesis, stellar dust formation, dust processing in the interstellar medium (ISM) and early solar system processes. They are recognized by their highly unusual variations in isotopic compositions, caused in many case by the nuclear reactions which occur at high temperatures in stellar interiors. This talk will review how isotopic signatures of presolar grains are used to infer their stellar sources and probe the nucleosynthetic and evolutionary processes which led to their compositions. Of particular interest are connections between different types of circumstellar grains and connections between grains found in meteorites and those found in IDPs. Cometary and interstellar samples returned by the STARDUST mission could provide crucial information on these connections. I will focus on three types of circumstellar grains: SiC, refractory oxides (primarily Al2O3 and MgAl2O4) and silicates (e.g., MgSiO3). The majority of these grain types are all believed to have originated in similar types of stars: low-mass (<3 solar masses) red giant branch (RGB) and asymptotic giant branch (AGB) stars. Some tens to hundreds of individual stars probably contributed SiC and/or oxide stardust to the Sun's parent cloud. SiC production is confined to late-stage AGB stars in which convective mixing of freshly synthesized (12)C increases the surface C/O ratio greater than unity. In contrast, oxides and silicates can be produced throughout the RGB and early AGB stages and thus can form in the same stars which later condense SiC.

Author

Interplanetary Dust; Meteoritic Composition; Stellar Evolution; Isotope Ratios; Meteorites

20030075678 Arizona State Univ., Tempe, AZ, USA

A Reassessment of the Emplacement and Erosional Potential of Turbulent, Low-Viscosity Lavas on the Moon

William, David A.; Fagents, Sarah A.; Greeley, Ronald; Journal of Geophysical Research; [2003]; ISSN 0148-0227; Volume 105, No. E8, pp. 20,189 - 20,205; In English

Contract(s)/Grant(s): NAG5-11787

Report No.(s): Paper-1999JE001220; Copyright; Avail: Other Sources; Abstract Only

We have reevaluated the role of thermal erosion by low-viscosity lunar lavas as a mechanism or the formation of the lunar sinuous rilles. We have adapted the model of Williams et aL and used the compositions of an Apollo 12 basalt and a terrestrial komatiitic basalt to investigate the compositional and environmental effects on the flow behavior of low-viscosity lavas on the Moon and Earth. Our model predict that lunar lava could have erupted as turbulent flows that were capable of flowing hundreds of kilometers on a sufficiently flat, unobstructed substrate. These results are consistent with previous studies. Modeling of lava over a substrate of the same composition shows that thermal erosion rates would have been low (approx. 10 cm/d). As a result, long-duration eruptions (approximately months to years) would have been required to incise deep (tens to hundreds of meters) channels. Partial melting and mechanical removal of the substrate, a mechanism suggested by Hulme to enhance erosion, only slightly increases thermal erosion rules. Other factors, such as higher flow rates or lava superheating, could have produced deep rilles by thermal erosion during shorter-duration eruption. A superheated lunar lava not only would have had a higher erosion rate (approx. 40 cm/d) but also would have remained uncrusted for tens of kilometers, which is consistent with the open channel morphology of most sinuous rilles. For lunar lavas with large volatile (t.e., vesicle) contents,

the presence of vesicles would have tended to increase viscosity at low strain rates, resulting in shorter turbulent flow distances, lower thermal erosion rates, and thus shallower erosion channel depths for given eruption durations.
Author
Turbulent Flow; Viscosity; Lava; Moon; Morphology

20030075708 Massachusetts Univ., Amherst, MA, USA
Topography within Circular Grabens: Implications for Polygon Origin, Utopia Planitia, Mars
Buczkowski, Debra L.; McGill, George E.; Geophysical Research Letters; [2002]; ISSN 0094-8276; Volume 29, No. 7, pp. 59-1 - 59-4; In English
Contract(s)/Grant(s): NAG5-8184
Report No.(s): Paper 2001GL014100; Copyright; Avail: Other Sources

Very large, fracture-bounded polygons occur in Acidalia and Utopia Planitiae, Mars. Two models for the origin of these large polygons postulate drape folding of a sedimentary cover material over an uneven buried surface, with the strain enhancement needed to explain the large size due to differential compaction. Throughout the polygonal terrain are circular grabens inferred to overlie buried crater rims. Drape folding models predict that (1) these circular grabens will bound topographic lows and (2) the surface relief and percent compaction within circular grabens will be proportional to ring diameters. Relief and compaction within 8 circular grabens have been determined by gridding MOLA data in ArcView. All 8 fulfill the first prediction, and 7 of them fulfill the second prediction. These results support a sedimentary origin for polygonal terrain materials, and thus are consistent with the past existence of an 'ocean' in the martian lowland.
Author
Mars Surface; Topography; Polygons; Tectonics; Planetary Geology; Geological Faults; Sedimentary Rocks

20030075714 Massachusetts Univ., Amherst, MA, USA
The Utopia Basin Revisited: Regional Slope and Shorelines from MOLA Profiles
McGill, George E.; Geophysical Research Letters; [2001]; ISSN 0094-8276; Volume 28, No. 3, pp. 411-414; In English
Contract(s)/Grant(s): NAG5-8184
Report No.(s): Paper-200GL008546; Copyright; Avail: Other Sources

MOLA profiles indicate that Utopia Planitia, including the Utopia Basin, has been tilted northward by approx. 0.025 deg since formation of the basin but no later than mid-Late Hesperian. This tilt could be a relic of the endogenic formation of the global dichotomy in late Noachian to early Hesperian by a process involving subcrustal erosion in the lowland. The Utopia Basin survives as a deep, circular depression within Utopia Planitia. Along its south flank are several horizontal or near horizontal terraces and benches that may be shorelines of an extensive northern lowland Ocean and a more restricted lake within the Utopia Basin. The large size (up to 200 km wide) of these putative shorelines represents a major geomorphic problem to be solved.
Author
Mars Surface; Geomorphology; Structural Basins; Planetary Geology; Extraterrestrial Oceans

20030075717 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Pathfinder Landing Site: Evidence for a Change in Wind Regime from Lander and Orbiter Data
Greeley, Ronald; Kraft, Michael D.; Kuzmin, Ruslan O.; Bridges, Nathan T.; Journal of Geophysical Research; January 25, 2000; ISSN 0148-0227; Volume 105, No. E1, pp. 1829-1840; In English
Contract(s)/Grant(s): NAG5-8453
Report No.(s): ASU-PVA-6555/TE; Paper 1999JE001072; Copyright; Avail: Other Sources

Surface features related to the wind are observed in the vicinity of the Mars Pathfinder (MPR landing site data from the lander and in data from orbit by the Viking Orbiter and Mars Global Surveyor missions. Features seen from the surface include wind tails associated with small rocks, barchanoid duneforms, ripplelike patterns, and ventifact flutes cut into some rocks. Features seen from orbit include wind tails associated with impact craters, ridges inferred to be duneforms, and modified crater rims interpreted to have been eroded and mantled by windblown material. The orientations of these features show two prevailing directions. One is inferred to represent winds from the northeast, which is consistent with strongest winds predicted by a general circulation model to occur during the Martian northern winter under current conditions. A second wind blowing from the ESE was responsible for modifying the crater rims and cutting some of the ventifacts. The two wind regimes could reflect a change in climate related to Mars' obliquity or some other, unknown factor. Regardless of the cause, the MPF area has been subjected to a complex pattern of winds and supply of small particles, and the original surface formed by sedimentary

processes from Tiu and Ares Vallis flooding events has been modified by repeated burial and exhumation.
Author
Landing Sites; Mars Surface; Wind Effects; Wind Direction

20030075730 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Summer 1997 Eruption at Pillan Patera on Io: Implications for Ultrabasic Lava Flow Emplacement
Williams, David A.; Davies, Ashley G.; Keszthelyi, Laszlo P.; Greeley, Ronald; Journal of Geophysical Research; December 25, 2001; ISSN 0148-0227; Volume 106, No. E12, pp. 33105-33119; In English
Contract(s)/Grant(s): NAG5-11787
Report No.(s): Paper-2000JE01339; ASU-PVA-6600/TE; Copyright; Avail: Other Sources

Galileo data and numerical modeling were used to investigate the summer 1977 eruption at Pillan Patera on Io. This event, now defined as 'Pillanian' eruption style, included a high-temperature (greater than 1600 C), possible ultrabasic , 140-km-high plume eruption that deposited dark, orthopyroxene-rich pyroclastic material over greater than 125,000 sq km, followed by emplacement of dark flow-like material over greater than 3100 sq km to the north of the caldera. We estimate that the high-temperature, energetic episode of this eruption had a duration of 52 - 167 days between May and September 1997, with peak eruption temperatures around June 28, 1997. Galileo 20 m/pixel images of part of the Pillan flow field show a wide-spread, rough, pitted surface that is unlike any flow surface we have seen before. We suggest that this surface may have resulted from: 1. A fractured lava crust formed during rapid, low-viscosity lava surging, perhaps including turbulent flow emplacement. 2. Disruption of the lava flow by explosive interaction with a volatile-rich substrate. or 3. A combination of 1 and 2 with or without accumulation of pyroclastic material on the surface. Well-developed flow lobes are observed, suggesting that this is a relatively distant part of the flow field.Shadow measurements at flow margins indicate a thickness of-8 - 10 m. We have modeled the emplacement of putative ultrabasic flow from the summer 1997 Pillan eruption using constraints from new Galileo data. Results suggest that either laminar sheet flows or turbulent channelized flows could have traveled 50 - 150 km on a flat, unobstructed surface, which is consistent with the estimated length of the Pillan flow field (approx. 60 km). Our modeling suggests low thermal erosion rates (less than 4.1 m/d), and that the formation of deep (greater than 20 m) erosion channels was unlikely, especially distal to the source. We calculate a volumetric flow rate of approx. 2 - 7 x 10(exp 3)cu m/s, which is greater than those for typical Mauna Loa/Kilaueaq flows but comparable to those for the (1783) Laki eruption and the inferred flow rates of the Roza flows in the Columbia River flood basalts. The differences in ultrabasic eruption styles on Earth and Io appear to be controlled by the different eruption environments; Plumes at sites of ultrabasic eruptions on Io suggest strong magma-volatile interactions on a low-gravity body lacking an atmosphere, whereas the geology at sites of komatiite eruptions on Earth suggest mostly submarine emplacement of thick flows with a pronounced lack of subaerial explosive activity.
Author
Io; Erosion; Calderas; Flat Surfaces; Flow Distribution; Flow Measurement; Flow Velocity; Igneous Rocks

20030075795 Arizona State Univ., Tempe, AZ, USA
Investigation of Nebular Processes Through Oxygen Isotopic Analysis of Primitive Meteorite Materials
Leshin, Laurie; [2002]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-7540; No Copyright; Avail: CASI; A01, Hardcopy

As a direct result of support provided by this grant, precise and accurate determination of delta(18)O and delta(17)O in silicates (and other minerals) by ion microprobe (both IMS 6f and IMS 1270) are now being carried out in several laboratories, and these analyses, combined with application of laser fluorination techniques, have led to a proliferation of oxygen isotopic data in the past approx. 3 years. The applications of these techniques in cosmochemical research have been myriad, from understanding the most refractory objects in the nebula (CAIs) to the low temperature alteration processes on meteorite parent bodies. Here, we describe our progress in understanding the oxygen isotopic microdistributions in primitive meteorite materials, as directly supported by this Origins grant.
Author
Nebulae; Oxygen Isotopes; Isotope Ratios; Meteoritic Composition

20030079993 Lunar and Planetary Inst., Houston, TX, USA

Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations

Herrick, Robert, Editor; Pierazzo, Elisabetta, Editor; 2003; ISSN 0161-5297; 157 pp.; In English; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations, 7-9 Feb. 2003, Houston, TX, USA; See also 20030079994 - 20030080044

Contract(s)/Grant(s): NASW-4574; NCC5-679

Report No.(s): LPI-Contrib-1162; No Copyright; Avail: CASI; A08, Hardcopy

On February 7-9,2003, approximately 60 scientists gathered at the Lunar and Planetary Institute in Houston, Texas, for a workshop devoted to improving knowledge of the impact cratering process. We (co-conveners Elisabetta Pierazzo and Robert Herrick) both focus research efforts on studying the impact cratering process, but the former specializes in numerical modeling while the latter draws inferences from observations of planetary craters. Significant work has been done in several key areas of impact studies over the past several years, but in many respects there seem to be a disconnect between the groups employing different approaches, in particular modeling versus observations. The goal in convening this workshop was to bring together these disparate groups to have an open dialogue for the purposes of answering outstanding questions about the impact process and setting future research directions. We were successful in getting participation from most of the major research groups studying the impact process. Participants gathered from five continents with research specialties ranging from numerical modeling to field geology, and from small-scale experimentation and geochemical sample analysis to seismology and remote sensing.With the assistance of the scientific advisory committee (Bevan French, Kevin Housen, Bill McKinnon, Jay Melosh, and Mike Zolensky), the workshop was divided into a series of sessions devoted to different aspects of the cratering process. Each session was opened by two invited t a b , one given by a specialist in numerical or experimental modeling approaches, and the other by a specialist in geological, geophysical, or geochemical observations. Shorter invited and contributed talks filled out the sessions, which were then concluded with an open discussion time. All modelers were requested to address the question of what observations would better constrain their models, and all observationists were requested to discuss how their observations can constrain modeling efforts.

Derived from text

Cratering; Mathematical Models; Geochemistry

20030079994 Pittsburgh Univ., Pittsburgh, PA, USA

Small Impact Craters in Argentine Loess: A Step up from Modeling Experiments

Cassidy, W. A.; Wright, S. P.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

While 20 small impact craters are known, there is some reason to believe there may be many more impact craters in this crater field. Campo del Cielo is a good location for linking model studies and impact craters. Further accumulation of a body of data on Campo del Cielo can lead to better interpretations of small-scale cratering on other planetary bodies. Direct analogies may be made, in general, to elongated fields of small craters on planetary surfaces, and also, specifically, to secondary crater fields around major impacts, which tend to be low-angle impacts occurring at relatively low velocities.

Derived from text

Craters; Impact Velocity

20030079995 Washington Univ., Seattle, WA, USA

Does Melt Volume Give the Signature of the Impactor?

Holsapple, K. A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Many analyses of impact events attempt to solve an inverse problem: Given the result, what was the impactor? One common example is the use of careful measurements of impact melt with the hope of deducing the impactor size and velocity. The approach is as follows. Suppose the amount of impact melt is, for a given geological site and assuming a given impactor material, known (for example by code calculation) as a function of impactor mass m, velocity U. (I shall ignore complexities of oblique impacts here.) Then we have some known functional relationship given. Then also we have some other known quantity, say the crater size. The goal is then to solve these two equations in two unknowns for the impactor mass m and the velocity U. Of course, that will fail if the two equations are not independent, and therein often lies the problem. This paper presents an analysis of these two equations.

Derived from text

Impact Melts; Impact Velocity; Numerical Analysis; Problem Solving

20030079996 Oxford Brookes Univ., Oxford, UK

Early Fracturing and Impact Residue Emplacement: Can Modeling Help to Predict Their Location in Major Craters?

Kearsley, A. T.; Graham, G. A.; McDonnell, J. A. M.; Bland, P. A.; Hough, R. M.; Helps, P. A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

In a field investigation of a crater, where are the most effective places to look for material that could reveal the nature of object responsible for the impact? Can numerical modeling of impact processes help to predict locations in which recognizable residue of the bolide could be found?

Author

Fracturing; Residues; Meteorite Craters

20030079998 Southwest Research Inst., Boulder, CO, USA

Cratering on Small Bodies: Lessons from EROS

Chapman, C. R.; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Cratering and regolith processes on small bodies happen continuously as interplanetary debris rains down on asteroids, comets, and planetary satellites. But they are very poorly observed and not well understood. On the one hand, we have laboratory experimentation at small scales and we have examination of large impact craters (e.g. Meteor Crater on Earth and imaging of abundant craters on terrestrial planets and outer planet moons). Understanding cratering on bodies of intermediate scales, tens of meters to hundreds of km in size, involves either extrapolation from our understanding of cratering phenomena at very different scales or reliance on very preliminary, incomplete examination of the observational data we now have for a few small bodies. I review the latter information in this paper.

Derived from text

Space Debris; Eros (Satellites); Regolith; Projectile Cratering; Celestial Bodies

20030079999 Academy of Sciences (USSR), Moscow, USSR

Experimental Modeling of Impact-induced High-Temperature Processing of Silicates

Gerasimov, M. V.; Dikov, Yu. P.; Yakovlev, O. I.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993

Contract(s)/Grant(s): RFBR-01-05-6464; No Copyright; Avail: CASI; A01, Hardcopy

Introduction: Large scale impacts of asteroids and meteorites play an important role in the evolution of planets and their satellites. Pulse input of huge energy during an impact results in noticeable changes in both mechanical and geochemical state of colliding material. The complexity of geochemical processes during an impact suggests experimental modeling as the main tool of its investigation rather than computing approach. On the other side, the modeling of mechanical issues of large scale impacts is mainly a success of computations. We need to have a good cooperation between both computer modeling of mechanical issues of an impact and experimental investigations of geochemical processes to build up a more or less realistic picture of a large-scale impact.

Author

Silicates; Geochemistry

20030080000 Academy of Sciences (USSR), Moscow, USSR

Complex Crater Formation: Verification of Numerical Models

Ivanov, B. A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling ad Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Numerical models of complex impact crater formation can be and should be verified by comparison with field geological and geophysical data. In this paper, an analysis of the complex crater formation is provided.

Derived from text

Geophysics; Mathematical Models; Geomorphology; Meteorite Craters

20030080001 Arizona Univ., Tucson, AZ, USA

Modeling Meteorite Impacts: What we Know and What we Would Like to Know

Melosh, H. J.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Meteorite impacts can be studied by computer simulation: Large meteorite impacts are among those phenomena that are either too large or too dangerous to study experimentally. Although impacts have affected the formation and surfaces of nearly every body in the solar system, we are limited to observing the results of past events. Investigation of impact processes is thus divided into observational studies of the traces of past impacts, small-scale analogue laboratory experiments and, most recently, detailed computer modeling. Computer models offer the possibility of studying craters at all scales, provided we completely understand the physics of the process and possess enough computer power to simulate the features of interest.
Derived from text
Computerized Simulation; Meteorite Collisions; Craters

20030080003 Lunar and Planetary Inst., Houston, TX, USA
Importance of Target Properties on Planetary Impact Craters, Both Simple and Complex
Schenk, P. M.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

For 20 years, the issue of whether surface gravity or target properties control the shape of planetary craters has continued unabated. Periodic revisions to and questions about quality control of the planetary crater database have vexed the debate. Here I review the current status of the observations and our understanding of the results. The observational data fall into two related categories: crater depths, and morphologic transitions from one landform to another. As it turns out there is more than one way to measure these transitions. It would appear that both target gravity and properties are important.
Derived from text
Planetary Craters; Impact; Landforms; Surface Properties

20030080004 Sandia National Labs., Albuquerque, NM, USA
Application of Adaptive Mesh Refinement to the Simulation of Impacts in Complex Geometries and Heterogeneous Materials
Crawford, D. A.; Barnouin-Jha, O. S.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations
Contract(s)/Grant(s): DE-AC04-94AL-85000; No Copyright; Avail: CASI; A01, Hardcopy

Adaptive mesh refinement (AMR) has been used for improving computational resolution on hyperbolic problems when resources are limited. For a mature Eulerian multi-material shock-physics code like CTH, adaptivity is considered a natural next step in code development. Recent work has demonstrated the utility of AMR for studying shock processes in 2-D heterogeneous targets for planetary impact applications. In this study, even more complex targets such as a pre-fractured 433 Eros are being simulated with 3-D AMR.
Derived from text
Grid Refinement (Mathematics); Heterogeneity; Three Dimensional Models; Computerized Simulation; Meteorite Craters; Morphology

20030080005 Royal Society of Canada, Ottawa, Ontario, Canada
WIRGO in TIC'S? [What (on Earth) is Really Going on in Terrestrial Impact Craters?] or Structure Evidence from Shock Metamorphism
Dence, Michael R.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Canada is well endowed with impact craters formed in crystalline rocks with relatively homogeneous physical properties. Representative craters are listed below. They exhibit all the main morphological-structural variations with crater size seen in craters on other rocky planets, from small simple bowl to large peak and ring forms. They demonstrate that form is not dependent on variations in the physical properties of the. target material, though such variations may be important modifiers. Lacking stratigraphy, analysis is based largely on the imprint of shock melting and metamorphism, to give insights into the mechanics of crater formation. Attention is directed to the limit of initial brecciation due to shock wave reverberations and its position of relative to level of shock metamorphism, and the distribution of shocked target that lies in the para-autochthone outside the limit of breccia development. In addition the form and distribution of late stage shears and breccias formed by late stage movements is important.
Derived from text
Craters; Metamorphism (Geology); Morphology

20030080006 Witwatersrand Univ., Johannesburg, South Africa

Thermal and Dynamic Consequences of Impact: Lessons from Large Impact Structures

Gibson, roger L.; Reimold, W. Uwe; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

In the early years following the recognition of meteorite impact cratering as an important geological process within the Solar System, impact researchers were largely confined to inferring cratering mechanics from studies of surface crater morphologies and small-scale experiments. With the advent of sophisticated computer-based numerical simulations and high-resolution geophysics, however, researchers have begun to explore more fully the detailed 3-D structure of craters and the processes that give rise to them. This paper examines some of the issues raised by the model simulations from the perspective of the field evidence presented in impact structures, with particular reference to the Vredefort structure in South Africa.

Derived from text

Meteorite Collisions; Geophysics; Solar System; Hypervelocity Projectiles; Thermodynamic Properties; Geomorphology

20030080007 National Research Council of Canada, Ottawa, Ontario, Canada

Observations of the Terrestrial Impact Cratering Record

Grieve, R. A. F.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

The currently known terrestrial record of impact cratering stands at over 160 impact structures and several new examples are identified each year. The record, however, is a biased sample of an originally much larger population, favoring younger, larger structures in geologically stable areas of the Earth's continental crust. The largest and oldest known structures are limited to diameters of approximately 250-300 km and ages of less than 2 Ga. Care must be taken, therefore, in making generalised statements regarding the record with respect to such time-integrated effects as variations in cratering rate, periodicities, etc. The terrestrial record, however, does provide cumulative observations of aspects of the cratering process and is the only available source of ground truth with respect to the structural and lithological results of large-scale natural impact events. Some critical and less certain observations of impact cratering studies are included. The author also presents some closing thoughts on these observations.

Derived from text

Geomorphology; Lunar Craters; Observation; Geochronology; Lithology

20030080009 Tartu Univ., Tartu, Estonia

Cooling of the Kaerdla Impact Crater, 2, Impact and Geothermal Modelling

Joeleht, A.; Kirsimaee, K.; Versh, E.; Plado, J.; Ivanov, B.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Hydrothermal mineralization has occurred in many impact craters including also a 4-km marine complex crater in Kaerdla, Estonia. Mineralogical and fluid inclusion data provide temperature ranges for different mineralization events and, thus, giving a starting point for modelling. Modelling includes both: (1) impact modelling to get the structure and temperature distribution in crater rocks right after the impact, and (2) geothermal modelling to get information on heat transfer processes and time-scale of post-impact cooling.

Derived from text

Cooling; Craters; Heat Transfer; Mineralogy

20030080010 Eotvos Lorand Univ., Budapest, Hungary

Crater Basin Rebound Above Plastic Layers: Model Based on Europa

Kereszturi, Akos; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Isostatic rebound and mega-slumpings are important processes in the modification of large craters. Beside the examples for these on Mercury, Moon, Earth, Callisto (possibly Venus and Mars) we have good images from Europa. Analysis of internal rings and benches of great (usually greater than 100 km) craters and palimpsests help in the reconstruction of

formation. The its young, pristine and tectonically homogene surfaced Europa can improve our knowledge in the reconstruction of crater basin formation.
Derived from text
Craters; Structural Basins; Isopycnic Processes; Mathematical Models; Europa

20030080012 NASA Ames Research Center, Moffett Field, CA, USA
Goldilocks and the Three Complex Crater Scaling Laws
McKinnon, William B.; Schenk, Paul M.; Moore, Jeffrey M.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Formed in the gravity regime, complex craters are larger than their simple crater equivalents, due to a combination of slumping and uplift. Just how much larger is a matter of great interest for, for example, age dating studies. We examine three empirical scaling laws for complex crater size, examining their strengths and weaknesses, as well as asking how well they accord with previously published and new data from lunar, terrestrial, and Venusian craters.
Derived from text
Lunar Craters; Scaling Laws; Geochronology; Geomorphology

20030080015 Brown Univ., Providence, RI, USA
Atmospheric Effects and Oblique Impacts: Comparing Laboratory Experiments with Planetary Observations
Schultz, Peter H.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Without direct observations of a major impact, one of the few ways to study the impact process is by assessing the effects of its environment (gravity, atmosphere) or conditions of impact (e.g., impact angle). The purpose of this contribution is to review selected consequences of both the atmosphere and impact angle as witnessed in laboratory experiments or revealed by large-scale craters preserved on different planets.
Derived from text
Atmospheric Effects; Lunar Craters; Obliqueness; Space Exploration; Hypervelocity Impact

20030080016 Eotvos Lorand Univ., Budapest, Hungary
Pyroclastic Flows and Surges: Possible Analogy for Crater Ejecta Deposition
Hargitai, H.; Kereszturi, A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

We analyze a possible modell of the crater ejecta development and deposition with pyroclastic flows and surges. Because several of their characteristics and depositional structures are known and observable on the Earth it is useful to try to find resembling phases of the crater ejecta formation.
Derived from text
Craters; Deposition; Analogies; Storm Surges; Volcanology; Ejecta

20030080017 California Inst. of Tech., Pasadena, CA, USA
Calculation of Planetary Impact Cratering to Late Times
Adhrens, Thomas J.; OKeefe, John D.; Stewart, Sarah T.; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Simulation of impact cratering on planetary materials is crucially dependent on adequate description of shock processing of surface materials. Two recent examples of the importance of these processes is demonstrated by the simulation of impact induced flow from the impact of a ca. 10 km bolide at 20 km/sec onto the Earth. This has been inferred to have occurred along the Yucatan (Mexican) coast, 65 million years ago. This impact is inferred to have triggered global climatic change, induced by the impact devolatilization of the marine anhydrite (CaSiO4) and gypsum (CaSO42HzO) deposits of the target rocks. These calculations conducted with Sandia's CTH code depend crucially upon utilizing a rock damage model which reduced crustal rock strength from 100 MPa to 1 MPa over a volume some 10(exp 2) times that of the bolide in about 1 minute and gives rise to a 100 km diameter central peak, flat-floored crater with overturned target flap some 8 minutes after impact. Comparison of calculated post-impact deformation compares favorably with seismic profiling and drill-core data. A second example is the formation of ejecta blankets giving rise to rampart Martian craters by fluidization with liquid water by a new impact cratering

simulation and recent shock wave data on H2O ice. We demonstrate that ground ice is melted by the impact shock within a hemisphere of radius equal to the final crater radius, resulting in excavation of a mixture of liquid water and brecciated rock into the continuous ejecta blanket. Our shock wave experiments demonstrate that ice at Mars temperature, 150 to 275 K, will begin to melt when shocked above 2.2 to 0.6 GPa, respectively, lower than previously expected. Hence, the presence of liquid water near the pre-impacted surface is not required to form fluidized ejecta. The amount of ice melted and incorporated into the ejecta blanket debris flow is within a factor of two of the subsurface ice content; therefore, debris flow modeling of fluidized ejecta morphologies may be used to quantify the amount of near-surface ground ice on Mars.
Author
Computation; Planetary Composition; Impact; Simulation; Shock Waves; Mars Craters

20030080018 California Inst. of Tech., Pasadena, CA, USA
Dynamic Tensile Strength of Crustal Rocks and Applications to Impact Cratering
Ai, H.; Ahrens, T. J.; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Dynamic tensile strengths of two crustal rocks, San Marcos gabbro and Coconino sandstone (Meteor Crater, Arizona), were determined by carrying out flat plate impact experiments. Porosity of San Marcos gabbro is very low, and the reported porosity for Coconino sandstone is approx. 25%. Aluminum flyer plates were used for gabbro with impact velocities of 13 to 50 m/s , which produce tensile stresses in the range of 120 to 450 MPa. PMMA flyer plates were used for sandstone with impact velocities of 5 to 25 m/s ,resulting tensile stresses in the range of approx. 13 to 55 MPa. Impact was normal to the bedding of sandstone. Tensile duration times for two cases were -1 and approx. 2.3 microns, respectively. Pre-shot and post-shot ultrasonic P and S wave velocities were measured for the targets.
Derived from text
Dynamic Characteristics; Tensile Strength; Crystal Structure; Rocks; Impact Velocity; Meteorite Craters

20030080019 NASA Ames Research Center, Moffett Field, CA, USA
The Evolution of Oblique Impact Flow Fields Using Maxwell's Z Model
Anderson, J. L. B.; Schultz, P. H.; Heineck, J. T.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Oblique impacts are the norm rather than the exception for impact craters on planetary surfaces. This work focuses on the excavation of experimental oblique impact craters using the NASA Ames Vertical Gun Range (AVGR). Three-dimensional particle image velocimetry (3D PIV) is used to obtain quantitative data on ejection positions, three-dimensional velocities and angles. These data are then used to test the applicability and limitations of Maxwell's Z Model in representing the subsurface evolution of the excavation-stage flow-field center during vertical and oblique impacts.
Author
Craters; Trajectory Analysis

20030080020 Academy of Sciences (USSR), Moscow, USSR
Oblique Impact and Its Ejecta: Numerical Modeling
Artemieva, N.; Pierazzo, E.; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

The trajectories of discrete particles in the atmosphere should be defined by a two-phases hydrodynamics that includes the interaction of the particles with the post-impact gas flow. Various processes influence the size and shape of individual particles. The approach of representative tracer particles is used to avoid limitations due to computer capacity. A simplified treatment models material disruption when the material is subject to tension. The hydrodynamic cell velocity defines the initial particle velocity, and the particle's initial position within the cell is randomly defined. An empirical size distribution for solid particles is adopted from experimental studies of high-energy chemical explosions, where particle sizes range from 1 mkm to 10 cm. The diameter of molten particles ranges from 1 to 3 cm, while particle size drops to 0.01 cm when produced by condensation from a two-phase mixture. In our study, solid, modestly shocked material (6-7% of the projectile mass) is ejected to velocities >5 km/s from a thin surface layer (approx. 1/10 of the projectile diameter), where the peak shock pressure is distinctly limited to about 9 to 45 GPa. This pressure range is essentially confirmed by the observations. Thus, recent

hypotheses that Martian rocks can reach the Earth without being intensely shocked and heated are incorrect or at least questionable.
Derived from text
Ejecta; Trajectories

20030080021 California Univ., Santa Cruz, CA, USA
Formation of Impact Craters on Comets and Asteroids: How Little is Known
Asphaug, Erik; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Impact phenomena shaped our solar system. From the accretion of planetesimals 4.6 billion years ago to the spallation of meteorites from their parent bodies, this process has left no bit of matter untouched. The study of impact craters on small bodies therefore provides a foundation for understanding accretion and the delivery of meteorites - topics central to the origin of planets. Moreover, geologic-scale impact craters forming in low gravity reveal details of the cratering process that are hidden on high-gravity worlds like the Earth and Moon.
Derived from text
Cratering; Comets; Asteroids

20030080022 Arizona Univ., Tucson, AZ, USA
Modeling Complex Crater Collapse
Collins, G. S.; Turtle, E. P.; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Impact crater collapse is the gravitationally driven modification of the cavity generated during the early stages of an impact event. It is the last major stage in the formation of an impact crater and has the most profound influence on the final morphology of the crater. The aim of this paper is to summarize the robust conclusions drawn from modeling crater collapse and highlight the questions that remain unanswered, particularly those that will require the collaboration of modelers and observers to answer.
Derived from text
Meteorite Craters; Gravitational Collapse; Mathematical Models; Tectonics

20030080023 Arizona Univ., Tucson, AZ, USA
Numerical Simulations of Silverpit Crater Collapse: A Comparison of Tekton and SALES 2
Collins, G. S.; Turtle, E. P.; Melosh, H. J.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

SALES 2 and Tekton are two numerical tools that have been used to simulate complex crater collapse. SALES 2 is a hydrocode capable of modeling the dynamic collapse of large impact craters. It has been successfully applied to the problem of central peak and peak-ring formation. Tekton is a finite-element code designed to be applied to a wide range of tectonic problems, where displacements are relatively small and the dynamics are less important. It has been used extensively to simulate the relaxation of large craters and the formation of exterior rings in multi-ring basins. Here we apply both techniques to the collapse of the Silverpit crater, to compare and contrast their capabilities.
Author
Tectonics; Mathematical Models; Meteorite Craters; Computerized Simulation; Gravitational Collapse

20030080024 Los Alamos National Lab., NM, USA
Two-and Three-Dimensional Simulations of Asteroid Ocean Impacts
Gisler, G.; Weaver, R. P.; Mader, C. L.; Gittings, M. L.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

We have performed a series of two-dimensional and three-dimensional simulations of asteroid impacts into an Ocean using the SAGE code from Los Alamos National Laboratory and Science Applications International Corporation. The SAGE code is a compressible Eulerian hydrodynamics code using continuous adaptive mesh refinement for following discontinuities

with a fine grid while treating the bulk of the simulation more coarsely. We have used tabular equations of state for the atmosphere, water, the oceanic crust, and the mantle. In two dimensions, we simulated asteroid impactors moving at 20 km/s vertically through an exponential atmosphere into a 5 km deep ocean. The impactors were composed of mantle material (3.32 g/cc) or iron (7.8 g/cc) with diameters from 250m to 10 km. In our three-dimensional runs we simulated asteroids of 1 km diameter composed of iron moving at 20 km/s at angles of 45 and 60 degrees from the vertical. All impacts, including the oblique ones, produce large underwater cavities with nearly vertical walls followed by a collapse starting from the bottom and subsequent vertical jetting. The initial asymmetry of the oblique-impact transient crater does not persist beyond the first two minutes. Substantial amounts of water are vaporized and lofted high into the atmosphere. In all cases we investigated, the waves are extremely dissipative, compared to other types of tsunamis or other waves on water. The reason for this is that the perturbation giving rise to the waves, namely the impact of the asteroid and the immediate vaporization of the water along the path of entry, is hypersonic and a complex system of shocks is initiated in the water, the air, and the ocean floor basalt. The interaction of these shocks with each other and with the bounding surfaces (the air-water interface and the water-crust interface) keeps perturbing the waves that are generated so that the motion becomes, and remains, highly turbulent.
Derived from text
Asteroids; Impact Velocity; Oceans

20030080025 Geological Survey, Menlo Park, CA, USA
Antipodal Hotspots on Earth: Are Major Deep-Ocean Impacts the Cause?
Hagstrum, J. T.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Hotspot volcanism on Earth is restricted to relatively small areas, on the order of 100 km in diameter, and is generally believed to result from narrow upwellings of hot mantle material called 'plumes'. At first glance, hotspots appear randomly distributed. General associations with geoid highs and divergent plate margins have been noted, and hotspots tend to occur in provinces separated by spotless areas. Matyska investigated angular symmetries of hotspot distributions, and showed that the highest maxima were obtained with 180 deg. rotations. Rampino and Caldeira also conducted a statistical analysis of large and small data sets and found that more hotspots occur as nearly antipodal pairs than would be expected from random distributions. The rise of antipodal plumes from the core-mantle boundary through a convecting mantle seems unlikely, but axial focusing of an impact's energy by the spherical Earth might underlie the antipodal pairing of hotspots. Such a focusing mechanism has been proposed to explain seismically disrupted terrains antipodal to major impact basins on the Moon and Mercury, and to explain formation of fractured crust on Mars opposite the Hellas basin-perhaps later exploited as a conduit for volcanism at Alba Patera. First-order problems with this model for Earth, however, include the expected low seismic efficiency of impacts and the lack of any volcanic features opposite large continental impact structures (e.g. Chicxulub).
Derived from text
Core-Mantle Boundary; Geoids; Mars Volcanoes; Ocean Bottom; Impact

20030080026 California Univ., Berkeley, CA, USA
Magnetic Fields of Lunar Impact Basins and Their Use in Constraining the Impact Process
Halekas, J. S.; Lin, R. P.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Measurements by the Magnetometer/Electron Reflectometer instrument on the Lunar Prospector spacecraft, which completed its mapping mission in 1999, have been used to construct the first completely global maps of lunar crustal magnetic fields. Now, for the first time, we have a data set with global coverage and a sensitivity and resolution which allow us to investigate the magnetic fields of lunar impact basins and craters. As on the Earth, impact sites have a variety of magnetic signatures associated with them, ranging from nearly complete demagnetization to strong central magnetic anomalies. Observations of the magnetic fields of terrestrial basins have been used to make inferences about the impact process, and we wish to show that lunar observations can also provide valuable constraints.
Derived from text
Geomagnetism; Magnetic Fields; Structural Basins; Lunar Crust; Lunar Prospector; Impact Damage

20030080027 Washington Univ., Saint Louis, MO, USA
Thicknesses of and Primary Ejecta Fractions in Basin Ejecta Deposits
Haskin, Larry A.; McKinnon, William B.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993
Contract(s)/Grant(s): NAG5-10458; No Copyright; Avail: CASI; A01, Hardcopy

We have developed a model for production of basin ejecta deposits to address provenances of materials collected at the Apollo and Luna landing sites and for consideration in interpreting remote sensing data.
Derived from text
Thickness; Ejecta; Deposits; Mathematical Models

20030080028 Lunar and Planetary Inst., Houston, TX, USA
Constraints on the Impact Process from Observations of Oblique Impacts on the Terrestrial Planets
Herrick, R. R.; Hessen, K.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Recently there have been significant advances in both experimental and numerical modeling techniques that hold promise for providing details on how the cratering process is affected by impact at a nonvertical angle. Anectdotal observations of craters on the terrestrial planets validated initial experimental efforts. Recent and ongoing systematic characterizations of craters reslting from oblique impact on the Moon, Mars, and Venus provide important constraints for the detailed modeling efforts currently being conducted.
Derived from text
Impact Damage; Terrestrial Planets; Mathematical Models; Experimentation

20030080029 Washington Univ., Seattle, WA, USA
What Do We Need to Know to Model Impact Processes?
Holsapple, K. A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

The computer modeling of hypervelocity impacts into planetary bodies is one of the most challenging computer tasks we attempt. The physical states encountered in impact events can begin with pressures measured in gigabars and temperatures measured in hundreds of electron-volts, and then proceed all the way down to the ordinary partial bars of pressure and few degrees of temperature as in our common experience in terrestrial soils and rocks. The interest in planetary science applications spans not only those common terrestrial soils and rocks, but also gases, ices at extreme low temperatures, and very loose, rubble-pile materials that could not even withstand the pressures of the Earth s gravity without crumbling.Since impact problems encounter the same extreme conditions as nuclear events, it is not surprising that we borrow the knowledge and tools of the national weapons laboratories for those equations of state, which they have been studying for over half a century.I will review various material property data and different models used in the community, and relate their features and failures to this overview picture.
Derived from text
Equations Of State; Impact Velocity; Cratering

20030080030 Calgary Univ., Alberta, Canada
Linking Experimental Modelling of Impact Craters to Structural Components of the Real Thing
Hildebrand, A. R.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Impact crater scaling relationships. such as for impact energy, are usually derived solely from experimental impact or explosion craters. Relating craters to a suite of possible source projectiles, and predicting what size crater a given impactor will produce in a surface of known composition, are basic requirements for reconstructing impactor populations from cratering records, comparing cratering rates derived from cratering records to those derived from observed impactor populations (known velocities), and assessing the hazard associated with a given impactor.
Author
Cratering; Impact Velocity

20030080031 Boeing Co., Seattle, WA, USA
Effects of Target Properties on the Cratering Process
Housen, K. R.; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; January 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Impact events in the solar system occur in a variety of materials, ranging from the rocky surfaces of the terrestrial planets

to the icy mantles of the satellites of the outer planets to the undoubtedly highly fractured and porous materials that make up many asteroids and comets. A major challenge to impact modelers has been to understand how the composition and mechanical properties of these varied target materials dictate the outcome of an impact event. Four sources of information have historically been used to study this problem: scaling theory, field explosion experiments, laboratory experiments, and numerical simulations.
Derived from text
Cratering; Numerical Analysis; Impact Tests; Targets

20030080032 Academy of Sciences (USSR), Moscow, USSR
Educational Experience in Numerical Modeling of Impact Cratering
Ivanov, B. A.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

The growing capability of the impact crater numerical modeling makes actual questions how to attract young students to the research and how to educate students specialized in general geology and geophysics. An experience in this direction has been accumulated in September 2002 during the ESF IMPACT Short Course 'Numerical Modeling of Impact Crater Formation'
Derived from text
Mathematical Models; Cratering; Impact

20030080033 Kiel Univ., Germany
Seismic Investigation and Numerical Modeling of the Lake Bosumtwi Impact Crater
Karp, T.; Artemieva, N. A.; Milkereit, B.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Lake Bosumtwi impact crater, Ghana, (age 1.07 Ma, diameter 10.5 km) is one of the youngest and best-preserved complex terrestrial impact structures. It was excavated from hard crystalline target rock and is the source of the Ivory Coast tektite strewn field. It is almost entirely filled by the Lake Bosumtwi.
Derived from text
Seismology; Mathematical Models; Craters; Impact; Crystallinity

20030080034 Wien Univ., Austria
Using Geochemical Observations to Constrain Projectile Types in Impact Cratering
Koeberl, Christian; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 2 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Breccias and melt rocks found at possible meteorite impact structures on Earth may contain a minor extraterrestrial component. In the absence of evidence of shock metamorphic effects in such rocks, the unambiguous detection of an extraterrestrial component can be of diagnostic value regarding the impact origin of a geological structure. The verification of an extraterrestrial component in impact-derived melt rocks or breccias can be of diagnostic value to provide confirming evidence for an impact origin of a geological structure. Similar approaches are of great value in the investigation of distal ejecta layers (as we are taught by the case history of the Cretaceous-Tertiary boundary).
Derived from text
Meteorite Collisions; Projectiles; Impact Melts; Cratering; Breccia

20030080035 New Mexico Univ., Albuquerque, NM, USA
Limits to the Presence of Impact-induced Hydrothermal Alteration in Small Impact Craters on the Earth: Implications for the Importance of Small Craters on Mars
Newsom, H. E.; Hagerty, J. J.; Results of the Workshop on Impact Cratering: Bridging Modeling the Gap Between Observations; January 2003; 1 pp.; In English; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Impact craters on the earth contain evidence for hydrothermal activity. An important property of small craters is the limit to the amount of energy deposited during the impact that can lead to hydrothermal activity. Hydrothermal activity is potentially important for producing alteration minerals, trapping water, and transporting mobile elements to the martian surface. Hydrothermal systems in impact craters may also be important for astrobiological investigations in terms of providing environments for organic chemical processes to occur and as near-surface locations that could be easily investigated by surface

exploration missions. Another important reason for understanding the lower limit on thermal effects for small craters is in the use of small superimposed craters as probes of larger craters during surface missions. If hydrothermal material is found associated with superimposed craters it will be important to distinguish between hydrothermal events associated with the earlier versus the later crater. In the future, comparisons of our observations with numerical models for the formation of small craters can lead to a better understanding of the role of small craters on Mars.
Derived from text
Impact; Hydrothermal Systems; Craters; Mathematical Models; Exobiology; Earth Surface

20030080036 Tokyo Univ., Japan
Sulfur Chemistry in K/T-Sized Impact Vapor Clouds
Ohno, S.; Sugita, S.; Kadono, T.; Hasegawa, S.; Igarashi, G.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

The geologic record indicates that the mass extinction at K/T boundary, 65 Myrs ago, was caused by a hypervelocity impact of an asteroid or a comet. During the K/T impact event, a large amount of sulfur was degassed from the impact site. The degassed sulfur converts to sulfuric acid aerosol and stays in the stratosphere for a long time. This reduces the sunlight significantly and leads to a mass extinction. However, if the degassed sulfur is dominated by SO3 not SO2, then the conversion to sulfuric acid aerosol occurs very rapidly and the blockage of sunlight does not last for a long time. The chemical reaction of sulfur-oxides in an impact vapor cloud, nevertheless, has not been studied in detail previously, and the SO2/SO3 ratio in a vapor cloud is yet highly uncertain. The purpose of this study is to estimate the SO2/SO3 ratio in the K/T impact vapor cloud. Here we discuss the results of calculation of chemical equilibrium and kinetics of sulfur-containing species in an impact vapor cloud as well as mass spectroscopic analysis of vapor plumes created by laser irradiation on anhydrite.
Derived from text
Sulfur Dioxides; Sulfur Oxides; Vapors; Hypervelocity Impact; Venus Clouds

20030080041 New Brunswick Univ., Fredericton, New Brunswick, Canada
Mechanisms of In Situ Rock Displacement During Hypervelocity Impact: Field and Microscopic Observations
Spray, J. G.; Results of the Workshop on Impact Cratering: Bridging the Modeling Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

The nature of rock deformation due to hypervelocity impact is discussed, especially with regard to the larger terrestrial structures (e.g., Sudbury, Vredefort, Manicouagan). Based on field observations and thin section microscopy, evidence is presented for two end-members of rock response to extreme strain rates: (1) bulk deformation, due to pervasive fracture generation and ensuing micro-displacement with melting; (2) localized large-displacement faulting, accompanied by friction melt generation (pseudotachylytes). There is no evidence for bulk fluidization at the thin section scale, except where bulk melting has occurred during impact melt sheet generation, wherein truly fluid (igneous) rocks are formed.
Derived from text
Hypervelocity Impact; Impact Melts; Microscopy; Igneous Rocks; Fracture Mechanics; Displacement; In Situ Measurement

20030080042 Tokyo Univ., Hongo, Japan
Toward a Complete Measurement of the Thermodynamic State of an Impact-induced Vapor Cloud
Sugita, Seiji; Hamano, Keiko; Kadono, Toshihiko; Schultz, Peter H.; Matsui, Takafumi; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Vaporization phenomena induced by hypervelocity impacts play an important role in the origin and evolution of Earth and other planets. There have been extensive research efforts made for understanding this process. However, the equation of state (EOS) and chemical reaction within high-pressure and high-temperature conditions of impact vapor are yet highly uncertain. This is primarily owing to the lack of experimental data on impact vapor cloud. Here we discuss newly developed spectroscopic methods to determine the thermodynamic state of impact-induced vapor very accurately.
Derived from text
Thermodynamics; Vaporizing; Hypervelocity Impact; Planetary Evolution; Spectroscopy

20030080043 Tartu Univ., Tartu, Estonia
Cooling of the Kardla Impact Crater, 1, The Mineral Parasequence Observations
Versh, E.; Joeleht, A.; Kirsimae, K.; Plado, J.; Results of the Workshop on Impact Cratering: Bridging the Gap Between

Modeling and Observations; 2003; 1 pp.; In English; Workshop on Impact Cratering; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Kinetic energy released to the target by a meteorite impact results in the heating-to-melting and vaporization of the projectile and target rocks, which then start to cool to the ambient conditions. In dry environments (e.g. Moon) the heat loss occurs mainly by conduction and radiation transfer. If the water is present at the crater site as on Earth and supposedly on Mars, then the cooling can include also convective heat transfer by hydrothermal circulation systems. Evidences of impact-induced hydrothermal activity have been found at many terrestrial craters, and it is suggested for extraterrestrial craters as well. Cooling and development of such impact-induced hydrothermal system can be recognized by the means of (1) mineralogical fluid inclusion studies, and (2) by impact and geothermal modeling. In this and following paper (see J&leht et al., in this volume) we report a complex geological observation and modeling study of pat-impact cooling of a medium-to-small scale impact crater of Kardla, Hiiumaa Island, Estonia. The Kardla crater is 4 km in diameter and approximately 540 m deep with a central uplift exceeding 100 m height above crater floor. It formed in a shallow (less than 100 m deep) epicontinental Ordovician sea approximately 455 Ma ago into a target composed of thin siliciclastic and carbonate sedimentary sequence covering crystalline basement. In this first part of our contribution we present the results of mineralogical, fluid inclusion and stable isotope studies.

Derived from text

Cooling; Kinetic Energy; Lunar Craters; Planetary Geology; Mineralogy; Hypervelocity Impact

20030080044 Wisconsin Univ., Madison, WI, USA

Impact Crater Morphology as a Guide to Regolith Structure at Taurus-Littrow

Schmitt, H. H.; Results of the Workshop on Impact Cratering: Bridging the Gap Between Modeling and Observations; 2003; 1 pp.; In English; See also 20030079993; No Copyright; Avail: CASI; A01, Hardcopy

Mapping of variables in primary crater morphology relative to crater size can be used as an initial guide to factors that will affect mining and processing of that material for lunar resources such as helium-3, hydrogen, oxygen and water. Although time did not permit the systematic mapping of craters during the Apollo 17 exploration of the Valley of Taurus Littrow, the writer was able to provide descriptions of the variety of crater morphologies present. About 3.5 b.y. ago, the Valley of Taurus-Littrow and its surroundings had been blanketed with a dark, pyroclastic mantle. Orange and black varieties of this mantle were specifically sampled at Station 4, Shorty Crater as well as being a significant component of most samples of the regolith. All of the craters investigated, observed, and described are younger than the period of pyroclastic mantling. Every later impact, however, re-mobilized the fine pyroclastic material as well as the developing regolith, partially mantling all nearby younger materials.

Author

Lunar Craters; Morphology; Regolith; Valleys

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20030069000 NASA Marshall Space Flight Center, Huntsville, AL, USA

Filament Eruption without Coronal Mass Ejection

Choudhary, Debi Prasad; Moore, Ronald L.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We report characteristics of quiescent filament eruptions that did not produce coronal mass ejections (CMEs). We examined 12 quiescent filament eruptions, each of which was located far from disk center (greater than or equal to 0.7 R (sub sun)) in diffuse remnant magnetic fields of decayed active regions, was well observed in full-disk movies in H alpha and Fe XII, and had good coronagraph coverage. Of the 12 eruptions, 7 produced CMEs and 5 did not. Even though the two kinds of eruption were indistinguishable in their magnetic setting and in the eruptive motion of the filament in the H alpha movies, each of the CME-producing eruptions produced a two-ribbon flare in H alpha and a flare arcade in Fe XII, and each of the non-CME-producing eruptions did not. From this result, and the appearance of the eruptive motion in the Fe XII movies, we conclude that the non-CME-producing filament eruptions are confined eruptions like the confined filament eruptions in active regions. We take the similarity of the confined and eruptive quiescent filament eruptions with their active-region counterparts to favor runaway tether-cutting reconnection for unleashing the magnetic explosion in all these eruptions.

Author

Coronal Mass Ejection; Sun; Solar Prominences; Aerospace Sciences

20030071103 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Seismic Study of The Solar Interior: Inferences from SOI/MDI Observations during Solar Activity
Korzennik, Sylvain G.; May 2003; 4 pp.; In English
Contract(s)/Grant(s): NAG5-9819
Report No.(s): Rept-3; No Copyright; Avail: CASI; A01, Hardcopy

The principal investigator describes several types of solar research conducted during the reporting period and gives a statement of work to be performed in the following year. Research conducted during the reporting period includes: exhaustive analysis of observational and instrumental effects that might cause systematic errors in the characterization of high-degree p-modes; study of the structure, asphericity and dynamics of the solar interior from p-mode frequencies and frequency splittings; characterizing the solar rotation; Time-Distance inversion; and developing and using a new peak-fitting method for very long MDI time series at low degrees.
CASI
Solar Interior; Helioseismology; Solar Rotation; Asphericity

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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*.

20030068984 NASA Marshall Space Flight Center, Huntsville, AL, USA
ATIC Experiment: Elemental Spectra from the Flight in 2000
Ahn, H. S.; Adams, J. H.; Bashindzhagyan, G.; Batkov, K. E.; Chang, J.; Christl, M.; Fazely, A. R.; Ganel, O.; Gunasingha, R. M.; Guzik, T. G., et al.; [2003]; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: Other Sources; Abstract Only

The Advanced Thin Ionization Calorimeter (ATIC) had successful Long Duration Balloon flights from McMurdo, Antarctica in both 2000 and 2002. The instrument consists of a silicon matrix charge detector, a 0.75 nuclear interaction length graphite target, 3 scintillator strip hodoscopes, and an 18 radiation length thick BGO calorimeter to measure the cosmic ray composition and energy spectra from approximately 30 GeV to near 100 TeV. In this paper, we present preliminary results from the first flight, which was a test flight that lasted for 16 days, starting on 12/28/00.
Author
Balloon Flight; Calorimeters; Energy Spectra; Ionization; Balloon-Borne Instruments

20030068994 NASA Marshall Space Flight Center, Huntsville, AL, USA
Comparison of Measured and Simulated Albedo Signals in the ATIC Experiment
Zatsepin, V. I.; Adams, J. H.; Ahn, H. S.; Bashindzhagyan, G. L.; Batkov, K. E.; Chang, J.; Christl, M.; Fazely, A. R.; Ganel, O.; Gunasingha, R. M., et al.; [2003]; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; No Copyright; Avail: Other Sources; Abstract Only

Albedo, radiation backscattered from an interaction and from the subsequent shower development, provides a 'background' for calorimeter experiments. In ATIC (Advanced Thin Ionization Calorimeter), a balloon borne instrument to measure cosmic ray composition and energy spectra for elements from hydrogen to iron from 30 GeV to near 100 TeV, a fully active BGO calorimeter follows a carbon interaction target and scintillator holdoscopes. The first detector is a silicon matrix constructed of 4480 individual silicon pixels, each 2 cm x 1.5 cm, that provide a measurement of the charge of the primary particle in the presence of albedo. ATIC had two successful balloon flights in Antarctica: from 28 Dec 2000 to 13 Jan 2001 (ATIC-1) and from 29 Dec 2002 to 18 Jan 2003 (ATIC-2). A comparison of albedo signals in the silicon matri:x in ATIC-1 experiment with simulations performed using the GEANT 3.21 code and the QGSM event generator for nucleus-nucleus interactions is presented.
Author
Albedo; Calorimeters; Ionization; Simulation; Balloon-Borne Instruments; Cosmic Rays

20030069005 NASA Marshall Space Flight Center, Huntsville, AL, USA
Rigidity Spectra of Protons and Helium as Measured in the First Flight of the ATIC Experiment
Zatsepin, V. I.; Adams, J. H.; Ahn, H. S.; Bashindzhagyan, G. L.; Batkov, K. E.; Chang, J.; Christl, M.; Fazely, A. R.; Ganel, O.; Gunasingha, R. M., et al.; [2003]; 1 pp.; In English; The 28th International Cosmic Ray Conference, 31 Jul.-7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: Other Sources; Abstract Only

ATIC (Advanced Thin Ionization Calorimeter) is a balloon borne experiment designed to measure cosmic ray composition for elements from hydrogen to iron and their energy spectra from 30 GeV to near 100 TeV. It is comprised of a fully active BGO calorimeter, a carbon interaction target, scintillator hodoscopes, and a silicon matrix that is used as a charge detector in the experiment. ATIC had two successful balloon flights in Antarctica: from 28 Dec 2000 to 13 Jan 2001 (ATIC-1) and from 29 Dec 2002 to 18 Jan 2003 (ATIC-2). Preliminary rigidity spectra of protons and helium nuclei and their ratio are presented for the test flight (ATIC-1). Particular attention is given to problems associated with measuring energy.
Author
Energy Spectra; Helium; Protons; Balloon-Borne Instruments; Rigidity; Balloon Flight; Calorimeters

20030071262 NASA Marshall Space Flight Center, Huntsville, AL, USA
Depth Distribution Of The Maxima Of Extensive Air Shower
Adams, J. H.; Howell, L. W.; May 1, 2003; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: Other Sources; Abstract Only

Observations of the extensive air showers from space can be free from interference by low altitude clouds and aerosols if the showers develop at a sufficiently high altitude. In this paper we explore the altitude distribution of shower maxima to determine the fraction of all showers that will reach their maxima at sufficient altitudes to avoid interference from these lower atmosphere phenomena. Typically the aerosols are confined within a planetary boundary layer that extends from only 2-3 km above the Earth's surface. Cloud top altitudes extend above 15 km but most are below 4 km. The results reported here show that more than 75% of the showers that will be observed by EUSO have maxima above the planetary boundary layer. The results also show that more than 50% of the showers that occur on cloudy days have their maxima above the cloud tops.
Author
Cosmic Ray Showers; Vertical Distribution

20030071623 NASA Marshall Space Flight Center, Huntsville, AL, USA
Accelerator Tests of the KLEM Prototypes
Bashindzhagyan, G.; Adams, J. H.; Bashindzhagyan, P.; Baranova, N.; Christl, M.; Chilingarian, A.; Chupin, I.; Derrickson, J.; Drury, L.; Egorov, N., et al.; [2003]; 1 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Copyright; Avail: Other Sources; Abstract Only

The Kinematic Lightweight Energy Meter (KLEM) device is planned for direct measurement of the elemental energy spectra of high-energy (10(exp 11)-10(exp 16) eV) cosmic rays. The first KLEM prototype has been tested at CERN with 180 GeV pion beam in 2001. A modified KLEM prototype will be tested in proton and heavy ion beams to give more experimental data on energy resolution and charge resolution with KLEM method. The first test results are presented and compared with simulations.
Author
Kinematics; Prototypes; Measuring Instruments; Accelerators; Energy Spectra

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20030071242 Hawaii Univ., Honolulu, HI
Development of a Semi-Autonomous Underwater Vehicle for Intervention Missions
Jun. 30, 2002; 362 pp.; In English; Original contains color illustrations
Report No.(s): AD-A415174; No Copyright; Avail: CASI; A16, Hardcopy

The primary research objective is to develop a Semi-Autonomous Underwater Vehicle for Intervention Missions (SAUVIM). Unlike the fly-by autonomous underwater vehicles (AUV), SAUVIM will have a manipulator work package. It will require an advanced control system and a precise sensory system to maintain high accuracy in station keeping and navigation.
DTIC
Autonomy; Navigation; Underwater Vehicles

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