National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

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NASA STI Program ... in Profile

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- TECHNICAL MEMORANDUM. Scientific and technical findings that are of preliminary or specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
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Introduction

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

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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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Subject Term Index

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20040053391 Pennsylvania State Univ., University Park, PA, USA
Overview of Motor Internal Flow Dynamics
Yang, Vigor; Internal Aerodynamics in Solid Rocket Propulsion; January 2004; In English; See also 20040053390; Copyright; Avail: Other Sources; Paper was not available at the time of publication

Paper not available at time of publication.

Author
Fluid Dynamics; Internal Flow; Rocket Engine Design

20040053396 Office National d'Etudes et de Recherches Aerospatiales, Paris, France
Combustion of Solid Propellants
Lengelle, G.; Duterque, J.; Trubert, J. F.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 4*1 - 4-62; In English; See also 20040053390; Original contains color illustrations; Copyright; Avail: CASI; A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A review of the understanding of the combustion mechanisms of solid propellants that the authors have built from their work and from the literature is presented. Such an understanding is an important part of the process carried out to master the behavior of solid propellants and to obtain desired characteristics (with respect to energetic level, burning rate level, sensitivity to pressure and initial temperature, nature of emitted combustion products, vulnerability to various aggressions...).

Author
Combustion Products; Solid Propellants; Combustion Temperature

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*.

20040053578 NASA Glenn Research Center, Cleveland, OH, USA
'Smoke': Characterization Of Smoke Particulate For Spacecraft Fire Detection
Urban, David L.; Mulholland, George W.; Yang, Jiann; Cleary, Thomas G.; Yuan, Zeng-Guang; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 269-272; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The 'Smoke' experiment is a flight definition investigation that seeks to increase our understanding of spacecraft fire detection through measurements of particulate size distributions of preignition smokes from typical spacecraft materials. Owing to the catastrophic risk posed by even a very small fire in a spacecraft, the design goal for spacecraft fire detection is to detect the fire as quickly as possible, preferably in the preignition phase before a real flaming fire has developed. Consequently the target smoke for detection is typically not soot (typical of established hydrocarbon fires) but instead, pyrolysis products, and recondensed polymer particles. At the same time, false alarms are extremely costly as the crew and

the ground team must respond quickly to every alarm. The U.S. Space Shuttle (STS: Space Transportation System) and the International Space Station (ISS) both use smoke detection as the primary means of fire detection. These two systems were designed in the absence of any data concerning low-gravity smoke particle (and background dust) size distributions. The STS system uses an ionization detector coupled with a sampling pump and the ISS system is a forward light scattering detector operating in the near IR. These two systems have significantly different sensitivities with the ionization detector being most sensitive (on a mass concentration basis) to smaller particulate and the light scattering detector being most sensitive to particulate that is larger than 1 micron. Since any smoke detection system has inherent size sensitivity characteristics, proper design of future smoke detection systems will require an understanding of the background and alarm particle size distributions that can be expected in a space environment.
Derived from text
Detection; False Alarms; Fires; Smoke; Warning Systems

20040055566 Army Aeromedical Research Lab., Fort Rucker, AL
Issues in Design and Safety of Helmet-Mounted Displays Results of a Rotary Wing Pilot Survey
Greig, Joanna L.; Gallagher, Siobhan; Dunkin, Shannen; Brock, Mary E.; LeDue, Patricia A.; Feb. 2004; 19 pp.; In English
Report No.(s): AD-A421376; USAARL-2004-07; No Copyright; Avail: CASI; A03, Hardcopy

An internet-based questionnaire study developed by researchers at the U.S. Army Aeromedical Research Laboratory (USAARL), Fort Rucker, Alabama, was conducted to address issues in design of the Aviator's Night Vision Imaging System Head-Up Display (ANVIS/HUD) and Optical Display Assembly (ODA) systems. Survey responses analyzed included those regarding structural and display design, as well as those addressing issues concerning flight safety. Survey participants included active duty, reserve, and National Guard, as well as Department of the Army civilian pilots, from units around the world responding to the questionnaire between January and July 2002. Data abstracted from open-ended questionnaire results were transformed into binary variables for analytical purposes. Approximately 32 percent of HUD users and 44 percent of ODA users indicated they would not use their HUD or ODA if given the choice. However, the results gathered are essential for directing further testing and evaluation of proposed modifications.
DTIC
Aircraft Safety; Flight Safety; Helmet Mounted Displays; Rotary Wings; Safety; Surveys

20040055569 Guided Systems Technologies, McDonough, GA
On-Line Trajectory Optimization for Autonomous Air Vehicles
Corban, J. Eric; Johnson, Eric N.; Calise, Anthony J.; Twigg, Shannon; Oct. 31, 2003; 61 pp.; In English
Contract(s)/Grant(s): F49620-02-C-0085
Report No.(s): AD-A421395; GST-03-4.5; AFRL-SR-AR-TR-04-0171; No Copyright; Avail: CASI; A04, Hardcopy

Successful operation of next-generation unmanned air vehicles will demand a high level of autonomy. Autonomous low-level operation in a high-threat environment dictates a need for on-hoard, robust, reliable and efficient trajectory optimization. in this report, we develop and demonstrate an innovative combination of traditional analytical and numerical solution procedures to produce efficient, robust and reliable means for nonlinear Light path optimization in the presence of time-varying obstacles and threats. The solution procedure exploits the natural time-scale separation that exists in the aircraft dynamics using singular perturbation theory. A reduced order problem involving only the kinematics of the position subspace is treated numerically. The nonlinear aircraft dynamics are to be treated analytically in phase II using a boundary layer analysis that results in an optimal feedback guidance solution. The developed algorithms were coupled with a neural network adaptive autopilot and integrated in an existing unmanned test-bed. This report documents the phase I effort, which produced a demonstration of the developed algorithm in near-real-time flight simulation, and included a simple evaluation of tracking computed trajectories on a rotary wing UAV.
DTIC
Aircraft Configurations; Autonomy; Drone Vehicles; Fixed Wings; Flight Simulation; On-Line Systems; Surveillance; Trajectories; Trajectory Optimization

20040055586 Massachusetts Univ., Amherst, MA
Course of Action Simulation, Testing, Evaluation and Revision (COASTER)
Cohen, Paul R.; Jensen, David; Atkin, Marc; Eyler-Walker, Zachary; Oates, Tim; Jan. 2004; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-C-0061; DARPA ORDER J647; Proj-CPOF
Report No.(s): AD-A421427; AFRL-IF-RS-TR-2004-17; No Copyright; Avail: CASI; A03, Hardcopy

This effort developed simulation, visualization and evaluation technology for air campaign planning. A simple war game called Capture the Flag was used to build and evaluate military Courses of Action based on the developed technology. The Capture the Flag system comprises a simulator, a control architecture, and a planner. The system provides graphical user interfaces for users to observe and participate in war games. A variety of visualizations, instrumentation, and other software support the execution and analysis of experiments. Dynamic maps were developed to visualize the results of hundreds of Monte Carlo simulation trials. This visualization technique, referred to as probabilistic dynamic mapping, relates dynamical properties of a war game to the probability of winning the game. A method for unsupervised clustering of univariate, categorical time series was also developed. This method is referred to as Bayesian Clustering by Dynamics.
DTIC
Simulation; War Games; Warfare

20040055644 Air Force Academy, CO
Aerospace Power in the Twenty-First Century: A Basic Primer
Chun, Clayton K. S.; Jul. 2001; 352 pp.; In English
Report No.(s): AD-A421723; No Copyright; Avail: CASI; A16, Hardcopy

Dr. Chun's Aerospace Power in the Twenty-First Century: A Basic Primer is a great start towards understanding the importance of aerospace power and its ability to conduct modern warfare. Aerospace power is continually changing because of new technology, threats, and air and space theories. However, many basic principles about aerospace power have stood the test of time and warfare. This book provides the reader with many of these time-tested ideas for consideration and reflection. Although Aerospace Power in the Twenty-First Century was written for future officers, individuals desiring a broad overview of aerospace power are invited to read, share, and discuss many of the ideas and thoughts presented here. Officers from other services will find that this introduction to air and space forces will give them a good grasp of aerospace power. More experienced aerospace leaders can use this book to revisit many of the issues that have affected air and space forces in the past and that might affect them in the future. Air Force officers will discover that Aerospace Power in the Twenty-First Century is a very timely and reflective resource for their professional libraries.
DTIC
Aerospace Engineering; Warfare; Educational Resources

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*.

20040051117 California Polytechnic State Univ., San Luis Obispo, CA, USA
Runway Independent Aircraft Extremely Short Takeoff and Landing
Hall, David W.; Pasman, Renee; April 1, 2004; 61 pp.; In English
Contract(s)/Grant(s): NCC2-1401; No Copyright; Avail: CASI; A04, Hardcopy

This report Summarizes the work done is support of NASA/Ames Runway Independent Aircraft Research during the summer of 2003. This work centered on the tasks laid out by the Statement of Work, which was to: Identify and assess operational scenarios including airport air and ground operations and how RIA operations would interface; 2) Identify critical technologies and create a list of technologies that might be pushed to provide a quantum jump in operating economy, reliability, and safety should sufficient finding be available; 3) Create public domain powered high lift methodologies; and 4) Identify and assess vehicle concepts that provide innovative approaches to RIA operations. All these tasks were accomplished, with certain areas needing additional exploration in future grant work. Three designs were analyzed to provide strawman configurations for the RIA operations. All three aircraft carried 60 passengers, with a stage length of 1,000 nautical miles. They were capable of operating with a balanced field length of 2000 feet or less. Three different technology approaches were explored. The first, the Model 115, was a mid-wing USB design, developed as a near-term, low risk concept. The second aircraft, the EMAX, used a directed thrust system, was a far-term, high-risk approach. The third configuration was the Model 114, whose development began in summer 2002. In addition, further research was conducted on issues related to STOL operations, such as noise concerns, SNI operations, and other areas of interest.
Author
Runways; Short Takeoff Aircraft; Aerodynamic Configurations; Aircraft Industry

20040053459 NASA Glenn Research Center, Cleveland, OH, USA

Supersonic Inlet with Pylons Set and Star-Shaped Forebody for Mixing, Combustion and Thrust Enhancement

Gilinsky, M.; Gonor, A. L.; Khaikine, V. A.; Blankson, I. M.; [2003]; 12 pp.; In English; AIAA 12th International Space Planes and Hypersonic Systems and Technologies Conference, 15-19 Dec. 2003, Norfolk, VA, USA

Contract(s)/Grant(s): NAG3-2422; NCC3-1037

Report No.(s): AIAA Paper 2003-7044; No Copyright; Avail: CASI; A03, Hardcopy

Two new approaches are discussed in this paper for application in the Scramjet inlet of an air-breathing propulsion system: 1) In the first approach, the pylon set is installed in the rectangular inlet near the cowl front edge. For a quasi-axisymmetric inlet, a similar set is installed along the Star-shaped forebody axis. This set contains 3 - 4 airfoil-shaped strips or cross-sectional rings depending on the type of inlet. The inlets: rectangular, axisymmetric or star-shaped, are located at different distances from the forebody. Fuel injection takes place through these pylons, which provides for uniform mixing downstream. The locations, sizes and angles of these pylons are very important for efficient application. Optimal values of geometrical parameters were determined from multi-parametric NSE-based numerical simulations of the laminar and turbulent external/internal flows. These simulations have shown significant benefits for mixing, combustion and thrust of the proposed approach by comparison with traditional well-known designs. Experimental tests will be conducted soon at the NASA LaRC and Institute of Mechanics at Moscow State University. Preliminary estimates are very promising.

Author

Supersonic Inlets; Pylons; Forebodies; Combustion; Mixing; Thrust Augmentation

20040055460 Army Research Lab., Aberdeen Proving Ground, MD

Failure Analysis of an AH-64 Main Rotor Damper Blade Rod End, P/N 7-211411186-5

Grendahl, Scott M.; Pepi, Marc S.; Dec. 2003; 59 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421230; ARL-TR-3100; No Copyright; Avail: CASI; A04, Hardcopy

The U.S. Army Aviation and Missile Command asked the U.S. Army Research Laboratory's Weapons and Materials Research Directorate to determine the probable cause of cracking of an AH-64 main rotor damper blade rod end, part number 7-211411186-5. The component secures an end of one of the linkages on the helicopter's main rotor. The failure was noted while the helicopter was stationed in Seckenheim, Germany, on 10 June 1998. The investigation included visual examination, scanning electron microscopy, energy dispersive spectroscopy, hardness testing, chemical analysis, and retained austenite analysis. The analysis was conducted to evaluate whether the failure was an isolated event or part of an extensive problem in the fleet.

DTIC

Ah-64 Helicopter; Crack Propagation; Failure; Failure Analysis; Rods; Rotary Wings

20040055524 CACI Technologies, Inc., Rome, NY

Battle Management Algorithms for Autonomous Unmanned Systems (BMAAUS)

Seitzer, Jennifer; Dec. 2003; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-00-D-0221; Proj-558T

Report No.(s): AD-A421313; AFRL-IF-RS-TR-2003-306; No Copyright; Avail: CASI; A03, Hardcopy

Autonomous agents are self-directed, independent entities that interact with an environment by in-taking percepts through sensing devices and by acting on the environment through effectors. This work centers on autonomous entities in an adversarial environment that operate with conflicting goals, process noisy data, adapt in real-time to a dynamic environment, and collaborate to achieve one or more collective goals. In this proposed work, the domain of application is robotic soccer. Ultimately, we expect the research to apply to work in Unmanned Air Vehicles (UAV). The work performed in this project relates to the implementation of autonomous agents.

DTIC

Algorithms; Autonomy; Drone Vehicles

20040055548 Air Force Research Lab., Wright-Patterson AFB, OH

UAV Task Assignment with Timing Constraints via Mixed-Integer Linear Programming

Schumacher, Corey; Chandler, Phillip; Pachter, Meir; Pachter, Lior; Feb. 2004; 15 pp.; In English

Report No.(s): AD-A421347; AFRL-VA-WP-TP-2004-308; No Copyright; Avail: CASI; A03, Hardcopy

The optimal timing of air-to-ground tasks is undertaken. Specifically, a scenario where multiple air vehicles are required to prosecute geographically dispersed targets is considered. The vehicles must perform multiple tasks on each target. The

targets must be found, classified, attacked, and verified as destroyed. The optimal performance of these tasks requires cooperation amongst the vehicles such that critical timing constraints are satisfied. In this paper, an optimal task assignment and timing algorithm is developed, using a mixed integer linear program, or MILP, formulation. MILP can be used to assign all tasks to the vehicles in an optimal manner, including variable arrival times, for groups of air vehicles with coupled tasks involving timing and task order constraints. When the air vehicles have sufficient endurance, the existence of a solution is guaranteed.
DTIC
Drone Vehicles; Integers; Linear Programming

20040055562 Army Research Lab., Aberdeen Proving Ground, MD
Conceptual Design, Engineering Modeling, and Experimental Validation of Air Sampling System for Chemical Sensor Insertion into the U.S. Army Research Laboratory's (ARL) Silent Operating Aerial Reconnaissance (SOAR) Program
Nair, Michael L.; Feb. 2004; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-1L162618H80
Report No.(s): AD-A421369; ARL-TR-3105; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Army Research Laboratory is interested in using a concept unmanned aerial vehicle (UAV) as a chemical weapons detection platform. This report details a preliminary effort to determine whether the UAV is capable of sustaining the needed air flow into a chemical weapons detector to ensure functionality. For this study, it was decided that a minimum volumetric flow rate of 1.4 liters/minute is required to satisfy the minimum flow requirement. Basic fluid mechanic equations are used to select the incompressible model for air flow, and then ADINA (automatic dynamic incremental nonlinear analysis) is used to create finite element analysis approximations of the flow problem. Based on the results of the computer analysis, it was decided that the best concept for acquiring the air flow is to use a small blower with an intake and exhaust orifice in the bottom of the UAV. A prototype device has been built and tested through the estimated flight profile of the UAV. It was found that this simple device leads to volumetric flow rates approximately 10 times higher than the minimum required for chemical weapons detection. Based on these results, it is possible to use this UAV as a chemical weapons detector with the induced air flow concept.
DTIC
Aerial Reconnaissance; Air Sampling; Detection; Drone Vehicles

20040055574 Institute for Scientific Research, Fairmont, WV
Implementation of High Level Architecture into the MultiUAV Research Software
Stolarik, Brian; Niland, Bill; Feb. 2004; 8 pp.; In English
Contract(s)/Grant(s): F33615-01-D-3105; Proj-2403
Report No.(s): AD-A421406; AFRL-VA-WP-TR-2004-310; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes the implementation of the Department of Defense's High Level Architecture (HLA) into the U.S. Air Force Research Laboratory's multiple unmanned aerospace vehicles research software (MultiUAV). MultiUAV allows simulations of multiple UAV's cooperating as a team to accomplish strongly coupled tasks. Since it operates in MathWorks' Simulink simulation environment, the HLA was integrated through a series of S-functions written in C++. The addition of the HLA into MultiUAV enables more realistic inter- vehicular communication modeling to include noise, latency, and data dropouts. It also enables the distribution of MultiUAV across a network of computers. Two mission scenarios were simulated both with and without the HLA. Identical behaviors in all four simulations show a successful implementation of the HLA into the MultiUAV research tool.
DTIC
Pilotless Aircraft; Computer Programs; C++ (Programming Language)

20040055620 Army Engineer Waterways Experiment Station, Vicksburg, MS
Occupational Survey Report, AFSC 2A6X4, Aircraft Fuel Systems
Vap, Scott; Aug. 12, 2003; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421556; No Copyright; Avail: CASI; A03, Hardcopy

Presentation of findings from Occupational Survey Report for AFSC 2A6X4, Aircraft Fuel Systems.
DTIC
Aircraft Fuel Systems; Armed Forces (United States); Personnel; Surveys; Tasks

20040055642 Air Force Research Lab., Wright-Patterson AFB, OH

SMI UAV Conference, London, UK (9-10 Feb 2004)

Coon, Bryan; Leahy, Michael B., Jr; Feb. 2004; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421721; AFRL-VA-WP-TM-2004-3011; AFRL-VA-WP-TM-2004-3011; No Copyright; Avail: CASI; A03, Hardcopy

The information is for a UAV conference in front of an international audience. This will be a top-level technology portfolio briefing.

DTIC

Conferences; Drone Vehicles

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics*; and *35 Instrumentation and Photography*.

20040051137 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

The Effects of NEXRAD Graphical Data Resolution and Direct Weather Viewing on Pilots' Judgments of Weather Severity and Their Willingness to Continue a Flight

Beringer, Dennis B.; Ball, Jerry D.; March 2004; 14 pp.; In English

Contract(s)/Grant(s): FAA-AM-A-03-HRR-521

Report No.(s): DOT/FAA/AM-04/5; No Copyright; Avail: CASI; A03, Hardcopy

A study was conducted to determine how variations in displayed NEXRAD weather data resolution interact with the pilot s direct view of weather. Pilots (32) were assigned to one of four groups; 8km, 4km, or 2km resolution, and a baseline condition without NEXRAD imagery. Each flew the simulator from Santa Rosa, NM, with the intent to land at Albuquerque. Heavy precipitation moved into the area during the flight, and pilots were required to decide, using both the NEXRAD data and their out-the-window view, whether to continue or to divert to an alternate airport. Pilots spent more time looking at higher-resolution images than at the lower-resolution ones. Baseline- and 2km-condition pilots deferred their decisions longer than did the other two groups. Posttest NEXRAD image judgments reinforced the notion that higher-resolution images are likely to encourage pilots to continue flights with the expectation that they can fly around or between significant weather features. The presence of out-the-window viewable weather phenomena was seen to have a significant effect on how pilots regarded the NEXRAD data.

Author

Meteorological Radar; Graphs (Charts); Pilots; Weather; Meteorological Parameters

20040052865 NASA Langley Research Center, Hampton, VA, USA

Flight Simulator Evaluation of Display Media Devices for Synthetic Vision Concepts

Arthur, J. J., III; Williams, Steven P.; Prinzel, Lawrence J., III; Kramer, Lynda J.; Bailey, Randall E.; January 2004; 12 pp.; In English; SPIE Defense and Security Symposium, 12-16 Apr. 2004, Orlando, FL, USA

Contract(s)/Grant(s): 728-60-10

Report No.(s): SPIE Paper 5442-2; No Copyright; Avail: CASI; A03, Hardcopy

The Synthetic Vision Systems (SVS) Project of the National Aeronautics and Space Administration's (NASA) Aviation Safety Program (AvSP) is striving to eliminate poor visibility as a causal factor in aircraft accidents as well as enhance operational capabilities of all aircraft. To accomplish these safety and capacity improvements, the SVS concept is designed to provide a clear view of the world around the aircraft through the display of computer-generated imagery derived from an onboard database of terrain, obstacle, and airport information. Display media devices with which to implement SVS technology that have been evaluated so far within the Project include fixed field of view head up displays and head down Primary Flight Displays with pilot-selectable field of view. A simulation experiment was conducted comparing these display devices to a fixed field of view, unlimited field of regard, full color Helmet-Mounted Display system. Subject pilots flew a visual circling maneuver in IMC at a terrain-challenged airport. The data collected for this experiment is compared to past SVS research studies.

Author

Flight Simulators; Evaluation; Display Devices; Helmet Mounted Displays; Enhanced Vision

20040052866 NASA Langley Research Center, Hampton, VA, USA

An X-Band Radar Terrain Feature Detection Method for Low-Altitude SVS Operations and Calibration Using LiDAR

Young, Steve; UijtdeHaag, Maarten; Campbell, Jacob; [2004]; 15 pp.; In English; SPIE Defense and Security Symposium, 12-16 Apr. 2004, Orlando, FL, USA

Contract(s)/Grant(s): NCC1-351; 728-60-30-01; No Copyright; Avail: CASI; A03, Hardcopy

To enable safe use of Synthetic Vision Systems at low altitudes, real-time range-to-terrain measurements may be required to ensure the integrity of terrain models stored in the system. This paper reviews and extends previous work describing the application of x-band radar to terrain model integrity monitoring. A method of terrain feature extraction and a transformation of the features to a common reference domain are proposed. Expected error distributions for the extracted features are required to establish appropriate thresholds whereby a consistency-checking function can trigger an alert. A calibration-based approach is presented that can be used to obtain these distributions. To verify the approach, NASA's DC-8 airborne science platform was used to collect data from two mapping sensors. An Airborne Laser Terrain Mapping (ALTM) sensor was installed in the cargo bay of the DC-8. After processing, the ALTM produced a reference terrain model with a vertical accuracy of less than one meter. Also installed was a commercial-off-the-shelf x-band radar in the nose radome of the DC-8. Although primarily designed to measure precipitation, the radar also provides estimates of terrain reflectivity at low altitudes. Using the ALTM data as the reference, errors in features extracted from the radar are estimated. A method to estimate errors in features extracted from the terrain model is also presented.

Author

Radar Detection; Terrain; Detection; Low Altitude; Calibrating; Operations

20040056018 NASA Langley Research Center, Hampton, VA, USA

Pathway Concepts Experiment for Head-Down Synthetic Vision Displays

Prinzel, Lawrence J., III; Arthur, Jarvis J., III; Kramer, Lynda J.; Bailey, Randall E.; [2004]; 12 pp.; In English; SPIE Defense and Security Symposium, 2004, 12-16 Apr. 2004, Orlando, FL, USA

Contract(s)/Grant(s): 23-728-60-10

Report No.(s): SPIE-5424-02; No Copyright; Avail: CASI; A03, Hardcopy

Eight 757 commercial airline captains flew 22 approaches using the Reno Sparks 16R Visual Arrival under simulated Category I conditions. Approaches were flown using a head-down synthetic vision display to evaluate four tunnel ('minimal', 'box', 'dynamic pathway', 'dynamic crow s feet') and three guidance ('ball', 'tadpole', 'follow-me aircraft') concepts and compare their efficacy to a baseline condition (i.e., no tunnel, ball guidance). The results showed that the tunnel concepts significantly improved pilot performance and situation awareness and lowered workload compared to the baseline condition. The dynamic crow s feet tunnel and follow-me aircraft guidance concepts were found to be the best candidates for future synthetic vision head-down displays. These results are discussed with implications for synthetic vision display design and future research.

Author

Aircraft Guidance; Display Devices; Enhanced Vision; Pilot Performance

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*.

20040053392 TRW, Inc., Clearfield, UT

Survey of Recent Al2O3 Droplet Size Data in Solid Rocket Chambers, Nozzles, and Plumes, Part 1

Salita, M.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004; In English; See also 20040053390; Copyright; Avail: Other Sources; Paper was not available at the time of publication

The paper discusses the following: motor stability, flow stability, droplet size in solid rocket chamber, nozzle design, and plumes.

CASI

Drop Size; Flow Stability; Nozzle Design

20040053393 California Inst. of Tech., Pasadena, CA, USA

Combustion Instabilities in Solid Propellant Rocket Motors

Culick, F. E. C.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 11-1 - A-14; In English; See also 20040053390; Original contains color illustrations

Contract(s)/Grant(s): N00014-95-I-1338; AGTSR-98-02-SR072; F49620-99-I-0118; Copyright; Avail: CASI; A09, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

These notes for two lectures are intended to provide the basic ideas for understanding and interpreting coherent oscillations is solid propellant rocket motors. The discussion is concerned mainly with the dynamics of a system consisting of two coupled sub-systems: the chamber containing combustion products; and the combustion processes con ned almost entirely to a thin region adjacent to the surface of burning propellant. Coupling between the sub-systems is always present due to the sensitivity of the combustion processes to local values of pressure and velocity. Thus the primary mechanisms for instabilities in solid rockets are related to those interactions. A second mechanism involves vortex shedding, a cause of instabilities mainly in large motors, notably the Space Shuttle and Ariene V boost motors. Following a brief review of the history of combustion instabilities in solid rockets, the mechanisms and their quantitative representations are discussed. The remainder of the lectures is devoted to an approximate analysis providing a general framework convenient for understanding, predicting and interpreting combustion instabilities.

Author

Solid Propellant Rocket Engines; Combustion Physics; Stability; Oscillations; Coherence

20040053394 Office National d'Etudes et de Recherches Aerospatiales, Paris, France

Introduction to Solid Rocket Propulsion

Kuentzmann, P.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 1-1 - 1-16; In English; See also 20040053390; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objectives of this introduction are to present the fundamentals of solid rocket motor (SRM), starting from the elementary analysis of rocket operation and then justifying the need of sophisticated computation of the internal flow. After a brief reminder of solid rocket history, a description of its main components is proposed. The elementary parameters controlling the operation are introduced and the basic formula predicting the steady-state operation pressure is established. The main issues faced by a SRM require an accurate description of internal aerodynamics, either to predict the pressure/thrust programs and the normal transient phases like ignition, or to study the motor stability. A short overview of the evolution of the codes devoted to SRM internal aerodynamics during the last thirty years is given in order to introduce the more specialized presentations; a discussion of the main limitations concerning these codes is also proposed. The prospects offered by SRM internal aerodynamics codes are finally described.

Author

Solid Propellant Rocket Engines; Thrust; Stability; Internal Flow; Pressure Chambers

20040053395 Aerospace Corp., Los Angeles, CA, USA

Flow-Structural Interaction in Solid Rocket Motors

Murdock, John W.; Johnston, William A.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 3-1 - 3-18; In English; See also 20040053390; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This article reviews and summarizes recent work on flow-structural interaction in solid motors. This interaction is important because it can lead to rocket motor failure. In the first part of the document, an idealized model of the failure mechanism is developed to illustrate in simple terms how such an event can occur. In the second part of this article recently published numerical modeling work, which models flow structural interactions in some detail, is summarized. The static test failure of the Titan solid rocket motor upgrade (SRMU) that occurred on 1 April 1991 demonstrated the importance of flow-structural modeling in the design of large solid rocket motors.

Author

Dynamic Structural Analysis; Flow Characteristics; Mathematical Models; Solid Propellant Rocket Engines

20040053397 Brigham Young Univ., Provo, UT, USA

A Summary of Aluminum Combustion

Beckstead, M. W.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 5-1 - 5-46; In English; See also 20040053390; Original contains color illustrations

Contract(s)/Grant(s): N00014-95-I-1338; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The combustion characteristics of aluminum combustion are summarized in an overview of the subject, focusing on the burning time of individual particles. The fundamental concepts that control aluminum combustion are discussed starting with a discussion of the D(sup n) law. Combustion data from over ten different sources with almost 400 datum points have been cataloged and correlated. Available models have also been used to evaluate combustion trends with key environmental parameters. The exponent is shown to be less than two, with nominal values of approx. 1.5 to 1.8 being typical. The effect of oxidizer is pronounced with oxygen being twice as effective as water and about five times more effective than carbon dioxide. The observed effect of pressure and initial temperature is minimal. In the second part of the paper a two-dimensional unsteady state kinetic-diffusion-vaporization controlled numerical model for aluminum particle combustion is presented. The model solves the conservation equations, while accounting for the species generation and destruction with a 15 reaction kinetic mechanism. Two of the major phenomena that differentiate aluminum combustion from hydrocarbon droplet combustion, namely the condensation of the aluminum oxide product and the subsequent deposition of part of the condensed oxide, are accounted for in detail with a sub-model for each phenomenon. The effect of the oxide cap in the distortion of the profiles around the particle has been included in the model. The results obtained from the model, which include two-dimensional species and temperature profiles, are analyzed and compared with experimental data. The combustion process is found to approach a diffusion controlled process for the oxidizers and conditions treated. The flame zone location and thickness is found to vary with oxidizer. The result shows that the exponent of the particle diameter dependence of burning time is not a constant and changes from about 1.2 for larger diameter particles to 1.9 for smaller diameter particles. Due to the deposition of the aluminum oxide on the particle surface, particle velocity oscillates. The effect of pressure is analyzed for a few oxidizers. Author

Aluminum; Combustion; Automatic Control; Two Dimensional Flow; Unsteady State; Diffusion; Kinetics; Mathematical Models

20040053398 Office National d'Etudes et de Recherches Aerospatiales, Toulouse, France

Motor Flow Instabilities, Part 2, Intrinsic Linear Stability of the Flow Induced by Wall Injection

Casalis, Gregoire; Vuillot, F.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 8-1 - 8-64; In English; See also 20040053390; Original contains color and black and white illustrations; Copyright; Avail: CASI; A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Thrust oscillations generally occur in large solid propellant motor during a few seconds of the flight, they exactly correspond to the frequencies of the cavity modes. The excitation of cavity modes has been reproduced in small scale solid propellant motors and also in cold gas facilities. However as extensively exposed by F. Vuillot in the present VKI lecture series, there are different possible causes of this excitation and all of them may play a role. Among them, as suggested by F. Vuillot, there is the intrinsic instability. The present course is limited to the presentation of the linear stability theory. We will show the general philosophy which is behind a so-called 'instability', the application of it for the special flow which is representative of the one in a solid propellant motor. We will also show that the present theory is very strange from a theoretical point of view, but very efficient in comparison with the available experimental results. Finally we will conclude as a 'Public Prosecutor' against the intrinsic instability modes which are suspected to be the forcing terms with respect to the emergence of the dangerous cavity modes.

Derived from text

Solid Propellant Rocket Engines; Stability; Oscillations

20040053401 Office National d'Etudes et de Recherches Aerospatiales, Paris, France

Motor Flow Instabilities, Part 1

Vuillot, F.; Casalis, G.; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 7-1 - 7-38; In English; See also 20040053390; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper will be given in two separate talks, a first one presenting the general problem and applications to actual motors and a second talk dealing more specifically with stability theory. Solid propellant rocket motor instability has been the subject of many research works for more than 40 years and valuable reviews can be found in references. First concerns were to

understand the sometimes violent instabilities that occurred during motor firings that could lead to motor failure or destruction. The combustion mechanisms were among the first to be studied since most of the energy released in the motor chamber is due to chemical reactions linked to propellant combustion. Indeed, only a very small fraction of this energy could, if directed to few instability modes, results in abnormal strains that could lead to propellant or case failure and then to motor destruction. Instability modes can be of several types and had been classified into volume modes and acoustic modes. Only the latter will be considered here since they appeared to be the most unpredictable. In such situations, the instabilities organize themselves around chamber acoustic modes and produce acoustic resonances,
EI
Solid Propellant Rocket Engines; Stability; Propellant Combustion; Acoustic Properties; Abnormalities

20040053458 NASA Glenn Research Center, Cleveland, OH, USA
Internal Designs Application for Inlet and Nozzle Aeroperformance Improvement
Gilinsky, M.; Blankson, I. M.; [2000]; 12 pp.; In English; 36th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 17-19 Jul. 2000, Huntsville, AL, USA
Contract(s)/Grant(s): NAG3-2422; NAG1-1835; NAG1-1836; NAG3-2249
Report No.(s): AIAA Paper 2000-3315; No Copyright; Avail: CASI; A03, Hardcopy

The following research results are based on development of an approach previously proposed by the authors for optimum nozzle design to obtain maximum thrust. The design was denoted a Telescope nozzle. A Telescope nozzle contains one or several internal designs of certain location, which are inserted at certain locations into a divergent conical or planar main nozzle near its exit. Such a design provides additional thrust augmentation over 20% by comparison with the optimum single nozzle of equivalent lateral area. What is more, recent experimental acoustic tests have discovered an essential noise reduction due to Telescope nozzles application. In this paper, some additional theoretical results are presented for Telescope nozzles and a similar approach is applied for aeroperformance improvement of a supersonic inlet. In addition, a classic gas dynamics problem of a similar supersonic flow into a plate has been analyzed. In some particular cases, new exact analytical solutions are obtained for a flow into a wedge with an oblique shock wave. Numerical simulations were conducted for supersonic flow into a divergent portion of a 2D or axisymmetric nozzle with several plane or conical designs as well as into a 2D or axisymmetric supersonic inlet with a forebody. The 1st order Kryko-Godunov march- ing numerical scheme for inviscid supersonic flows was used. Several cases were tested using the NASA CFL3d code based on full Navier-Stokes equations. Numerical simulation results have confirmed essential benefits of Telescope design applications in propulsion systems.
Author
Nozzle Design; Inlet Nozzles; Performance Prediction; Improvement; Design Optimization; Thrust Augmentation

20040053475 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Overview of Rocket Propulsion Testing at NASA Stennis Space Center
Rahman, S.; Gilbrech, R.; Lightfoot, R.; Dawson, M.; 10 Nov. 1999; 18 pp.; In English
Report No.(s): SE-1999-11-00024-SSC; No Copyright; Avail: CASI; A03, Hardcopy

THe recent nationwide thrust toward development of low-cost space transportation has precipitated a sharp increase in demand for subscale and full-scale propulsion test services. This paper highlights the unique capabilities of Stennis Space Center(SSC) to meet these demands, and summarizes several major propulsion test activities and other related milestone achievements during the 1999 calendar year. The current and projected list of SSC test projects heralds an even more vigorous, interesting, and challenging future in propulsion test.
Author
Full Scale Tests; Rockets; Propulsion System Performance

20040053505 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA
Soot Nanostructure And Its Impact Upon The O2 Oxidation Rate
Wal, Randy L. Vander; Tomasek, Aaron J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 41-44; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-975; No Copyright; Avail: CASI; A01, Hardcopy

Studies of soot oxidation have ranged from in situ flame studies to shock tubes to flow reactors. Each of these systems possesses particular advantages and limitations related to temperature, time and chemical environments. Despite the aforementioned differences, these soot oxidation investigations share three striking features. First and foremost is the wide variation in the rates of oxidation. Reported oxidation rates vary by factors of +6 to - 20 relative to the Nagle

Strickland-Constable (NSC) rate for graphite oxidation [3]. Rate variations are not surprising, as the temperatures, residence times, types of oxidants and methods of oxidation differ from study to study. Nevertheless, a valid explanation for rate differences of this magnitude has yet to be presented.
Author
Soot; Oxidation; Flames; Nanostructure (Characteristics)

20040053530 NASA Glenn Research Center, Cleveland, OH, USA
Droplet Vaporization In A Levitating Acoustic Field
Ruff, G. A.; Liu, S.; Ciobanescu, I.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 5-8; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Combustion experiments using arrays of droplets seek to provide a link between single droplet combustion phenomena and the behavior of complex spray combustion systems. Both single droplet and droplet array studies have been conducted in microgravity to better isolate the droplet interaction phenomena and eliminate or reduce the effects of buoyancy-induced convection. In most experiments involving droplet arrays, the droplets are supported on fibers to keep them stationary and close together before the combustion event. The presence of the fiber, however, disturbs the combustion process by introducing a source of heat transfer and asymmetry into the configuration. As the number of drops in a droplet array increases, supporting the drops on fibers becomes less practical because of the cumulative effect of the fibers on the combustion process. To eliminate the effect of the fiber, several researchers have conducted microgravity experiments using unsupported droplets. Jackson and Avedisian investigated single, unsupported drops while Nomura et al. studied droplet clouds formed by a condensation technique. The overall objective of this research is to extend the study of unsupported drops by investigating the combustion of well-characterized drop clusters in a microgravity environment. Direct experimental observations and measurements of the combustion of droplet clusters would provide unique experimental data for the verification and improvement of spray combustion models. In this work, the formation of drop clusters is precisely controlled using an acoustic levitation system so that dilute, as well as dense clusters can be created and stabilized before combustion in microgravity is begun. While the low-gravity test facility is being completed, tests have been conducted in 1-g to characterize the effect of the acoustic field on the vaporization of single and multiple droplets. This is important because in the combustion experiment, the droplets will be formed and levitated prior to ignition. Therefore, the droplets will begin to vaporize in the acoustic field thus forming the 'initial conditions' for the combustion process. Understanding droplet vaporization in the acoustic field of this levitator is a necessary step that will help to interpret the experimental results obtained in low-gravity.
Author
Drops (Liquids); Vaporizing; Acoustic Levitation; Combustion Physics; Gravitational Effects

20040053531 Virginia Univ., Charlottesville, VA, USA
Combustion Of Porous Graphite Particles In Oxygen Enriched Air
Delisle, Andrew J.; Miller, Fletcher J.; Chelliah, Harsha K.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 9-12; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-1928; No Copyright; Avail: CASI; A01, Hardcopy

Combustion of solid fuel particles has many important applications, including power generation and space propulsion systems. The current models available for describing the combustion process of these particles, especially porous solid particles, include various simplifying approximations. One of the most limiting approximations is the lumping of the physical properties of the porous fuel with the heterogeneous chemical reaction rate constants [1]. The primary objective of the present work is to develop a rigorous modeling approach that could decouple such physical and chemical effects from the global heterogeneous reaction rates. For the purpose of validating this model, experiments with porous graphite particles of varying sizes and porosity are being performed under normal and micro gravity.
Author
Combustion; Graphite; Porosity; Oxygen; Chemical Reactions; Fuels; Propulsion System Performance

20040053532 McGill Univ., Montreal, Quebec, Canada
Liquid Flame: Combustion Of Metal Suspensions In Liquid Sulfur
Goroshin, Sam; Camargo, Lorena; Lee, John; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 13-16; In English; See also 20040053504
Contract(s)/Grant(s): 9F007-5011/001/ST; No Copyright; Avail: CASI; A01, Hardcopy

Combustion of the majority of solid heterogeneous systems such as pyrotechnics or SHS is accompanied by phase change:

melting or/and vaporization of initial reactants and formation of intermediate combustion products in a liquid or gaseous state. Most of the known binary heterogeneous systems are also loose or compacted powder mixtures and are porous. Flows that are induced by volume change during phase transitions, capillary forces, and evolution of gases trapped in pores complicate the flame propagation process and the study of the high-temperature combustion chemistry. The system described in the present paper is the first observation of a non-gaseous 'uniphase' flame when the initial mixture, flame and combustion products are all in liquid state. Combustion of suspensions of iron and manganese powders in liquid sulfur does not release gases and produces products (metal sulfides) that remain liquid in the wake of the flame front. Though free from the flows induced by the phase transitions, the liquid flame fronts are strongly influenced by gravity forces. Buoyancy-driven convection in cooling combustion products and sedimentation of metal particles in the liquid sulfur matrix complicates the study of the system at normal gravity conditions. The use of very fine, micron-sized metal powders and the shallow-pool flame technique allowed the authors to provide some observations at normal gravity conditions, though the study of this unique system in a wide range of parameters is possible only under a microgravity environment.
Author
Flame Propagation; Combustion Products; Combustion Chemistry; Metal Particles; Sulfur; Liquid Metals

20040053533 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
A Two-Dimensional Instability In Deflagrations With Edges
Chen, M.; Buckmaster, J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 17-20; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

We examine the Lewis-number-greater-than-1 stability of a deflagration sitting on a porous-plug burner with an inert coflow. The flame edges generated by the coflow influence the stability, and this influence is examined. Very wide flames display the same stability characteristics as unbouded flames (flames sans edges), but for moderately wide flames the instability is suppressed. A new two-dimensional instability can occur for narrow flames, and this can occur for parameter values for which the unbounded flame is stable, There is a rage of mass fluxes for which a monotonic decrease in burner (flame) width generates a transition from unstable flames to stable flames, to unstable flames, to quenching.
Author
Stability; Deflagration; Lewis Numbers; Two Dimensional Models

20040053534 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA
Lewis-Number Effects On Edge-Flame Propagation
Nayagam, Vedha; Williams, Forman A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 21-24; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Highly strained diffusion flames experience extinction. Strain-rate variations in nonuniform flows can lead to extinctions at some locations while the diffusion flame remains intact at others, resulting in a diffusion flame with an edge. Mixing of fuel and oxidizer in the extinguished regions can lead to triple flames. At strain rates high enough for the diffusive transport zones on each side of the diffusion flame to be comparable in size with the preheat zone of the stoichiometric premixed propagating nose of the triple flame, the two premixed flames of the triple flame disappear, merging into a propagating edge of the diffusion flame. Detailed analyses of such edge flames in general necessitate considering the multidimensional, time-dependent conservation equations. Buckmaster, however, identified a one-dimensional model that simplifies the analysis greatly and reveals many properties of edge flames. The present work explores further the implications of a model of this general type, addressing especially effects of the Lewis number of the fuel. Experimental motivation for the present study stems from observations of rotating spiral edge flames in von Karman swirling flows. Slow injection of fuel through a spinning porous disk into air results under suitable conditions in flat diffusion-flame spirals, separated from the disk by a distance only on the order of 1 mm, comparable with the corresponding premixed flame preheat-zone thickness. Propagation of the edge of the spiral into the oncoming flow locally resembles edge-flame propagation. Explanation of the spiral flames thus can make use of knowledge of edge-flame propagation velocities. The spirals are observed to be different for fuels of different molecular weights, thereby suggesting that the Lewis number of the fuel plays a role. It is for this reason that the present work focuses on effects of Lewis numbers. The spiral flames are observed near extinction conditions, in that a small decrease in the flow rate of the fuel completely extinguishes the flame. A mixture fraction, defined to be unity in the fuel feed stream and zero in the air, has a small value, of order 0.1, already at the external surface of the disk. The dominant heat loss from the diffusion flame therefore occurs by conduction through the steep temperature gradient from the flame to the surface of the disk. This tends to cause oxygen leakage through the diffusion flame, even on the basis of one-step activation-energy asymptotics,

independent of detailed chemistry. Linans premixed-flame regime of the diffusion flame therefore appears to be more applicable than the diffusion-flame regime addressed by Buckmaster.
Author
Lewis Numbers; Flames; Edges; Flame Propagation; Premixed Flames; Propagation Velocity

20040053535 Northwestern Univ., Evanston, IL, USA
Flame Oscillations In Non-Premixed Systems Diffusion Flames and Edge-Flames
Matalon, Moshe; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 25-28; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-2511; No Copyright; Avail: CASI; A01, Hardcopy

Diffusive-thermal instabilities are well known features of premixed and diffusion flames. In one of its form the instability appears as spontaneous oscillations. In premixed systems oscillations are predicted to occur when the effective Lewis number, defined as the ratio of the thermal diffusivity of the mixture to the mass diffusivity of the deficient component, is sufficiently larger than one. Oscillations would therefore occur in mixtures that are deficient in the less mobile reactant, namely in lean hydrocarbon-air or rich hydrogen-air mixtures. The theoretical predictions summarized above are in general agreement with experimental results; see for example [5] where a jet configuration was used and experiments were conducted for various inert-diluted propane and methane flames burning in inert-diluted oxygen. Nitrogen, argon and SF6 were used as inert in order to produce conditions of substantially different Lewis numbers and mixture strength. In accord with the predicted trend, it was found that oscillations arise at near extinction conditions, that for oscillations to occur it suffices that one of the two Lewis numbers be sufficiently large, and that oscillations are more likely to be observed when is relatively large.
Derived from text
Flame Propagation; Oscillations; Premixed Flames; Diffusion Flames; Edges

20040053536 NASA Glenn Research Center, Cleveland, OH, USA
Flamelet Formation In Hele-Shaw Flow
Wichman, I. S.; Olson, S. L.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 29-32; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

A Hele-Shaw flow apparatus constructed at Michigan State University (MSU) produces conditions that reduce influences of buoyancy-driven flows. In addition, in the MSU Hele-Shaw apparatus it is possible to adjust the heat losses from the fuel sample (0.001 in. thick cellulose) and the flow speed of the approaching oxidizer flow (air) so that the 'flamelet regime of flame spread' is entered. In this regime various features of the flame-to-smolder (and vice versa) transition can be studied. For the relatively wide (approx. 17.5 cm) and long (approx. 20 cm) samples used, approximately ten flamelets existed at all times. The flamelet behavior was studied mechanistically and statistically. A heat transfer analysis of the dominant heat transfer mechanisms was conducted. Results indicate that radiation and conduction processes are important, and that a simple 1-D model using the Broido-Shafizadeh model for cellulose decomposition chemistry can describe aspects of the flamelet spread process. Introduction
Author
Flames; Heat Transfer; Buoyancy; Oxidizers

20040053537 NASA Glenn Research Center, Cleveland, OH, USA
Laminar Soot Processes (LSP) Experiment: Findings From Space Flight Measurements
Sunderland, P. B.; Urban, D. L.; Yuan, Z. G.; Aalburg, C.; Diez, F. J.; Faeth, G. M.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 33-36; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-2048; NAG3-2404; No Copyright; Avail: CASI; A01, Hardcopy

The present experimental study of soot processes in hydrocarbon-fueled laminar nonbuoyant and nonpremixed (diffusion) flames at microgravity within a spacecraft was motivated by the relevance of soot to the performance of power and propulsion systems, to the hazards of unwanted fires, and to the emission of combustion-generated pollutants. Soot processes in turbulent flames are of greatest practical interest, however, direct study of turbulent flames is not tractable because the unsteadiness and distortion of turbulent flames limit available residence times and spatial resolution within regions where soot processes are important. Thus, laminar diffusion flames are generally used to provide more tractable model flame systems to study processes relevant to turbulent diffusion flames, justified by the known similarities of gas-phase processes in laminar and turbulent diffusion flames, based on the widely-accepted laminar flamelet concept of turbulent flames. Unfortunately, laminar diffusion flames at normal gravity are affected by buoyancy due to their relatively small flow velocities and, as discussed next, they do

not have the same utility for simulating the soot processes as they do for simulating the gas phase processes of turbulent flames.
Derived from text
Laminar Flow; Soot; Buoyancy; Combustion Products; Diffusion Flames; In-Flight Monitoring; Measuring Instruments; Turbulent Flames

20040053538 Delaware Univ., Newark, DE, USA
Experiments And Modeling Of Soot Formation In Laminar Premixed Flames: Detailed Particle Size Distribution Function, Effect Of Ferrocene Addition, And Role Of Ion In Soot Mass Growth
Wang, Hai; Sung, Chih-Jen; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 45-48; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The research addressed here is a collaborative project between University of Delaware and Case Western Reserve University. There are two basic and related scientific objectives. First, we wish to demonstrate the suitability of spherical, laminar, premixed flames in the study of the fundamental chemical and physical processes of soot formation. Our reasoning is that the flame standoff distance in spherical flames under microgravity can be substantially larger than that in a flat burner-stabilized flame. Therefore the spherical flame is expected to give better spatial resolution to probe the soot inception and growth chemistry than flat flames. Second, we wish to examine the feasibility of defining the laminar flame speed of soot forming flames. Our basic assumption is that under the adiabatic condition (in the absence of conductive heat loss), the amount and dynamics of soot formed in the flame is unique for a given fuel/air mixture. The laminar flame speed can be rigorously defined as long as the radiative heat loss can be determined. This laminar flame speed characterizes the characteristics of soot formation and dynamics in addition to the heat release rate. The research involves two integral parts: experiments of spherical and cylindrical sooting flames in microgravity, and the computational counterpart that aims to simulate sooting laminar flames, and the sooting limits of near adiabatic flames. During the last two years, our primary focus has been to prepare the experiments that are to be conducted in the 2.2-second Microgravity Drop Tower. The diagnostic system has been developed and tested. Several experimental and computational projects have been carried out with the aim to address issues related the overall aim of the research. These projects are (a) a computational study on the role of ions in soot mass growth, (b) the simulation of detailed particle size distribution functions of soot formed a laminar premixed flame, and (c) an experimental and computational study on the role of iron additive on soot formation. Status of the microgravity experiments and the results of the aforementioned projects will be reviewed below.
Author
Experimentation; Models; Soot; Formation; Laminar Flow; Premixed Flames; Particle Size Distribution; Ferrocenes; Ions; Distribution Functions

20040053539 NASA Glenn Research Center, Cleveland, OH, USA
Sooting Limits Of Diffusion Flames With Oxygen-Enriched Air And Diluted Fuel
Sunderland, P. B.; Urban, D. L.; Stocker, D. P.; Chao, B. H.; Axelbaum, R. L.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 49-52; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-697; NAG3-1910; NCC3-696; NAG3-1912; No Copyright; Avail: CASI; A01, Hardcopy

Oxygen-enhanced combustion permits certain benefits and flexibility that are not otherwise available in the design of practical combustors, as discussed by Baukal. The cost of pure and enriched oxygen has declined to the point that oxygen-enhanced combustion is preferable to combustion in air for many applications. Carbon sequestration is greatly facilitated by oxygen enrichment because nitrogen can be eliminated from the product stream. For example, when natural gas (or natural gas diluted with CO2) is burned in pure oxygen, the only significant products are water and CO2. Oxygen-enhanced combustion also has important implications for soot formation, as explored in this work. We propose that soot inception in nonpremixed flames requires a region where C/O ratio, temperature, and residence time are above certain critical values. Soot does not form at low temperatures, with the threshold in nonpremixed flames ranging from about 1250-1650 K, a temperature referred to here as the critical temperature for soot inception, Tc. Soot inception also can be suppressed when residence time is short (equivalently, when the strain rate in counterflow flames is high). Soot induction times of 0.8-15 ms were reported by Tesner and Shurupov for acetylene/nitrogen mixtures at 1473 K. Burner stabilized spherical microgravity flames are employed in this work for two main reasons. First, this configuration offers unrestricted control over convection direction. Second, in steady state these flames are strain-free and thus can yield intrinsic sooting limits in diffusion flames, similar to the way past work in premixed flames has provided intrinsic values of C/O ratio associated with soot inception limits.
Derived from text
Burners; Combustion; Critical Temperature; Diffusion Flames; Dilution; Soot; Oxygen; Fuels

20040053546 Nebraska Univ., Lincoln, NE, USA

Combustion Of Moving Droplets And Of Droplets Suspended Within A Convective Environment: Transient Numerical Results

Gogos, George; Pope, Daniel N.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 161-164; In English; See also 20040053504

Contract(s)/Grant(s): DAAD19-99-I-0116; NCCS-572; NCC3-572; No Copyright; Avail: CASI; A01, Hardcopy

The problem considered is that of a single-component liquid fuel (n-heptane) droplet undergoing evaporation and combustion in a hot, convective, low pressure, zero-gravity environment of infinite expanse. For a moving droplet, the relative velocity (U(sub infinity)) between the droplet and freestream is subject to change due to the influence of the drag force on the droplet. For a suspended droplet, the relative velocity is kept constant. The governing equations for the gas-phase and the liquid-phase consist of the unsteady, axisymmetric equations of mass, momentum, species (gas-phase only) and energy conservation. Interfacial conservation equations are employed to couple the two phases. Variable properties are used in the gas- and liquid-phase. Multicomponent diffusion in the gas-phase is accounted for by solving the Stefan-Maxwell equations for the species diffusion velocities. A one-step overall reaction is used to model the combustion. The governing equations are discretized using the finite volume and SIMPLEC methods. A colocated grid is adopted. Hyperbolic tangent stretching functions are used to concentrate grid points near the fore and aft lines of symmetry and at the droplet surface in both the gas- and liquid-phase. The discretization equations are solved using the ADI method with the TDMA used on each line of the two alternating directions. Iterations are performed within each time-step until convergence is achieved. The grid spacing, size of the computational domain and time-step were tested to ensure that all solutions are independent of these parameters. A detailed discussion of the numerical model is given.

Author

Computational Grids; Mathematical Models; Drops (Liquids); Combustion; Evaporation; Liquid Fuels

20040053552 Iowa State Univ. of Science and Technology, Ames, IA, USA

Quenching Combustible Dust Mixtures Using Electric Particulate Suspensions (EPS): A New Testing Method For Microgravity

Colver, Gerald M.; Greene, Nathanael; Shoemaker, David; Xu, Hua; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 173-176; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-846; No Copyright; Avail: CASI; A01, Hardcopy

The Electric Particulate Suspension (EPS) is a combustion ignition system being developed at Iowa State University for evaluating quenching effects of powders in microgravity (quenching distance, ignition energy, flammability limits). Because of the high cloud uniformity possible and its simplicity, the EPS method has potential for 'benchmark' design of quenching flames that would provide NASA and the scientific community with a new fire standard. Microgravity is expected to increase suspension uniformity even further and extend combustion testing to higher concentrations (rich fuel limit) than is possible at normal gravity. Two new combustion parameters are being investigated with this new method: (1) the particle velocity distribution and (2) particle-oxidant slip velocity. Both walls and (inert) particles can be tested as quenching media. The EPS method supports combustion modeling by providing accurate measurement of flame-quenching distance as a parameter in laminar flame theory as it closely relates to characteristic flame thickness and flame structure. Because of its design simplicity, EPS is suitable for testing on the International Space Station (ISS). Laser scans showing stratification effects at 1-g have been studied for different materials, aluminum, glass, and copper. PTV/PIV and a leak hole sampling rig give particle velocity distribution with particle slip velocity evaluated using LDA. Sample quenching and ignition energy curves are given for aluminum powder. Testing is planned for the KC-135 and NASA s two second drop tower. Only 1-g ground-based data have been reported to date.

Author

Ignition Systems; Combustion Chemistry; Laminar Flow; Particle Image Velocimetry

20040053556 Drexel Univ., Philadelphia, PA, USA

Cool Flames in Propane-Oxygen Premixtures at Low and Intermediate Temperatures at Reduced-Gravity

Pearlman, Howard; Foster, Michael; Karabacak, Devrez; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 193-196; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-871; No Copyright; Avail: CASI; A01, Hardcopy

The Cool Flame Experiment aims to address the role of diffusive transport on the structure and the stability of gas-phase, non-isothermal, hydrocarbon oxidation reactions, cool flames and auto-ignition fronts in an unstirred, static reactor. These reactions cannot be studied on Earth where natural convection due to self-heating during the course of slow reaction dominates

diffusive transport and produces spatio-temporal variations in the thermal and thus species concentration profiles. On Earth, reactions with associated Rayleigh numbers (Ra) less than the critical Ra for onset of convection (Ra(sub cr) approx. 600) cannot be achieved in laboratory-scale vessels for conditions representative of nearly all low-temperature reactions. In fact, the Ra at 1g ranges from 10(exp 4) - 10(exp 5) (or larger), while at reduced-gravity, these values can be reduced two to six orders of magnitude (below Ra(sub cr)), depending on the reduced-gravity test facility. Currently, laboratory (1g) and NASA s KC-135 reduced-gravity (g) aircraft studies are being conducted in parallel with the development of a detailed chemical kinetic model that includes thermal and species diffusion. Select experiments have also been conducted at partial gravity (Martian, 0.3gearth) aboard the KC-135 aircraft. This paper discusses these preliminary results for propane-oxygen premixtures in the low to intermediate temperature range (310- 350 C) at reduced-gravity.
Derived from text
Flame Temperature; Propane; Oxygen; Mixtures; Low Temperature; Microgravity

20040053561 California Univ., Davis, CA, USA
Combustion Of Han-Based Monopropellant Droplets In Reduced Gravity
Shaw, B. D.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 109-112; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Hydroxylammonium nitrate (HAN) is a major constituent in a class of liquid monopropellants that have many attractive characteristics and which display phenomena that differ significantly from other liquid monopropellants. They are composed primarily of HAN, H2O and a fuel species. HAN-based propellants have attracted attention as liquid gun propellants, and are attractive for NASA spacecraft propulsion applications. Triethanolammonium nitrate (TEAN), methanol and glycine have been investigated as potential fuel species for HAN-based monopropellants for thruster applications. This research is focused upon studying combustion of HAN-based monopropellant droplets. The fuel species considered are TEAN, methanol and glycine, and droplets initially in the mm size range are studied at pressures up to 12 atm. Reduced gravity is employed to enable observations of fundamental combustion behaviors to be made without the complicating effects of buoyant convection. High-pressure normal gravity experiments have previously been performed as a part of this research program. The present paper will focus on more recent normal-gravity experiments as well as reduced-gravity experiments.
Derived from text
Combustion; Monopropellants; Drops (Liquids); Microgravity; Liquid Fuels

20040053563 Orbital Technologies Corp., Madison, WI, USA
Mars ISRU Co/O2 Rocket Engine Development And Testing
Rice, E. E.; Gramer, D. J.; SaintClair, C. P.; Chiaverini, M. J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 101-104; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

This article addresses the current status of a research and development effort in which ORBITEC has undertaken to test new types of ISRU-based propulsion systems for use on Mars. The Martian atmosphere (about 95.5% CO2) provides a readily available supply of carbon dioxide (CO2) to produce both CO and O2, which can be used for rocket engine applications. Hybrid propulsion systems have several safety and operational features that make them attractive for space systems. For Mars ISRU applications, CO gas can be frozen directly to form a solid fuel grain, then burned with liquid oxygen. Alternatively, both CO and O2 gas can be liquefied and burned in a liquid propellant combustion chamber. This article presents the results of a hybrid rocket test program that used storable propellants to simulate SCO/LOX combustion, as well as a discussion of future tests with a vortex combustion, liquid bipropellant CO/O2 thrust chamber.
Author
Rocket Engines; Thrust Chambers; Propulsion System Performance; Propellant Combustion; Liquid Rocket Propellants; Liquid Oxygen

20040053584 Michigan Univ., Ann Arbor, MI, USA
Laminar Soot Processes (Lsp) Experiment: Findings From Ground-Based Measurements
Kim, C. H.; El-Leathy, A. M.; Faeth, G. M.; Xu, F.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 37-40; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-1878; NAG3-2048; NAG3-2404; No Copyright; Avail: CASI; A01, Hardcopy

Processes of soot formation and oxidation must be understood in order to achieve reliable computational combustion calculations for nonpremixed (diffusion) flames involving hydrocarbon fuels. Motivated by this observation, the present

investigation extended earlier work on soot formation and oxidation in laminar jet ethylene/air and methane/oxygen premixed and acetylene-nitrogen/air diffusion flames at atmospheric pressure in this laboratory, emphasizing soot surface growth and early soot surface oxidation in laminar diffusion flames fueled with a variety of hydrocarbons at pressures in the range 0.1 - 1.0 atm.
Derived from text
Atmospheric Pressure; Combustion; Diffusion Flames; Jet Flow; Laminar Flow; Soot

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*.

20040053432 NASA Ames Research Center, Moffett Field, CA, USA
Overview of Intelligent Systems and Operations Development
Pallix, Joan; Dorais, Greg; Penix, John; [2004]; 9 pp.; In English; Joint Army Navy NASA Airforce Interagency Propulsion Committee Conference; No Copyright; Avail: CASI; A02, Hardcopy

To achieve NASA's ambitious mission objectives for the future, aircraft and spacecraft will need intelligence to take the correct action in a variety of circumstances. Vehicle intelligence can be defined as the ability to 'do the right thing' when faced with a complex decision-making situation. It will be necessary to implement integrated autonomous operations and low-level adaptive flight control technologies to direct actions that enhance the safety and success of complex missions despite component failures, degraded performance, operator errors, and environment uncertainty. This paper will describe the array of technologies required to meet these complex objectives. This includes the integration of high-level reasoning and autonomous capabilities with multiple subsystem controllers for robust performance. Future intelligent systems will use models of the system, its environment, and other intelligent agents with which it interacts. They will also require planners, reasoning engines, and adaptive controllers that can recommend or execute commands enabling the system to respond intelligently. The presentation will also address the development of highly dependable software, which is a key component to ensure the reliability of intelligent systems.
Author
Operational Problems; Flight Control; Decision Making; Computer Programming; Adaptive Control

20040055516 Michigan Univ., Ann Arbor, MI
Nonlinear Identification and Adaptive Control
Bernstein, Dennis S.; Feb. 23, 2004; 23 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0094
Report No.(s): AD-A421303; AFRL-SR-AR-TR-04-0174; No Copyright; Avail: CASI; A03, Hardcopy

To address Air Force applications, new methods are developed for system identification (ID) and adaptive control. For linear systems, ID algorithms are developed to obtain consistent parameter estimates, stable models, and optimal inputs. Nonlinear ID methods are developed for block- structured models with measured-input nonlinearities. Subspace ID methods are used to identify linear model components, while optimization methods are used to construct efficient basis functions. Specialized methods are developed to identify nonlinear systems with output nonlinearities, limit cycle dynamics, and hysteresis. Adaptive stabilization algorithms are developed for uncertain linear and nonlinear systems under full-state feedback, as well as linear systems with unknown but bounded relative degree. Extensions to discrete-time systems are addressed. Adaptive command-following algorithms are developed for spacecraft and demonstrated on an experimental testbed. Adaptive disturbance rejection algorithms are developed for tonal and broadband disturbances. Nonlinear control algorithms are developed for shape change actuation for spacecraft. Semistability theory is developed to support research in adaptive control.
DTIC
Adaptive Control; Nonlinear Systems; Nonlinearity

20040055564 Air Force Research Lab., Wright-Patterson AFB, OH
Reconfigurable Control Design for the X-40A With In-Flight Simulation Results
Oppenheimer, Michael W.; Doman, David B.; Feb. 2004; 12 pp.; In English
Report No.(s): AD-A421374; AFRL-VA-WP-TP-2004-301; AFRL-VA-WP-TP-2004-301; No Copyright; Avail: CASI; A03, Hardcopy

In order to increase survivability and maximize performance, autonomous vehicles require the development of algorithms that fulfill the role of an adaptive human pilot in response to failures, damage, or uncertain vehicle dynamics. Hence, the guidance and control algorithms implemented on autonomous vehicles must be able to react and compensate, whenever possible, for failures so that their impact can be minimized. In this work, an adaptive reconfigurable inner-loop controller is developed for a modified version of the X-40A Space Maneuvering Vehicle. The purpose of this inner loop control system is to accurately track body-frame angular velocity vector commands, while automatically reacting to and compensating for failures, damage, or uncertain vehicle dynamics.
DTIC
Adaptive Control; In-Flight Simulation; X-40a Vehicle

20040055572 Barron Associates, Inc., Charlottesville, VA
Flight Test Results of an Adaptive Guidance System for Reusable Launch Vehicles
Schierman, John D.; Gandhi, Neha; Hull, Jason R.; Ward, David G.; Feb. 2004; 18 pp.; In English
Contract(s)/Grant(s): F33615-01-C-3114; Proj-3005
Report No.(s): AD-A421400; AFRL-VA-WP-TP-2004-304; No Copyright; Avail: CASI; A03, Hardcopy

To enable autonomous operations in future Reusable Launch Vehicles (RLVs), reconfigurable control and adaptive guidance will often be required to facilitate recovery of the mission following a major anomalous event such as an effector failure. An adaptive guidance system that works in conjunction with a reconfigurable controller and an autonomous trajectory command reshaping algorithm is presented. The guidance law utilizes a backstepping architecture to generate pitch rate commands that drive the inner-loop control system. Under extreme failure conditions the control surfaces can saturate in an attempt to meet commanded moments. In these cases, the guidance feedback gains are reduced to preserve stability margins in the guidance loops. A case study is presented that shows the benefits of the guidance gain adaptation. Without adjusting the gains, the guidance loops go unstable, whereas stability is maintained with gain reduction.
DTIC
Adaptive Control; Autonomous Navigation; Flight Tests; Launch Vehicles; Reusable Launch Vehicles

20040055604 Air Force Research Lab., Wright-Patterson AFB, OH
A New Control Allocation Method That Accounts for Effector Dynamics
Venkataraman, Ram; Oppenheimer, Michael; Doman, David; Feb. 2004; 8 pp.; In English
Report No.(s): AD-A421502; AFRL-VA-WP-TP-2004-307; AFRL-VA-WP-TP-2004-307; No Copyright; Avail: CASI; A02, Hardcopy

Given a time history of desired moments, the confrol allocation problem is to solve for the effector inputs so that some norm of the error between the achieved and desired moments is minimized. Existing methods solve for the actuator deflections, while accounting for Magnitude and rate limitations of the effectors. In this paper, we propose the Dynamic Control Allocation (DCA) method, that also accounts for effector dynamics, in addition to magnitude and rate limits. We show through numerical experiments that the DCA method allocates the desired moments according to effector bandwidths - that is the slow effectors are allocated the lower frequencies in the desired moments. The numerical simulations also show that the DCA outperforms the existing simplex algorithm based LP method, that does not account for actuator dynamics.
DTIC
Control Equipment; Flight Control

20040055605 Air Force Research Lab., Wright-Patterson AFB, OH
Model Predictive Dynamic Control Allocation with Actuator Dynamics
Luo, Yu; Serrani, Andrea; Yurkovich, Stephen; Doman, David B.; Oppenheimer, Michael W.; Oct. 2003; 16 pp.; In English
Report No.(s): AD-A421503; AFRL-VA-WP-TP-2003-346; No Copyright; Avail: CASI; A03, Hardcopy

A model predictive, dynamic control allocation algorithm is developed in this paper for the inner loop of re- entry vehicle guidance and control system. The purpose of the control allocation portion of the guidance and control architecture is to distribute control power among redundant control effectors to meet the desired control objectives under a set of constraints. Most existing algorithms neglect the actuator dynamics or deal with the actuator dynamics separately, thereby assunung a static relationship between actuator outputs (in our case, control surface deflections) and plant inputs (i.e., moments about the three body axis). In this paper, we propose a dynamic control allocation scheme based on Model-based Predictive Control

(MPC) that directly takes into account actuators with nonnegligible dynamics and hard constraints.
DTIC
Actuators; Dynamic Control; Flight Control; Predictions

20040055621 Army Engineer Waterways Experiment Station, Vicksburg, MS
Occupational Survey Report, AFSC 2A3X1, A-10/F- 15/U-2 Avonics Systems
Burright, Burke; Jul. 10, 2003; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421559; No Copyright; Avail: CASI; A03, Hardcopy

Presentation of findings from Occupational Survey Report for AFSC 2A3X1, A-10, F-15 and U-2 avionics systems.
DTIC
Armed Forces (United States); Personnel; Surveys; Tasks

20040056017 NASA Langley Research Center, Hampton, VA, USA
Pathway Design Effects on Synthetic Vision Head-Up Displays
Kramer, Lynda J.; Prinzel, Lawrence J., III; Arthur, Jarvis J., III; Bailey, Randall E.; [2004]; 12 pp.; In English; SPIE Defense and Security Symposium, 12-16 Apr. 2004, Orlando, FL, USA
Contract(s)/Grant(s): 728-60-10
Report No.(s): SPIE Paper 5425-08; No Copyright; Avail: CASI; A03, Hardcopy

NASA s Synthetic Vision Systems (SVS) project is developing technologies with practical applications that will eliminate low visibility conditions as a causal factor to civil aircraft accidents while replicating the operational benefits of clear day flight operations, regardless of the actual outside visibility condition. A major thrust of the SVS project involves the development/demonstration of affordable, certifiable display configurations that provide intuitive out-the-window terrain and obstacle information with advanced pathway guidance for transport aircraft. This experiment evaluated the influence of different tunnel and guidance concepts upon pilot situation awareness (SA), mental workload, and flight path tracking performance for Synthetic Vision display concepts using a Head-Up Display (HUD). Two tunnel formats (dynamic, minimal) were evaluated against a baseline condition (no tunnel) during simulated IMC approaches to Reno-Tahoe International airport. Two guidance cues (tadpole, follow-me aircraft) were also evaluated to assess their influence on the tunnel formats. Results indicated that the presence of a tunnel on an SVS HUD had no effect on flight path performance but that it did have significant effects on pilot SA and mental workload. The dynamic tunnel concept with the follow-me aircraft guidance symbol produced the lowest workload and provided the highest SA among the tunnel concepts evaluated.
Author
Display Devices; Enhanced Vision; Flight Paths; Flight Simulation; Head-Up Displays

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*.

20040055563 Aerospace Corp., El Segundo, CA
Mechanical Property Characterization of P-5Ag Silver-Filled Carbon
Chang, D. J.; Steckel, G. L.; Patel, D. N.; Dec. 20, 2003; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8802-04-C-0001
Report No.(s): AD-A421373; TR-2003(1534)-1; SMC-TR-04-09; No Copyright; Avail: CASI; A03, Hardcopy

Silver-filled carbon ring material P-5Ag, produced by Morgan AM&T, Inc., has been used in cryogenic applications. For example, it was used to fabricate carbon ring seals for the Atlas RL 10 engine. However, the mechanical properties of this material, i.e., tensile strength and modulus, shear strength and modulus, as well as fracture toughness, have not been well characterized, particularly at the liquid-nitrogen temperature. A test series was conducted to characterize both the room-temperature and the cryogenic-temperature mechanical properties for silver-filled carbon material P-5Ag. The P-5Ag carbon material was procured from Morgan AM&T, Inc. The types of tests in this series included tensile strength, tensile modulus, shear strength, shear modulus, flexure strength and modulus, mode I fracture toughness, and coefficients of thermal

expansion (CTE). However, because of the limited number of tests in each category, highly reliable engineering allowables cannot be established.
DTIC
Carbon; Cryogenics; Mechanical Properties; Silver

13
ASTRODYNAMICS

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

20040055607 Aerospace Corp., El Segundo, CA
Analysis of Mir Reentry Breakup
Stern, Richard G.; Feb. 11, 2003; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A421506; TR-2003(8506)-1; SMC-TR-04-05; No Copyright; Avail: CASI; A03, Hardcopy

This report presents an analysis of the CNN video of the Mir reentry, which was generated and supplied by Hugh Williams. The analysis determined how and when the space station's individual modules mechanically separated from each other. Also, the subsequent time and location of the aerothermal breakup (melting) of several of the modules was established. The aerothermal breakup was consistent with numerous satellite reentries studied by the author. (4 tables, 13 figures)
DTIC
Aerothermodynamics; Atmospheric Entry; Reentry Vehicles; Space Stations; Spacecraft Breakup

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

20040053451 NASA Ames Research Center, Moffett Field, CA, USA
Development and Preliminary Results of CTAS on Airline Operational Control Center Operations
Zelenka, Richard; Beatty, Roger; Engelland, Shawn; [2004]; 1 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 10-12 Aug. 1998, Boston, MA, USA
Contract(s)/Grant(s): RTOP 538-18-24; No Copyright; Avail: Other Sources; Abstract Only

Continued growth and expansion of air traffic and increased air carrier economic pressures have mandated greater flexibility and collaboration in air traffic management. The ability of airspace users to select their own routes, so called 'free-flight', and to more actively manage their fleet operations for maximum economic advantage are receiving great attention. A first step toward greater airspace user and service provider collaboration is information sharing. In this work, arrival scheduling and airspace management data generated by the NASA/FAA Center/TRACON Automation System (CTAS) and used by the FAA service provider is shared with an airline with extensive operations within the CTAS operational domain. The design and development of a specialized airline CTAS 'repeater' system is described, as well as some preliminary results of the impact and benefits of this information on the air carrier's operations. FAA controller per aircraft scheduling information, such as that provided by CTAS, has never before been shared in real-time with an airline. Expected airline benefits include improved fleet planning and arrival gate management, more informed 'hold-go decisions, and avoidance of costly aircraft diversions to alternate airports when faced with uncertain airborne arrival delays.
Author
Air Traffic Control; Airline Operations; Automatic Control; Real Time Operation; Scheduling

20040055369 Lockheed Martin Space Systems Co., Huntsville, AL, USA
Secure Payload Access to the International Space Station
Pitts, R. Lee; Reid, Chris; [2002]; 24 pp.; In English; AIAA Space Ops 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: CASI; A03, Hardcopy

The ISS finally reached an operational state and exists for local and remote users. Onboard payload systems are managed by the Huntsville Operations Support Center (HOSC). Users access HOSC systems by internet protocols in support of daily

operations, preflight simulation, and test. In support of this diverse user community, a modem security architecture has been implemented. The architecture has evolved over time from an isolated but open system to a system which supports local and remote access to the ISS over broad geographic regions. This has been accomplished through the use of an evolved security strategy, PKI, and custom design. Through this paper, descriptions of the migration process and the lessons learned are presented. This will include product decision criteria, rationale, and the use of commodity products in the end architecture. This paper will also stress the need for interoperability of various products and the effects of seemingly insignificant details. Author

International Space Station; Space Station Payloads; NASA Space Programs; Interoperability

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*.

20040053388 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Marbles for the Imagination

Shue, Jack; ASK Magazine, No. 16; February 2004, pp. 17-20; In English; See also 20040053380; No Copyright; Avail: CASI; A01, Hardcopy

The end-to-end test would verify the complex sequence of events from lander separation to landing. Due to the large distances involved and the significant delay time in sending a command and receiving verification, the lander needed to operate autonomously after it separated from the orbiter. It had to sense conditions, make decisions, and act accordingly. We were flying into a relatively unknown set of conditions-a Martian atmosphere of unknown pressure, density, and consistency to land on a surface of unknown altitude, and one which had an unknown bearing strength. In order to touch down safely on Mars the lander had to orient itself for descent and entry, modulate itself to maintain proper lift, pop a parachute, jettison its aeroshell, deploy landing legs and radar, ignite a terminal descent engine, and fly a given trajectory to the surface. Once on the surface, it would determine its orientation, raise the high-gain antenna, perform a sweep to locate Earth, and begin transmitting information. It was this complicated, autonomous sequence that the end-to-end test was to simulate.
Derived from text

Landing Radar; Parachutes; Compressive Strength; Mars Atmosphere; Touch

20040055608 Air Force Research Lab., Wright-Patterson AFB, OH

Trajectory Generation Using a Modified Simple Shooting Method

Trent, Ashley; Venkataraman, Ram; Doman, David; Feb. 2004; 9 pp.; In English

Report No.(s): AD-A421508; AFRL-VA-WP-TP-2004-306; No Copyright; Avail: CASI; A02, Hardcopy

Recently, several authors have studied the problem of trajectory redesign for hypersonic aircraft. The usual procedure for solving such problems is to set it up as a constrained optimal control problem. Lu and Schierman used direct methods to numerically solve the optimal control problems. Alternatively, one could use Pontryagin's Minimum Principle to obtain first-order necessary conditions for the optimal control problem and obtain a two-point boundary-value problem (TPBVP). Originally created to solve two-point boundary value problems (TPBVPs), the Modified Simple Shooting Method (MSSM) has been shown to be superior, both in speed and accuracy, to known methods for solving TPBVPs. Since optimal control problems can be formulated with differential equations and boundary conditions, it seems feasible to propose that the MSSM could be used to solve problems in optimal control. Here, the original MSSM algorithm was altered and used in conjunction with Pontryagin's Minimum Principle in an attempt to solve an optimal control problem in trajectory generation. In this paper, the authors consider the problem of trajectory redesign of the unpowered reentry phase for a hypersonic air vehicle. They consider outer loop equations governing the motion of the center of mass and consider the angle of attack to be the input variable. The lift and drag forces for the aircraft considered were obtained from a polynomial neural network approximation of experimental data. Effector deflections were chosen so that the aircraft Underwent trimmed flight. (6 figures, 7 refs.)
DTIC

Boundary Value Problems; Flight Control; Launch Vehicles; Reentry Vehicles; Trajectories

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*.

20040053527 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA
Oxygen and Fuel Jet Diffusion Flame Studies in Microgravity Motivated by Spacecraft Oxygen Storage Fire Safety
Sunderland, P. B.; Yuan, Z.-G.; Krishnan, S. S.; Abshire, J. M.; Gore, J. P.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 377-380; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Owing to the absence of past work involving flames similar to the Mir fire namely oxygen-enhanced, inverse gas-jet diffusion flames in microgravity the objectives of this work are as follows: 1. Observe the effects of enhanced oxygen conditions on laminar jet diffusion flames with ethane fuel. 2. Consider both earth gravity and microgravity. 3. Examine both normal and inverse flames. 4. Compare the measured flame lengths and widths with calibrated predictions of several flame shape models. This study expands on the work of Hwang and Gore which emphasized radiative emissions from oxygen-enhanced inverse flames in earth gravity, and Sunderland et al. which emphasized the shapes of normal and inverse oxygen-enhanced gas-jet diffusion flames in microgravity.
Derived from text
Diffusion Flames; Microgravity; Aerospace Safety

20040053596 Naval Research Lab., Washington, DC, USA
An Approach For Addressing Fire Safety In Reduced Gravity Environments
Kailasanath, K.; Abbud-Madrid, Angel; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 349-352; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

An interim approach for addressing safety issues with compartment fires in spacecraft could be to conduct numerical simulations. In general, to gain sufficient confidence in the results from numerical simulations, comparisons with at least limited experimental data is needed. How- ever, it would be too risky to conduct such validation experiments in space without a fairly good idea of the expected results. Therefore, an alternate approach is needed. In this alternate approach, Earth-based experiments are combined with numerical simulations and analysis of potential fire scenarios in various gravitational environments. The credibility of the numerical simulations is an important issue to be addressed in order to gain confidence in this approach. It is generally agreed that confidence in the results of simulations can be gained by the processes of .verification. and .validation.. According to the AIAA guidelines10, verification can be defined as: The process of determining that a model implementation accurately represents the developer.s conceptual description of the model and the solution to the model. Validation is defined as: The process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended uses of the model.
Author
Fire Prevention; Spacecraft

20040053602 NASA Glenn Research Center, Cleveland, OH, USA
Quantification Of Fire Signatures For Practical Spacecraft Materials
VanderWal, Randy L.; Ruff, Gary A.; Tomasek, Aaron J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 389-392; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The overall objective of this project is to measure the fire signatures of typical spacecraft materials in 1-g and determine how these signatures may be altered in a microgravity environment. During this project, we will also develop a test technique to obtain representative low-gravity signatures. The specific tasks that will be accomplished to achieve these objectives are to: (1) measure the time history of various fire signatures of typical spacecraft materials in 1-g at varying heating rates, temperatures, convective velocities, and oxygen concentrations, (2) conduct tests in the Zero-Gravity Facility at NASA John H. Glenn Research Center to investigate the manner that a microgravity environment alters the fire signature,(3) compare 0-g and 1-g time histories and determine if 0-g data exhibits the same dependence on the test parameters as experienced in 1-g (4) develop a 1-g test technique by which 0-g fire signatures can be measured. The proposed study seeks to investigate the differences in the identities and relative concentrations of the volatiles produced by pyrolyzing and/or smoldering materials between normal gravity and microgravity environments. Test materials will be representative of typical spacecraft materials

and, where possible, will be tested in appropriate geometries. Wire insulation materials of Teflon, polyimide, silicone, and PVC will be evaluated using either cylindrical samples or actual wire insulation. Other materials such as polyurethane, polyimide, melamine, and silicone-based foams will be tested using cylindrical samples, in addition to fabric materials, such as Nomex. Electrical components, such as resistors, capacitors, circuit board will also be tested.
Author
Combustion Products; Microgravity; Signature Analysis

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*.

20040051104 Communications Research Lab., Tokyo, Japan
Development of Telephone Service System
Kawasaki, Kazuyoshi; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 153-157; In English; See also 20040051097; Copyright; Avail: Other Sources

We have provided the various space environment information for users by a telephone service system. The telephone service system have been altered and enlarged from first-generation to second-generation system. As a result, the current system have improved the amount of information and usability for users.
Author
Aerospace Environments; Telephones; Information Systems; Automatic Control

20040051105 Communications Research Lab., Tokyo, Japan
Space Weather Forecast in the Future Manned Space Era
Tomita, Fumihiko; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 159-172; In English; See also 20040051097; Copyright; Avail: Other Sources

Space weather is the conditions of the Sun and in the solar wind, magnetosphere, ionosphere and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems and can endanger human and animal life or health. In 2050, everyone will be able to enjoy his/her space tour. The space weather research will transform into more and more practical science in that future manned space era.
Author
Space Weather; Manned Space Flight; Weather Forecasting; Aerospace Environments

20040051113 Communications Research Lab., Tokyo, Japan
Space Environment Information Service System
Ishibashi, Hiromitsu; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 143-151; In English; See also 20040051097; Copyright; Avail: Other Sources

CRL provides a daily space environment report via an automatic telephone information service and an Internet web server. A daily summary and forecast of solar and geomagnetic activity, proton events, and ionospheric disturbances are included in this report. A daily editing routine is done by a forecaster on duty with computer processing: a dataset of preformed sentences with selective terms registered in a dedicated computer for the system can be handled on demand and used to arrange the report. However, since this editing style has several restrictions regarding text expressions themselves, forecasters cannot always make routine reports properly. Furthermore we are planning to introduce a more sophisticated style of routine space environment forecasts, in which more multiple forecasters will cooperate together and work as a group. This means that more flexible functions that help forecasters edit more accurate and informative space environment content should be developed and implemented in the space environment information service system.
Author
Aerospace Environments; Space Weather; Information Systems; Communication Networks; Automatic Control

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*.

20040053384 NASA Langley Research Center, Hampton, VA, USA
End-to-End Commitment
Newcomb, John; ASK Magazine, No. 16; February 2004, pp. 21-24; In English; See also 20040053380; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The end-to-end test would verify the complex sequence of events from lander separation to landing. Due to the large distances involved and the significant delay time in sending a command and receiving verification, the lander needed to operate autonomously after it separated from the orbiter. It had to sense conditions, make decisions, and act accordingly. We were flying into a relatively unknown set of conditions-a Martian atmosphere of unknown pressure, density, and consistency to land on a surface of unknown altitude, and one which had an unknown bearing strength.
Derived from text
Atmospheric Pressure; Mars Atmosphere; Landing; Viking Spacecraft

20040053464 National Oceanic and Atmospheric Administration, Washington, DC, USA
Future Operational Satellites
Miller, D.; Workshop on Satellite Meteorology. Part 1: Satellite and Their Data; [1982]; 16 pp.; In English; See also 20040053463; Copyright; Avail: CASI; A03, Hardcopy

This section includes: 'User Needs and the Future of Operational Meteorological Satellites' and other materials concerning the Geosynchronous Operational Environment Satellite (GOES) as well as polar satellite products.
CASI
Meteorological Satellites; Technology Assessment; User Requirements

20040053466 NASA Marshall Space Flight Center, Huntsville, AL, USA
Meteorological Satellites and Their Data
Vaughn, W.; Workshop on Satellite Meteorology. Part 1: Satellite and Their Data; [1982]; 78 pp.; In English; See also 20040053463; Original contains black and white illustrations; Copyright; Avail: CASI; A05, Hardcopy

This paper presents an overview of the meteorological satellite programs that have been evolving from 1958 to the present and reviews plans for the future meteorological and environmental satellite systems that are scheduled to be placed into service in the early 1980's. The development of the TIROS family of weather satellites, including TIROS, ESSA, ITOS/NOAA, and the present TIROS-N (the third-generation operational system) is summarized. The contribution of the Nimbus and ATS technology satellites to the development of the operational polar-orbiting and geostationary satellites is discussed. Included are descriptions of both the TIROS-N and the DMSP payloads currently under development to assure a continued and orderly growth of these systems into the 1980's.
Author
Meteorological Satellites; Tiros Satellites; Itos Satellites; Nimbus Satellites; Dmsp Satellites

20
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*.

20040051127 Mississippi State Univ., Mississippi State, MS, USA
Testing Facility Uncertainty Analyses for RBCC Systems Testing
Hudson, Susan T.; Steele, W. Glenn; Ryan, Harry M.; Hughes, Mark S.; Hammond, J. Matt; June 19, 2002; 15 pp.; In English; 38th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 7-10 Jul. 2002, Indianapolis, IN, USA
Contract(s)/Grant(s): NAS13-98033
Report No.(s): SE-2002-06-0051-SSC; Copyright; Avail: CASI; A03, Hardcopy

The Rocket Based Combined Cycle (RBCC) engine is expected to evolve based upon past combined-cycle propulsion test experience/data and new extensive test data. Currently, it is envisioned that a portion of the component and system testing will be pursued at NASA Stennis Space Center (SSC). To realize the greatest benefit of the test data, uncertainty analyses are being performed on the relevant RBCC components and systems to be tested at NASA SSC to ascertain the needed measurement requirements. These studies pertain to the existing E-Complex test stands as well as a new facility, E-4. This paper describes the approach used in the studies and gives examples to demonstrate the approach and the usefulness of the results. Future work will greatly increase the reliability of the test data while minimizing costs by focusing expenditures in the proper areas that are critical to program success and not allowing resources to be wasted in areas that are not significant relative to overall program goals.
Author
Rocket-Based Combined-Cycle Engines; Full Scale Tests; Test Stands; Systems Engineering; Numerical Analysis

20040053529 NASA Glenn Research Center, Cleveland, OH, USA
Combustion Of Interacting Droplet Arrays In Microgravity
Dietrich, D. L.; Struk, P. M.; Ikegami, M.; Xu, G.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 1-4; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Theory and experiments involving single droplet combustion date back to 1953, with the first microgravity work appearing in 1956. The problem of a spherical droplet burning in an infinite, quiescent microgravity environment is a classical problem in combustion research with the classical solution appearing in nearly every textbook on combustion. The microgravity environment offered by ground-based facilities such as drop towers and space-based facilities is ideal for studying the problem experimentally. A recent review by Choi and Dryer shows significant advances in droplet combustion have been made by studying the problem experimentally in microgravity and comparing the results to one dimensional theoretical and numerical treatments of the problem. Studying small numbers of interacting droplets in a well-controlled geometry represents a logical step in extending single droplet investigations to more practical spray configurations. Studies of droplet interactions date back to Rex and co-workers, and were recently summarized by Annamalai and Ryan. All previous studies determined the change in the burning rate constant, k, or the flame characteristics as a result of interactions. There exists almost no information on how droplet interactions a effect extinction limits, and if the extinction limits change if the array is in the diffusive or the radiative extinction regime. Thus, this study examined experimentally the effect that droplet interactions have on the extinction process by investigating the simplest array configuration, a binary droplet array. The studies were both in normal gravity, reduced pressure ambients and microgravity facilities. The microgravity facilities were the 2.2 and 5.2 second drop towers at the NASA Glenn Research Center and the 10 second drop tower at the Japan Microgravity Center. The experimental apparatus and the data analysis techniques are discussed in detail elsewhere.
Author
Combustion; Burning Rate; Microgravity; Gravitational Effects; Drop Size; Diffusivity

20040053579 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Suppression and Structure of Low Strain Rate Nonpremixed Flames
Hamins, Anthony; Bundy, Matthew; Park, Woe Chul; Lee, Ki Yong; Logue, Jennifer; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 273-276; In English; See also 20040053504 Contract(s)/Grant(s): NASA Order C-32066-T; No Copyright; Avail: CASI; A01, Hardcopy

The agent concentration required to achieve suppression of low strain rate nonpremixed flames is an important fire safety consideration. In a microgravity environment such as a space platform, unwanted fires will likely occur in near quiescent conditions where strain rates are very low. Diffusion flames typically become more robust as the strain rate is decreased. When designing a fire suppression system for worst-case conditions, low strain rates should be considered. The objective of this study is to investigate the impact of radiative emission, flame strain, agent addition, and buoyancy on the structure and extinction of low strain rate nonpremixed flames through measurements and comparison with flame simulations. The suppression effectiveness of a suppressant (N2) added to the fuel stream of low strain rate methane-air diffusion flames was measured. Flame temperature measurements were attained in the high temperature region of the flame (T greater than 1200 K) by measurement of thin filament emission intensity. The time varying temperature was measured and simulated as the flame made the transition from normal to microgravity conditions and as the flame extinguished.
Derived from text
Temperature Measurement; Strain Rate; Microgravity; Flame Temperature; Fire Prevention

20040053601 NASA Glenn Research Center, Cleveland, OH, USA

Catalyzed Combustion In Micro-Propulsion Devices: Project Status

Sung, C. J.; Schneider, S. J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 385-388; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

In recent years, there has been a tendency toward shrinking the size of spacecraft. New classes of spacecraft called micro-spacecraft have been defined by their mass, power, and size ranges. Spacecraft in the range of 20 to 100 kg represent the class most likely to be utilized by most small sat users in the near future. There are also efforts to develop 10 to 20 kg class spacecraft for use in satellite constellations. More ambitious efforts will be to develop spacecraft less than 10 kg, in which MEMS fabrication technology is required. These new micro-spacecraft will require new micro-propulsion technology. Although micro-propulsion includes electric propulsion approaches, the focus of this proposed program is micro-chemical propulsion which requires the development of microcombustors. As combustors are scaled down, the surface to volume ratio increases. The heat release rate in the combustor scales with volume, while heat loss rate scales with surface area. Consequently, heat loss eventually dominates over heat release when the combustor size becomes smaller, thereby leading to flame quenching. The limitations imposed on chamber length and diameter has an immediate impact on the degree of miniaturization of a micro-combustor. Before micro-combustors can be realized, such a difficulty must be overcome. One viable combustion alternative is to take advantage of surface catalysis. Micro-chemical propulsion for small spacecraft can be used for primary thrust, orbit insertion, trajectory-control, and attitude control. Grouping micro-propulsion devices in arrays will allow their use for larger thrust applications. By using an array composed of hundreds or thousands of micro-thruster units, a particular configuration can be arranged to be best suited for a specific application. Moreover, different thruster sizes would provide for a range of thrust levels (from N s to mN s) within the same array. Several thrusters could be fired simultaneously for thrust levels higher than the basic units, or in a rapid sequence in order to provide gradual but steady low-g acceleration. These arrays of micro-propulsion systems would offer unprecedented flexibility and redundancy for satellite propulsion and reaction control for launch vehicles. A high-pressure bi-propellant micro-rocket engine is already being developed using MEMS technology. High pressure turbopumps and valves are to be incorporated onto the rocket chip . High pressure combustion of methane and O2 in a micro-combustor has been demonstrated without catalysis, but ignition was established with a spark. This combustor has rectangular dimensions of 1.5 mm by 8 mm (hydraulic diameter 3.9 mm) and a length of 4.5 mm and was operated at 1250 kPa with plans to operate it at 12.7 MPa. These high operating pressures enable the combustion process in these devices, but these pressures are not practical for pressure fed satellite propulsion systems. Note that the use of these propellants requires an ignition system and that the use of a spark would impose a size limitation to this micro-propulsion device because the spark unit cannot be shrunk proportionately with the thruster. Results presented in this paper consist of an experimental evaluation of the minimum catalyst temperature for initiating/supporting combustion in sub-millimeter diameter tubes. The tubes are resistively heated and reactive premixed gases are passed through the tubes. Tube temperature and inlet pressure are monitored for an indication of exothermic reactions and composition changes in the gases.

Derived from text

Combustion Chambers; Liquid Rocket Propellants; Microelectromechanical Systems; Microrocket Engines

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*.

20040053513 Colorado School of Mines, Golden, CO, USA

Effect Of Gravity On Porous Tricalcium Phosphate And Nonstoichiometric Titanium Carbide Produced Via Combustion Synthesis

Castillo, M.; Moore, J. J.; Schowengerdt, F. D.; Ayers, R. A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 61-64; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Novel processing techniques, such as self-propagating high temperature synthesis (SHS), have the capability to rapidly produce advanced porous materials that are difficult to fabricate by other methods. This processing technique is also capable of near net shape synthesis, while variable gravity allows the manipulation of the structure and composition of the material. The creation of porous tricalcium phosphate (TCP) is advantageous in the biomaterials field, since it is both a biocompatible

material and an osteoconductive material. Porous tricalcium phosphate produced via SHS is an excellent candidate for bone scaffold material in the bone regeneration process. The porosity allows for great vascularization and ingrowth of tissue. Titanium Carbide is a nonstoichiometric biocompatible material that can be incorporated into a TiC-Ti composite system using combustion synthesis. The TiC-Ti composite exhibits a wide range of mechanical and chemical properties. Both of these material systems (TCP and TiC-Ti) can be used to advantage in designing novel bone replacement materials. Gravity plays an important role in both the pore structure and the chemical uniformity of these composite systems and offers considerable potential in advanced bone engineering.
Author
Gravitational Effects; Combustion Synthesis; Titanium Carbides; Porous Materials; Phosphates

20040053519 Maryland Univ., College Park, MD, USA
Material Properties Governing Co-Current Flame Spread: The Effect of Air Entrainment
Coutin, Mickael; Rangwala, Ali S.; Torero, Jose L.; Buckley, Steven G.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 205-208; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

A study on the effects of lateral air entrainment on an upward spreading flame has been conducted. The fuel is a flat PMMA plate of constant length and thickness but variable width. Video images and surface temperatures have allowed establishing the progression of the pyrolyis front and on the flame stand-off distance. These measurements have been incorporated into a theoretical formulation to establish characteristic mass transfer numbers ('B' numbers). The mass transfer number is deemed as a material related parameter that could be used to assess the potential of a material to sustain co-current flame spread. The experimental results show that the theoretical formulation fails to describe heat exchange between the flame and the surface. The discrepancies seem to be associated to lateral air entrainment that lifts the flame off the surface and leads to an over estimation of the local mass transfer number. Particle Image Velocimetry (PIV) measurements are in the process of being acquired. These measurements are intended to provide insight on the effect of air entrainment on the flame stand-off distance. A brief description of the methodology to be followed is presented here.
Author
Air Flow; Flame Propagation; Flames; Flammability; Spacecraft Construction Materials

20040053521 California Univ., Davis, CA, USA
Electric Field Effects in Self-Propagating High-Temperature Synthesis under Microgravity Conditions
Unuvar, C.; Frederick, D. M.; Shaw, B. D.; Munir, Z. A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 313-316; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Self-propagating high-temperature synthesis (SHS) has been used to form many materials. SHS generally involves mixing reactants together (e.g., metal powders) and igniting the mixture such that a combustion (deflagration) wave passes though the mixture. The imposition of an electric field (AC or DC) across SHS reactants has been shown to have a marked effect on the dynamics of wave propagation and on the nature, composition, and homogeneity of the product . The use of an electric field with SHS has been termed 'field-assisted SHS'. Combustion wave velocities and temperatures are directly affected by the field, which is typically perpendicular to the average wave velocity. The degree of activation by the field (e.g., combustion rate) is related to the current density distribution within the sample, and is therefore related to the temperature-dependent spatial distribution of the effective electrical conductivity of reactants and products. Furthermore, the field can influence other important SHS-related phenomena including capillary flow, mass-transport in porous media, and Marangoni flows. These phenomena are influenced by gravity in conventional SHS processes (i.e., without electric fields). As a result the influence of the field on SHS under reduced gravity is expected to be different than under normal gravity. It is also known that heat loss rates from samples, which can depend significantly on gravity, can influence final products in SHS. This research program is focused on studying field-assisted SHS under reduced gravity conditions. The broad objective of this research program is to understand the role of an electric field in SHS reactions under conditions where gravity-related effects are suppressed. The research will allow increased understanding of fundamental aspects of field-assisted SHS processes as well as synthesis of materials that cannot be formed in normal gravity.
Derived from text
Electric Fields; Gravitation; High Temperature; Microgravity; Self Propagation; Materials

20040053525 Virginia Univ., Charlottesville, VA, USA

Size And Residence Time Effects Of Fine-Water Droplets In Suppressing Non-Premixed And Premixed Methane-Air Flames

Chelliah, Harsha K.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 333-336; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

On a mass basis condensed-phase fire suppressants, such as fine-water droplets, are equally as effective as some well known gaseous fire suppressants. They are known to promote fire suppression/inhibition primarily through thermal effects (because of the relative large latent heat associated with phase-change). However, full realization of thermal effects of condensed-phase agents depends heavily on the flame structure, velocity field, and the size of the condensedphase agent used. This paper reports a detailed numerical modeling effort aimed at quantifying the flow residence time and size effects by considering two widely used laboratory flow fields. The two flame configurations considered are the non-premixed counterflow flames and freely-propagating premixed flames, with fine-water droplets as the condensed-phase flame suppressant. Comparisons with previously reported experiments are also presented.

Derived from text

Drops (Liquids); Flames; Mathematical Models; Premixed Flames; Water; Spray Characteristics; Drop Size

20040053526 Auburn Univ., AL, USA

Coupled Radiation And Thermophoretic Effects In Sooting Microgravity Flames

Mackowski, D. W.; Nayagam, V.; Sunderland, P. B.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 365-368; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The objective of our research program is to investigate, both theoretically and analytically, the effects of coupled radiation emission and thermophoretic transport on the dynamics of soot particles in flames. The effect of this coupling would be familiar to anyone who has immersed a thermocouple into a sooting flame. As is well recognized, radiative cooling of the bead creates a conductive flow of heat from the gas to the bead, and the resulting temperature gradient in the gas drives a thermophoretic motion of soot particles towards the bead, leading to soot deposition onto the bead. We propose that this effect can occur among the soot particles themselves; soot is an efficient radiator of heat, and in high temperature gases the soot, via radiative emission, will create a heat sink in the gas. The temperature gradients in the gas that result from this sink will act, through thermophoresis, to 'compress' the soot particles into regions of increasing concentration. The ultimate effect of this coupling would be the accelerated growth of large soot aggregates via the scavenging of smaller particles. There is some evidence that the coupled radiation/thermophoretic (CRT) mechanism affects the dynamics of the soot fields in microgravity gaseous jet and droplet diffusion flames. Images of such flames show the formation and growth of large (visible to the eye) soot aggregates within the soot 'shell' that is formed between the flame and the source of fuel. Brownian diffusion or fluid shear mechanisms of coagulation cannot account for the formation of such particles in the time span (approx. 2:2 - 5 s) of the experiments. Aside from developing a better understanding of the processes which govern soot growth, an additional motivation for our research stems from the fact that the CRT mechanism could lead to new methods for controlling particle agglomeration, via manipulation of the radiation environment. The tasks of the research consist of 1) predicting the thermophoretic, diffusive, and radiative properties of realistic soot aggregates; 2) modelling the effects of CRT on the dynamics of the soot field; and 3) developing experimental methods in which the CRT mechanism can be identified and manipulated.

Derived from text

Flames; Microgravity; Radiation Effects; Soot; Thermophoresis; Coupling

20040053541 Notre Dame Univ., IN, USA

Mechanistic Studies Of Combustion And Structure Formation During Combustion Synthesis Of Advanced Materials: Phase Separation Mechanism For Bio-Alloys

Varma, A.; Lau, C.; Mukasyan, A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 65-68; In English; See also 20040053504

Contract(s)/Grant(s): NAG3-2133; No Copyright; Avail: CASI; A01, Hardcopy

Among all implant materials, Co-Cr-Mo alloys demonstrate perhaps the most useful balance of resistance to corrosion, fatigue and wear, along with strength and biocompatibility [1]. Currently, these widely used alloys are produced by conventional furnace technology. Owing to high melting points of the main alloy elements (e.g. Tm.p.(Co) ~1768 K), high-temperature furnaces and long process times (several hours) are required. Therefore, attempts to develop more efficient and flexible methods for production of such alloys with superior properties are of great interest. The synthesis of materials

using combustion phenomena is an advanced approach in powder metallurgy [2]. The process is characterized by unique conditions involving extremely fast heating rates (up to 10(exp 6 K/s), high temperatures (up to 3500 K), and short reaction times (on the order of seconds). As a result, combustion synthesis (CS) offers several attractive advantages over conventional metallurgical processing and alloy development technologies. The foremost is that solely the heat of chemical reaction (instead of an external source) supplies the energy for the synthesis. Also, simple equipment, rather than energy-intensive high-temperature furnaces, is sufficient. This work was devoted to experiments on CS of Co-based alloys by utilizing thermite (metal oxide-reducing metal) reactions, where phase separation subsequently produces materials with tailored compositions and properties. Owing to high reaction exothermicity, the CS process results in a significant increase of temperature (up to 3000 C), which is higher than melting points of all products. Since the products differ in density, phase separation may be a gravitydriven process: the heavy (metallic phase) settles while the light (slag) phase floats. The goal was to determine if buoyancy is indeed the major mechanism that controls phase segregation.
Author
Phase Separation (Materials); Combustion Synthesis; Chemical Reactions; Metal Oxides; Combustion Physics; Biocompatibility

20040053544 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA
Flame Synthesis Of Single-Walled Carbon Nanotubes And Nanofibers
Wal, Randy L. Vander; Berger, Gordon M.; Ticich, Thomas M.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 73-76; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Carbon nanotubes are widely sought for a variety of applications including gas storage, intercalation media, catalyst support and composite reinforcing material [1]. Each of these applications will require large scale quantities of CNTs. A second consideration is that some of these applications may require redispersal of the collected CNTs and attachment to a support structure. If the CNTs could be synthesized directly upon the support to be used in the end application, a tremendous savings in post-synthesis processing could be realized. Therein we have pursued both aerosol and supported catalyst synthesis of CNTs. Given space limitations, only the aerosol portion of the work is outlined here though results from both thrusts will be presented during the talk. Aerosol methods of SWNT, MWNT or nanofiber synthesis hold promise of large-scale production to supply the tonnage quantities these applications will require. Aerosol methods may potentially permit control of the catalyst particle size, offer continuous processing, provide highest product purity and most importantly, are scaleable. Only via economy of scale will the cost of CNTs be sufficient to realize the large-scale structural and power applications on both earth and in space. Present aerosol methods for SWNT synthesis include laser ablation of composite metalgraphite targets or thermal decomposition/pyrolysis of a sublimed or vaporized organometallic [2]. Both approaches, conducted within a high temperature furnace, have produced single-walled nanotubes (SWNTs). The former method requires sophisticated hardware and is inherently limited by the energy deposition that can be realized using pulsed laser light. The latter method, using expensive organometallics is difficult to control for SWNT synthesis given a range of gasparticle mixing conditions along variable temperature gradients; multi-walled nanotubes (MWNTs) are a far more likely end products. Both approaches require large energy expenditures and produce CNTs at prohibitive costs, around $500 per gram. Moreover these approaches do not possess demonstrated scalability. In contrast to these approaches, flame synthesis can be a very energy efficient, low-cost process [3]; a portion of the fuel serves as the heating source while the remainder serves as reactant. Moreover, flame systems are geometrically versatile as illustrated by innumerable boiler and furnace designs. Addressing scalability, flame systems are commercially used for producing megatonnage quantities of carbon black [4]. Although it presents a complex chemically reacting flow, a flame also offers many variables for control, e.g. temperature, chemical environment and residence times [5]. Despite these advantages, there are challenges to scaling flame synthesis as well.
Author
Carbon Nanotubes; Aerosols; Flames; Energy Transfer; Composite Materials

20040053545 California Univ., Berkeley, CA, USA
Microgravity Production Of Nanoparticles Of Novel Materials Using Plasma Synthesis
Dato, A. M.; Fernandez-Pello, A. C.; Frenklach, M.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 77-79; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Non-oxide materials such as diamond, SiC, SiN, and c-BN, possess a unique combination of useful mechanical, thermal, optical, and electronic properties. These materials are of interest in several industrial applications, such as high temperature load bearings or high speed metal machining. Furthermore, nanoparticulates of these materials have specific application in the

fabrication of MEMS based combustion systems, and in the development and growth of nanosystems and nano-structures of these materials. The synthesis of such materials is a great challenge, and research on chemical vapor deposition of these materials is now being carried out throughout the world at an increasing rate. Most of this research has been focused on diamond films. The principal limitation found in these studies is the short length of the reaction zone and small residence time. The best results for the formation of diamond powder were observed at low pressures, at conditions where the reaction zone was stretched. A research project is currently underway to study the formation in reduced gravity of high quality nanoparticulate of novel materials using plasma synthesis. Particular emphasis will be placed on the production of powders of non-oxide materials like diamond, SiC, SiN, and c-BN. The objective of the study is to investigate the effect of gravity on the plasma synthesis of these materials, and to determine how microgravity synthesis can improve the quality and yield of the produced nanoparticles. Microgravity conditions offer better conditions for the plasma synthesis of non-oxide materials. The controlling mechanisms of the plasma synthesis of high quality nanoparticulate could be better understood in a microgravity environment because of increased uniformity of the reaction zone and the absence of buoyancy effects on the reaction. Also, because of longer residence times and reaction uniformity, higher yields of nanoparticles at a better quality could be produced in microgravity. In the work we are presenting here, a series of ground-based tests determine the quality and yield of high quality nanoparticulate in normal gravity. Yield and quality of collected nanoparticles were analyzed by means of transmission electron microscopy. The results of these tests will be compared with novel materials produced aboard the KC-135 Parabolic Flight Aircraft in future experiments.

Author

Diamonds; Silicon Carbides; Microelectromechanical Systems; Nanostructure (Characteristics); Vapor Deposition; Gravitational Effects

20040053549 NASA Glenn Research Center, Cleveland, OH, USA

Radiant Extinction Of Gaseous Diffusion Flames

Berhan, S.; Chernovsky, M.; Atreya, A.; Baum, Howard R.; Sacksteder, Kurt R.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 85-88; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-482; No Copyright; Avail: CASI; A01, Hardcopy

The absence of buoyancy-induced flows in microgravity (mu:g) and the resulting increase in the reactant residence time significantly alters the fundamentals of many combustion processes. Substantial differences between normal gravity (ng) and :g flames have been reported in experiments on candle flames [1, 2], flame spread over solids [3, 4], droplet combustion [5,6], and others. These differences are more basic than just in the visible flame shape. Longer residence times and higher concentration of combustion products in the flame zone create a thermochemical environment that changes the flame chemistry and the heat and mass transfer processes. Processes such as flame radiation, that are often ignored in ng, become very important and sometimes even controlling. Furthermore, microgravity conditions considerably enhance flame radiation by: (i) the build-up of combustion products in the high-temperature reaction zone which increases the gas radiation, and (ii) longer residence times make conditions appropriate for substantial amounts of soot to form which is also responsible for radiative heat loss. Thus, it is anticipated that radiative heat loss may eventually extinguish the Aweak@ (low burning rate per unit flame area) :g diffusion flame. Yet, space shuttle experiments on candle flames show that in an infinite ambient atmosphere, the hemispherical candle flame in :g will burn indefinitely [1]. This may be because of the coupling between the fuel production rate and the flame via the heat-feedback mechanism for candle flames, flames over solids and fuel droplet flames. Thus, to focus only on the gas-phase phenomena leading to radiative extinction, aerodynamically stabilized gaseous diffusion flames are examined. This enables independent control of the fuel flow rate to help identify conditions under which radiative extinction occurs. Also, spherical geometry is chosen for the :g experiments and modeling because: (i) It reduces the complexity by making the problem one-dimensional. (ii) The spherical diffusion flame completely encloses the soot which is formed on the fuel rich side of the reaction zone. This increases the importance of flame radiation because now both soot and gaseous combustion products co-exist inside the high temperature spherical diffusion flame. (iii) For small fuel injection velocities, as is usually the case for a pyrolyzing solid, the diffusion flame in :g around the solid naturally develops spherical symmetry. Thus, spherical diffusion flames are of interest to fires in :g and identifying conditions that lead to radiation-induced extinction is important for spacecraft fire safety.

Author

Combustion Physics; Diffusion Flames; Extinction; Radiant Cooling; Radiative Heat Transfer; Microgravity; Gaseous Diffusion; Flame Propagation; Burning Rate

20040053550 University of Southern California, Los Angeles, CA, USA

Particle Effects On The Extinction And Ignition Of Flames In Normal- And Micro-Gravity

Andac, M. G.; Egolfopoulos, F. N.; Campbell, C. S.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 89-92; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-834; No Copyright; Avail: CASI; A01, Hardcopy

Reacting dusty flows have been studied to lesser extent than pure gas phase flows and sprays. Particles can significantly alter the ignition, burning and extinction characteristics of the gas phase due to the dynamic, thermal, and chemical couplings between the phases. The understanding of two-phase flows can be attained in stagnation flow configurations, which have been used to study spray combustion [e.g. 1] as well as reacting dusty flows [e.g. 2]. The thermal coupling between inert particles and a gas, as well as the effect of gravity, were studied in Ref. 3. It was also shown that the gravity can substantially affect parameters such as the particle velocity, number density, mass flux, and temperature. In Refs. 4 and 5, the effects of inert particles on the extinction of strained premixed and nonpremixed flames were studied both experimentally and numerically at 1-g and m-g. It was shown that large particles can cool flames more effectively than smaller particles. The effects of flame configuration and particle injection orientation were also addressed. It was shown that it was not possible to obtain a simple and still meaningful scaling that captured all the pertinent physics due to the complexity of the couplings between parameters. Also, the cooling by particles is more profound in the absence of gravity as gravity works to reduce the particle number density in the neighborhood of the flame. The efforts were recently shifted towards the understanding of the effects of combustible particles on extinction [6], the gas-phase ignition by hot particle injection [7], and the hot gas ignition of flames in the presence of particles that are not hot enough to ignite the gas phase by themselves.

Author

Gravitational Effects; Microgravity; Extinction; Combustion; Ignition; Flames; High Temperature Gases

20040053551 Colorado Univ., Boulder, CO, USA

Combustion Of Metals In Reduced Gravity And Extraterrestrial Environments

Abbud-Madrid, A.; Modak, A.; Branch, M. C.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 169-172; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The recent focus of this research project has been to model the combustion of isolated metal droplets and, in particular, to couple the existing theories and formulations of phenomena such as condensation, reaction kinetics, radiation, and surface reactions to formulate a more complete combustion model. A fully transient, one-dimensional (spherical symmetry) numerical model that uses detailed chemical kinetics, multi-component molecular transport mechanisms, condensation kinetics, and gas phase radiation heat transfer was developed. A coagulation model was used to simulate the particulate formation of MgO. The model was used to simulate the combustion of an Mg droplet in pure O2 and CO2. Methanol droplet combustion is considered as a test case for the solution method for both quasi-steady and fully transient simulations. Although some important processes unique to methanol combustion, such as water absorption at the surface, are not included in the model, the results are in sufficient agreement with the published data. Since the major part of the heat released in combustion of Mg, and in combustion of metals in general, is due to the condensation of the metal oxide, it is very important to capture the condensation processes correctly. Using the modified nucleation theory, an Arrhenius type rate expression is derived to calculate the condensation rate of MgO. This expression can be easily included in the CHEMKIN reaction mechanism format. Although very little property data is available for MgO, the condensation rate expression derived using the existing data is able to capture the condensation of MgO. An appropriate choice of the reference temperature to calculate the rate coefficients allows the model to correctly predict the subsequent heat release and hence the flame temperature.

Author

Combustion Physics; Metal Combustion; Extraterrestrial Environments; Mathematical Models

20040053553 NASA Glenn Research Center, Cleveland, OH, USA

Effect Of Low External Flow On Flame Spreading Over ETFE Insulated Wire Under Microgravity

Nishizawa, Katsuhiro; Fujita, Osamu; Ito, Kenichi; Kikuchi, Masao; Olson, Sandra L.; Kashiwagi, Takashi; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 177-180; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Fire safety is one of the most important issues for manned space missions. A likely cause of fires in spacecraft is wire insulation combustion in electrical system. Regarding the wire insulation combustion it important to know the effect of low external flow on the combustion because of the presence of ventilation flow in spacecraft. Although, there are many researches on flame spreading over solid material at low external flows under microgravity, research dealing with wire insulation is very limited. An example of wire insulation combustion in microgravity is the Space Shuttle experiments carried out by Greenberg

et al. However, the number of experiments was very limited. Therefore, the effect of low flow velocity is still not clear. The authors have reported results on flame spreading over ETFE (ethylene - tetrafluoroetylene) insulated wire in a quiescent atmosphere in microgravity by 10 seconds drop tower. The authors also performed experiments of polyethylene insulated nichrom wire combustion in low flow velocity under microgravity. The results suggested that flame spread rate had maximum value in low flow velocity condition. Another interesting issue is the effect of dilution gas, especially CO2, which is used for fire extinguisher in ISS. There are some researches working on dilution gas effect on flame spreading over solid material in quiescent atmosphere in microgravity. However the research with low external flow is limited and, of course, the research discussing a relation of the appearance of maximum wire flammability in low flow velocity region with different dilution gas cannot be found yet. The present paper, therefore, investigates the effect of opposed flow with different dilution gas on flame spreading over ETFE insulated wire and change in the presence of the maximum flammability depending on the dilution gas type is discussed within the limit of microgravity time given by ground-based facility.
Derived from text
Combustible Flow; Fire Extinguishers; Fire Prevention; Flame Propagation; Insulation; Microgravity; Wire

20040053589 Alabama Univ., Tuscaloosa, AL, USA
Models And Experiments Of Laminar Diffusion Flames In Non-Uniform Magnetic Fields
Baker, J.; Varagani, R.; Saito, K.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 317-320; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-2560; No Copyright; Avail: CASI; A01, Hardcopy

Non-uniform magnetic fields affect laminar diffusion flames as a result of the paramagnetic and diamagnetic properties of the products and reactants. Paramagnetism is the weak attraction to a magnetic field a material exhibits as a result of permanent magnetic dipole moments in the atoms of the material. Diamagnetism is the weak repulsion to a magnetic field exhibited by a material due to the lack of permanent magnetic dipole moments in the atoms of a material. The forces associated with paramagnetic and diamagnetism are several orders of magnitude less than the forces associated with the more familiar ferromagnetism. A typical example of a paramagnetic gas is oxygen while hydrocarbon fuels and products of combustion are almost always diamagnetic. The fact that magnets can affect flame behavior has been recognized for more than one hundred years. Early speculation was that such behavior was due to the magnetic interaction with the ionized gases associated with a flame. Using a scaling analysis, it was later shown that for laminar diffusion flames the magnetic field/ionized gas interaction was insignificant to the paramagnetic and diamagnetic influences. In this effort, the focus has been on examining laminar diffusion slot flames in the presence of non-uniform upward decreasing magnetic fields produced using permanent magnets. The principal reason for choosing slot flames was mathematical models of such flames show an explicit dependence on gravitational body forces, in the buoyancy-controlled regime, and an applied magnetic field would also impose a body force. In addition, the behavior of such flames was more easily visualized while maintaining the symmetry of the two-dimensional problem whereas it would have been impossible to obtain a symmetric magnetic field around a circular flame and still visually record the flame height and shape along the burner axis. The motivation for choosing permanent magnets to produce the magnetic fields was the assumption that space-related technologies based on the knowledge gained during this investigation would more likely involve permanent magnets as opposed to electromagnets. While no analysis has been done here to quantify the impact that an electric field, associated with an electromagnetic, would have relative to the paramagnetic and diamagnetic interactions, by using permanent magnets this potential effect was completely eliminated and thus paramagnetic and diamagnetic effects were isolated.
Derived from text
Diamagnetism; Diffusion Flames; Ferromagnetism; Flames; Laminar Flow; Magnetic Fields; Nonuniform Magnetic Fields; Permanent Magnets

20040053592 Saskatchewan Univ., Saskatoon, Saskatchewan, Canada
Experimental Study of Clothing Flammability and Associated Skin Burn Damage in Microgravity
Cavanagh, Jane M.; Torvi, David A.; Gabriel, Kamiel S.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 329-332; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

This research is an experimental study of flame spread over fabrics and the resulting burn injury which can occur. The experiment is intended to simulate the fire behaviour of test fabrics used in clothing in a microgravity environment such as a shuttle or the international space station. Previous fabric flammability tests done in microgravity are not numerous. In fact, most of the flammability data used is from ground-based tests that are then assumed to be the worst-case scenario in microgravity. Past experiments in microgravity have used the NASA NHB8060.1 Upward Flammability apparatus, the NIST

lateral ignition and flame-spread tester (LIFT), and a cone calorimeter. Information was gathered from these tests on flammability, ignitability and lateral flame spread, and rate of heat release. While most of the materials passed the NASA test, which is often used to obtain flammability data, some materials did not perform well in the other tests. Therefore, a single test may not be an accurate representation of the performance of a material. No substantial experimental work has been done to give information about burn injury of skin in microgravity. Some research has been done in this area under normal gravity. This paper describes an experiment designed to investigate the flammability of various fabrics used by astronauts and the skin burn damage that can result if these fabrics ignite. This research will provide important information on the similarities and differences between the fire performance of textiles when subjected to the same conditions under normal gravity and in microgravity. This information can be used to assess the suitability of current testing procedures and if necessary, to develop new tests more appropriate to the microgravity environment. The overall goal is to ensure astronauts will be sufficiently protected from possible fires while in orbit.
Derived from text
Burns (Injuries); Fabrics; Flammability; Ignition; Microgravity; Textiles

20040053593 Michigan Univ., Ann Arbor, MI, USA
Chemically-Passive Suppression Of Premixed Flames In Spacecraft Environments At Microgravity
Kim, C. H.; Qiao, L.; Faeth, G. M.; Kwon, O. C.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 337-340; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The effects of flame suppressants on outwardly-propagating spherical laminar premixed flames at atmospheric pressure were studied, emphasizing changes of both unstretched laminar burning velocities and flame response to stretch due to the presence of a flame suppressant. Experimental and computational methods were used to study laminar H2/O2/N2 premixed flames, considering helium, argon, nitrogen, water vapor, carbon dioxide and water mist as suppressants with the reactants at normal temperature.
Derived from text
Combustion; Microgravity; Premixed Flames; Water Vapor; Flame Propagation; Flame Retardants

20040053597 NASA Glenn Research Center, Cleveland, OH, USA
A Characterization Of Alcohol Fuel Vapor For Wavelength Modulation Spectroscopy Applied To Microgravity Flame Spread
Kulis, Michael J.; Perry, David S.; Miller, Fletcher; Piltch, Nancy; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 357-360; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-2512; NGT3-52364; No Copyright; Avail: CASI; A01, Hardcopy

A diode laser diagnostic is being developed for use in an ongoing investigation of flame spread in microgravity at NASA Glenn Research Center. Flame spread rates through non-homogenous gas mixtures are significantly different in a microgravity environment because of buoyancy and possibly hydrostatic pressure effects. These effects contribute to the fuel vapor concentration ahead of the flame being altered so that flame spread is more rapid in microgravity. This paper describes spectral transmission measurements made through mixtures of alcohol, water vapor, and nitrogen in a gas cell that was designed and built to allow measurements at temperatures up to 500 C. The alcohols considered are methanol, ethanol, and n-propanol. The basic technique of wavelength modulation spectroscopy for gas species measurements in microgravity was developed by Silver et al. For this technique to be applicable, one must carefully choose the spectral features over which the diode laser is modulated to provide good sensitivity and minimize interference from other molecular lines such as those in water. Because the methanol spectrum was not known with sufficient resolution in the wavelength region of interest, our first task was to perform high-resolution transmission measurements with an FTIR spectrometer for methanol vapor in nitrogen, followed recently by ethanol and n-propanol. A computer program was written to generate synthesized data to mimic that expected from the experiment using the laser diode, and results from that simulation are also presented.
Derived from text
Flame Propagation; Gas Composition; Microgravity; Spectrum Analysis; Alcohols

20040053598 Yale Univ., New Haven, CT, USA
Fuel Dilution Studies Of Coflow Laminar Diffusion Flames In A Microgravity Environment
Long, Marshall B.; Smooke, Mitchell D.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 361-364; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

While computational and experimental studies of diffusion flames have become increasingly sophisticated over the past ten years, they have also helped to illustrate areas in which improvement in both the chemical and physical modeling of these systems is needed. Two specific areas in which further research is warranted are the effects of fuel dilution on flame liftoff and stability, and the formation of combustion generated soot-particulates. The unique characteristics of the microgravity environment are useful for studying both of these phenomena, which occur at opposite ends of the fuel dilution spectrum. Microgravity enables the stabilization of very weak flames with high levels of dilution. For undiluted fuels, microgravity flames have increased soot residence times (and therefore greater soot volume fractions) compared to their normal-gravity counterparts. Studying these flames will enable us to better understand the factors that affect diffusion flame lift-off height and extinction. It will also enable us to quantify the roles of inception, surface growth and oxidation processes in combustion-generated soot particulates. The goals of the research will be the development of modified kinetic mechanisms for hydrocarbon fuels that are able to model effectively diffusion flame structure under a larger parameter range than existing mechanisms. We will also pursue the development of submodels for soot formation that are capable of predicting both high and low soot loading levels in hydrocarbon flames of various fuels.
Derived from text
Diffusion Flames; Dilution; Fuels; Microgravity

20040053647 National Inst. of Environmental Health Sciences, Research Triangle Park, NC, USA
NTP Technical Report on the Toxicology and Carcinogenesis Studies of Propylene Glycol Mono-t-Butyl Ether (CAS No. 57018-52-7) in F344/N Rats and B6C3F1 Mice and a Toxicology Study of Propylene Glycol Mono-t-Butyl Ether in Male NBR Rats (Inhalation
Mar. 2004; 316 pp.; In English
Report No.(s): PB2004-104949; NTP-TR-515; NIH/PUB-04-4449; No Copyright; Avail: CASI; A14, Hardcopy
Propylene glycol mono-t-butyl ether is used as a solvent in all-purpose cleaners, inks, and nail polish lacquers. We studied the effects of propylene glycol mono-t-butyl ether on male and female rats and mice to identify potential toxic or cancer-related hazards to humans. We exposed groups of male and female rats and mice to air containing vapors of propylene glycol mono-t-butyl ether at concentrations of 75,300, or 1, 200 parts per million (ppm) for 6 hours per day, 5 days a week for 2 years. Untreated control animals were housed in similar exposure chambers but without chemical exposure for comparison. Tissues from more than 40 sites were examined for every animal.
NTIS
Toxicology; Carcinogens; Cancer

20040055520 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
The Effects of Nicotine on MK-801-induced Attentional Deficits: An Animal Model of Schizophrenia
Phillips, Jennifer M.; Jan. 2002; 82 pp.; In English
Report No.(s): AD-A421308; No Copyright; Avail: CASI; A05, Hardcopy
The present study consisted of three experiments. Experiment 1 examined the effects of acute nicotine (0, 0.1 or 0.5 mg/kg) on the acoustic startle reflex (ASR) and pre-pulse inhibition (PPI) in animals treated with MK-801, an NMDA antagonist that models schizophrenic attentional deficits. Experiment 2 examined the effects of acute nicotine (0, 0.01 or 1.0 mg/kg) on ASR and PPI in MK-801-treated animals. Experiment 3 examined the effects of chronic nicotine (0 or 6. 0 mg/kg/day) on ASR and PPI in animals treated with MK-801. MK- 801 consistently disrupted attention by increasing ASR and decreasing PPI in all experiments. Nicotine failed to consistently attenuate these attentional disruptions. Nicotine had no significant effects on ASR or PPI at any dosage and attenuated the decrease in PPI caused by MK-801 only in a single set of startle parameters. These findings suggest that this model of attentional deficits in schizophrenia is not affected by nicotine.
DTIC
Animals; Nicotine; Physiological Effects; Schizophrenia

20040055554 Naval Facilities Engineering Service Center, Port Hueneme, CA
Joint Service Solvent Substitution Methodology
May 2003; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421353; NFESC-TM-2361-ENV; No Copyright; Avail: CASI; A03, Hardcopy
The Naval Facilities Engineering Service Center (NFESC) was tasked to develop a process that can be used to ensure successful implementation of environmentally friendly solvents. NFESC contacted and coordinated with the Navy, Army, and Air Force to develop a Joint Service Solvent Substitution Methodology.' The methodology, derived in part from existing

information supplied by these DOD agencies, can be used as a tool for establishing the compatibility, environmental, and cleaning criteria (referred to as the acceptance criteria) needed to obtain approval and successfully implement alternative solvents. The methodology focuses on the importance of involving stakeholders in development of acceptance criteria, test plans, and evaluation of results. This process is not intended to be used for identifying alternative solvents, but to identify the steps that are critical for gaining acceptance of alternative solvents for DOD industrial maintenance activities.
DTIC
Solvents; Substitutes

20040055561 Army Research Lab., Aberdeen Proving Ground, MD
Environmentally Assisted Cracking: Concerns for Cadmium Replacement
Grendahl, Scott M.; Dec. 2003; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-181E31
Report No.(s): AD-A421367; ARL-TR-3099; No Copyright; Avail: CASI; A03, Hardcopy

Recently, cadmium replacement has become the topic of an Environmental Security Technology Certification Program. As a direct result of this program, replacement coating systems will be developed and scrutinized. A fundamental starting point for corrosion-resistant coatings development work consists of a target for the overall chemical potential (galvanic series) and pH of the coating system and the substrate. This work developed the data necessary to determine the target for several high strength steels. Hydrogen is widely recognized as having a detrimental embrittling effect on high strength materials, especially high strength steel. Many of these materials show a strong dependence of hydrogen on chemical potential and pH. This work focused on determining the effect of hydrogen on the environmentally assisted cracking critical stress intensity values (K(sub IEAC)) for several common high strength structural steels. Evaluating the effects of hydrogen on K(sub IEAC) over a range of chemical potential and pH will make the optimum chemical potential and pH evident for each material. It then becomes possible for the coating system designers to tailor a prospective coating system around those optimum values with the various substrates. If a system were designed at the optimum values for chemical potential and pH, the substrate material would be at the most tolerant conditions for resisting detrimental hydrogen effects, regardless of the source of the hydrogen.
DTIC
Cadmium; Cracking (Fracturing); Protective Coatings; Replacing

20040055654 Boeing Phantom Works, Seattle, WA
Development of an Enhanced Durability Corrosion Protecting Self-Priming Topcoat
Osborne, Joseph H.; Jan. 12, 2004; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-C-0108
Report No.(s): AD-A421759; No Copyright; Avail: CASI; A02, Hardcopy

Monthly report of progress in developing an enhanced self priming topcoat using high performance urethane resins and advanced concepts in nonchromate corrosion protection. The goal of the program is to develop a coating that meets and exceeds the requirements of TT-P-2756 and exceeds the performance of the existing topcoat material qualified to the specification.
DTIC
Corrosion; Corrosion Prevention; Durability; Protective Coatings

20040055932 Naval Surface Warfare Center, Indian Head, MD
Field Demonstration of In Situ Perchlorate Bioremediation at Building 1419
Cramer, Randall J.; Yates, Carey; Hatzinger, Paul; Shaw, Jay D.; Jan. 22, 2004; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421555; NOSSA-TR-2004-001; NOSSA-TR-2004-001; No Copyright; Avail: CASI; A05, Hardcopy

The Applied Technology Department at the Indian Head Division, Naval Surface Warfare Center and Shaw Environmental, Inc., have just successfully completed a field demonstration of in situ bioremediation of a groundwater aquifer contaminated with perchlorate. Using a recirculation cell design, naturally occurring microorganisms were stimulated to degrade perchlorate by injecting a food source (lactate) and neutralizing the groundwater acidity with a carbonate buffer. Starting with perchlorate concentrations in excess of 210 mg/L, perchlorate levels were reduced by more than 95% in eight of the nine test plot monitoring wells over the 5 months of sampling. In two of the monitoring wells, the perchlorate levels were lowered to less than 5 ppb. In addition to the perchlorate levels and the pH, alkalinity, nitrate, and sulfate concentrations were measured. In situ bioremediation techniques are much less expensive and significantly lower in maintenance than

traditional ex situ pump-and-treat systems. This is the first field trial conducted on the east coast of the USA, the first trial performed in an acidic aquifer, and the first demonstration of treating in situ perchlorate levels in excess of 200 mg/L. This project provides new and valuable information concerning the application of bioremediation for in situ perchlorate treatment. DTIC

Biodegradation; Contamination; Microorganisms; Perchlorates; Water Pollution

24
COMPOSITE MATERIALS

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

20040053286 NASA Ames Research Center, Moffett Field, CA, USA, MRJ Technology Solutions, Inc., Moffett Field, CA, USA

Structure of Boron Nitride Nanotubes: Tube Closing Vs. Chirality

Srivastava, Deepak; Menon, Madhu; January 2004; 14 pp.; In English

Contract(s)/Grant(s): NAS2-14303; NSF OSR-94-52895; RTOP 519-40-12; Copyright; Avail: CASI; A03, Hardcopy

The structure of boron nitride nanotubes is investigated using a generalized tight-binding molecular dynamics method. It is shown that dynamic relaxation results in a wavelike or 'rippled' surface in which the B atoms rotate inward and the N atoms move outward, reminiscent of the surface relaxation of the III-V semiconductors. More importantly, the three different morphologies of the tube closing with flat, conical and amorphous ends, as observed in experiments, are shown to be directly related to the tube chiralities. The abundance of flat end tubes observed in experiments is, thus, shown to be an indication of the greater stability of 'zig-zag' BN tubes over the 'arm-chair' tubes under experimental conditions.

Author

Boron Nitrides; Nanotubes; Molecular Dynamics; Amorphous Materials

20040053520 NASA Glenn Research Center, Cleveland, OH, USA

Piloted Ignition of Polypropylene/Glass Composites in a Forced Air Flow

Fernandez-Pello, A. C.; Rich, D.; Lautenberger, C.; Stefanovich, A.; Metha, S.; Torero, J.; Yuan, Z.; Ross, H.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 209-212; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-478; NAG3-1961; No Copyright; Avail: CASI; A01, Hardcopy

The Forced Ignition and Spread Test (FIST) is being used to study the flammability characteristics of combustible materials in forced convective flows. The FIST methodology is based on the ASTM E-1321, Lateral Ignition and Flame Spread Test (LIFT) which is used to determine the ignition and flame spread characteristics of materials, and to produce 'Flammability Diagrams' of materials. The LIFT apparatus, however, relies on natural convection to bring air to the combustion zone and the fuel vapor to the pilot flame, and thus cannot describe conditions where the oxidizer flow velocity may change. The FIST on the other hand, by relying on a forced flow as the dominant transport mechanism, can be used to examine variable oxidizer flow characteristics, such as velocity, oxygen concentration, and turbulence intensity, and consequently has a wider applicability. Particularly important is its ability to determine the flammability characteristics of materials used in spacecraft since in the absence of gravity the only flow present is that forced by the HVAC of the space facility. In this paper, we report work on the use of the FIST approach on the piloted ignition of a blended polypropylene fiberglass (PP/GL) composite material exposed to an external radiant flux in a forced convective flow of air. The effect of glass concentration under varying external radiant fluxes is examined and compared qualitatively with theoretical predictions of the ignition process. The results are used to infer the effect of glass content on the fire safety characteristics of composites.

Author

Flammability; Composite Materials; Ignition

20040053649 Texas A&M Univ., College Station, TX

Performance of the TxDOT T202 (MOD) Bridge Rail Reinforced with Fiber Reinforced Polymer Bars

Buth, C. E.; Williams, W. F.; Bligh, R. P.; Menges, W. L.; Oct. 2002; 102 pp.; In English

Report No.(s): PB2004-104113; TTI-0-4138; RR-0-4138-3; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this project was to investigate the behavior of fiber reinforced polymer (FRP) reinforcement in a concrete bridge rail when subjected to a vehicle collision. FRP reinforcement for a Texas Department of Transportation (TXDOT) T202 (MOD) bridge rail (now TXDOT T203 bridge rail) was designed, and the rail was subjected to two full-scale crash tests. Two

design conditions were incorporated into the test article. One was based on strength immediately after construction, and the other was based on reduced strength after deterioration due to long-term exposure to the environment. In the first test, which was performed on the stronger section, structural performance of the rail was good, but the vehicle rolled and safety performance was unacceptable. For the second test, which was performed on the weaker section, the height of the rail was increased to 30 inches. Both structural and safety performance of the rail was good.
NTIS
Impact Tests; Composite Materials; Crashworthiness; Collisions

20040053666 Virginia Transportation Research Council, Charlottesville, VA
Plate and Tube Bridge Deck Evaluation in the Deck Test Bed on the Troutville, Virginia, Weigh Station
Cousins, T. E.; Lesko, J. J.; Mar. 2004; 30 pp.; In English
Report No.(s): PB2004-104487; VTRC-04-CR12; Copyright; Avail: National Technical Information Service (NTIS)

This report addresses the laboratory and field performance of multi-cellular fiber-reinforced polymer (FRP) composite bridge deck systems. We focus specifically on FRP decks produced from adhesively bonded pultrusions where the core of the deck possesses a square geometry running transversely to traffic. In laboratory tests, two schemes of loading patches were designed: a steel patch dimensioned according to the American Association of State Highway and Transportation Officials (AASHTO) ridge Design Specifications, and a simulated tire patch constructed from an actual truck tire reinforced with silicon rubber. The stiffness, strength, and failure characteristics of the cellular FRP decks were examined using both loading patches.
NTIS
Design Analysis; Adhesive Bonding; Fiber Composites; Composite Materials

20040055521 Delaware Univ., Newark, DE
Experimental and Numerical Investigations on Damage and Delamination in Thick Plain Weave S-2 Glass Composites Under Quasi-Static Punch Shear Loading
Gama, Bazle A.; Xiao, Jia-Run; Haque, Md. J.; Yen, Chian-Fong; Gillespie Jr, John W.; Feb. 2004; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0001; DAAD19-01-2-0005; Proj-622618.H80
Report No.(s): AD-A421310; ARL-CR-534; No Copyright; Avail: CASI; A03, Hardcopy

Quasi-static punch-shear tests are carried out on plain weave S-2 Glass/SC-15 epoxy composite thick laminates with a blunt impactor. Load-unload tests are carried out to capture different levels of damage mechanisms and the corresponding displacements at which they occur. Energies absorbed at different levels of damage are obtained from the load-unload curves. Two different support spans of 2.54-cm (1- in) and 10-cm diameter (4 in) with 22 layers (thickness 1. 321 cm) of plain weave glass/epoxy plates are tested quasi- statically to identify interlaminar shear-dominated and tensile-shear combined modes of damage. After each test the damaged plates are sectioned to visualize the extent of delamination and material damage. The punch shear tests are simulated using LS-DYNA composite material and delamination models. The modeling is carried out using a newly developed damage model namely MAT 162 which has been incorporated into LS-DYNA. It uses damage mechanics principles for progressive damage and material degradation. The simulated results show excellent agreement with experimental results. It has been found that the dominant damage mechanisms are delamination and fiber breakage due to shear and tension. This study will be useful for characterizing and predicting damage and ballistic limits of thick-woven composites.
DTIC
Damage; Delaminating; Fiber Composites; Glass; Static Loads

20040055590 Naval Surface Warfare Center, Bethesda, MD
SIDER Testing of Royal Navy Vessel P292 HMS Trumpeter
Ratcliffe, Collin P.; Crane, Roger M.; Sep. 2003; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421446; NSWCCD-65-TR-2003/37; No Copyright; Avail: CASI; A03, Hardcopy

This report documents work performed by the Naval Surface Warfare Center, Carderock Division in support of The Technical Cooperation Program (TTCP), composite panel TP-7, Operating Assignment 026, on the durability assessment of composites in the service environment. This is part of ETA-10, composite performance and long-term durability under dynamic, thermal and shock loading. This report presents the results of a single Structural Irregularity and Damage Evaluation routine (SIDER) inspection of the forecastle of EMS Trumpeter, pennant number P292. The forecastle consists of a balsa or plywood core with glass composite facesheets and a top layer of nonskid. The SIDER inspection identified several regions that

had changes in structural stiffness. Several of these indications corresponded to structural features in the hull such as deck prisms, vents, and areas where bulkheads terminated. In addition, there was an indication identified where the nonskid material was debonded from the deck. The SIDER inspection failed to identify many nonstructural irregularities since the ship was nearing completion of its refurbishment.
DTIC
Navy

20040055622 Dayton Univ. Research Inst., OH
Life Prediction Methodologies for Aerospace Materials Annual Report, 2002
Ashbaugh, N. E.; Brockman, R. A.; Buchanan, D. J.; Hartman, G. A.; Hutson, A. L.; Jun. 2002; 250 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-98-C-5214; Proj-4347
Report No.(s): AD-A421560; AFRL-ML-WP-TR-2004-4026; No Copyright; Avail: CASI; A11, Hardcopy

Three types of models to predict behavior of gamma titanium aluminide (g-TiAl) alloys in a high temperature turbine engine environment were developed and have been refined: (a) a model to evaluate linear elastic response, (b) a crystal plasticity model, and (c) a computational model for analyzing stress variations within polycrystals of g-TiAl. Orientation-imaging microscopy (OIM) has been used to understand the role that crystallographic orientation plays with respect to fatigue crack initiation and growth. Mechanical tests have been conducted on various ceramic matrix composites to determine their viability in applications such as exhaust wash structures, exhaust nozzle flaps and seals and combustor liners. Models have been developed for determining effective thermoelastic properties and creep and damage associated with anisotropy of the creep response in off-axis orientations. Titanium, nickel and aluminum alloys used in fabricating engine components have been examined to assess their behavior under laboratory conditions designed to simulate fretting fatigue, in turbine engine blade attachments, foreign object damage, high-cycle fatigue, and high-cycle/low- cycle interactions under engine operation. The ability to predict turbine-engine-materials behavior under operating conditions is an important facet of the Engine Rotor Life Extension (ERLE) and Phase 1 DARPA Prognostics programs. Various studies have been undertaken to assess: (a) baseline properties for virgin material and material extracted from retired turbine disks, (b) fatigue crack initiation and growth, (c) the role that material defects play in low cycle fatigue crack initiation, (d) periodic overloads on fatigue crack growth behavior, (e) fatigue crack growth under near-threshold conditions, and (f) fracture surface marking for crack location during spin-pit testing. Studies that lead t
DTIC
Aerospace Systems; Aircraft Construction Materials; Aluminum Alloys; Ceramic Matrix Composites; Life (Durability); Prediction Analysis Techniques; Predictions; Service Life; Spacecraft Construction Materials; Titanium Aluminides

20040055931 Tuskegee Inst., AL
Survivability of Affordable Aircraft Composite Structures. Volume 2: High Strain Rate Characterization of Affordable Woven Carbon/Epoxy Composites
Hosur, Mahesh V.; Jeelani, Shaik; Vaidya, Uday K.; Nwosu, Sylvanus; Apr. 2003; 147 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-99-C-3608; Proj-2402
Report No.(s): AD-A421599; AFRL-VA-WP-TR-2003-3072; No Copyright; Avail: CASI; A07, Hardcopy

Studies on the high strain rate impact tests performed on conventional unidirectional and affordable woven carbon/epoxy composites using the Split Hopkinson's Pressure Bar (SHPB) setup are presented in the this report. Stitched and unstitched samples made of plain and satin weave carbon/epoxy composites were subjected to high strain rate compression loading at strain rates varying from 320/s to 1149/s using a modified SHPB setup. Further unstitched samples were subjected to inplane off-axes loading at high strain rates at various angles. Failure modes were characterized through optical and scanning electron microscopy. Results of the test indicated that the peak stress increased with increase in strain rate. Under off-axes loading, the peak stress decreased with increase in off-axes angle. Stitching helped in preventing splitting damage. Studies on carbon/epoxy plates using penetrating SHPB indicate that the strain rate, ultimate strain, and energy released increased nonlinearly, particle velocity and displacement increased linearly with impact energy and the dynamic modules seems to decrease nonlinearly with impact velocity, energy released, strain rate and strain. Penetration limit (PL) increased with increase in the thickness of the laminate. Damage modes include perforation and plugging above PL.
DTIC
Aircraft Structures; Composite Structures; Epoxy Matrix Composites; Strain Rate; Woven Composites

20040055933 Tuskegee Inst., AL

Survivability of Affordable Aircraft Composite Structures. Volume 3: Characterization of Affordable Woven Carbon/Epoxy Composites Under Low-Velocity Impact Loading

Hosur, Mahesh V.; Jeelani, Shaik; Vaidya, Uday K.; Kelkar, Ajit D.; Apr. 2003; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-99-C-3608; Proj-2402

Report No.(s): AD-A421601; AFRL-VA-WP-TR-2003-3073; No Copyright; Avail: CASI; A04, Hardcopy

Experimental investigations carried out on affordable woven carbon/epoxy laminates under low-velocity impact loading are reported in this volume. Stitched and unstitched carbon/epoxy laminates were fabricated using plain and satin weave fabric with SC-15 epoxy resin system. Two orthogonal stitch spacing: 12.7- and 15.4-mm were used. Four- inch square samples were subjected to low-velocity impact loading at energy ranging from 5-40 J. Results of the study indicated that the damage due to low-velocity impact loading reduced considerably due to stitching. Of the two weave types, satin weave laminates carried higher impact loads compared to plain weave laminates due to relatively straighter fiber architecture. In another study, effects of laminate thickness and samples size on the upper and lower-bound energy level were established. To establish damage tolerance of woven fabric composites, post impact studies were carried out which included static compression and fatigue tests. Post fatigue tension tests were carried out to determine the reduction in stiffness. Though most of the laminates sustained 100,000 fatigue cycles, there was a sharp decrease in the stiffness with increasing drop height.

DTIC

Aircraft Structures; Composite Structures; Epoxy Matrix Composites; Impact Loads; Low Speed; Woven Composites

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*.

20040053478 NASA Ames Research Center, Moffett Field, CA, USA

The Role of Born-Oppenheimer Breakdown in the Prediction of Accurate Transition Frequencies in Ordinary Molecules

Schwenke, David W.; [2003]; 23 pp.; In English; International Symposium on Molecular Spectroscopy, 20 Jun. 2003, Columbus, OH, USA; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation shows that the Born-Oppenheimer breakdown is important at the 1/cm level. BO corrections can be computed accurately ab initio. Basis extrapolations can be very accurate.

Derived from text

Born-Oppenheimer Approximation; Frequencies; Predictions

20040053504 NASA Glenn Research Center, Cleveland, OH, USA

Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems, Rev. 1

Sacksteder, Kurt, Compiler; August 2003; 410 pp.; In English; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems, 3-6 Jun. 2003, Cleveland, OH, USA; See also 20040053505 - 20040053602

Contract(s)/Grant(s): WBS 101-52-01

Report No.(s): NASA/CP-2003-212376/REV1; E-13952-1; No Copyright; Avail: CASI; A18, Hardcopy

The Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems was planned for June 3-6, 2003, in Cleveland, Ohio, near the NASA John H. Glenn Research Center at Lewis Field. The new name for the workshop is based on the decision to broaden our scope to encompass support for future space exploration through basic and applied research in reacting systems that in some cases may not look like combustion. The workshop has been lengthened to 4 days with focus sessions on spacecraft fire safety and exploration-related research. We believe that the microgravity combustion science community is almost uniquely positioned to make substantial contributions to this new effort.

Author

Aerospace Safety; Fire Prevention; Combustion; Microgravity

20040053508 University of Southern California, Los Angeles, CA, USA

Quantitative Studies on the Propagation and Extinction of Near-Limit Premixed Flames Under Normal and Microgravity

Dong, Y.; Spedding, G. R.; Egolfopoulos, F. N.; Miller, F. J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 185-188; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-678; No Copyright; Avail: CASI; A01, Hardcopy

The main objective of this research is to introduce accurate fluid mechanics measurements diagnostics in the 2.2-s drop tower for the determination of the detailed flow-field at the states of extinction. These results are important as they can then be compared with confidence with detailed numerical simulations so that important insight is provided into near-limit phenomena that are controlled by not well-understood kinetics and thermal radiation processes. Past qualitative studies did enhance our general understanding on the subject. However, quantitative studies are essential for the validation of existing models that subsequently be used to describe near-limit phenomena that can initiate catastrophic events in micro- and/or reduced gravity environments.

Derived from text

Premixed Flames; Flame Propagation; Microgravity; Extinction

20040053515 NASA Glenn Research Center, Cleveland, OH, USA

Forced Forward Smoldering Experiments Aboard The Space Shuttle

Fernandez-Pello, A. C.; Bar-Ilan, A.; Rein, G.; Urban, D. L.; Torero, J. L.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 129-132; In English; See also 20040053504

Contract(s)/Grant(s): NAG3-2026; No Copyright; Avail: CASI; A01, Hardcopy

Smoldering is a basic combustion problem that presents a fire risk because it is initiated at low temperatures and because the reaction can propagate slowly in the material interior and go undetected for long periods of time. It yields a higher conversion of fuel to toxic compounds than does flaming, and may undergo a transition to flaming. To date there have been a few minor incidents of overheated and charred cables and electrical components reported on Space Shuttle flights. With the establishment of the International Space Station, and the planning of a potential manned mission to Mars, there has been an increased interest in the study of smoldering in microgravity. The Microgravity Smoldering Combustion (MSC) experiment is part of a study of the smolder characteristics of porous combustible materials in a spacecraft environment. The aim of the experiment is to provide a better fundamental understanding of the controlling mechanisms of smoldering combustion under normal- and microgravity conditions. This in turn will aid in the prevention and control of smolder originated fires, both on earth and in spacecrafts. The microgravity smoldering experiments have to be conducted in a space-based facility because smoldering is a very slow process and consequently its study in a microgravity environment requires extended periods of time. The microgravity experiments reported here were conducted aboard the Space Shuttle. The most recent tests were conducted during the STS-105 and STS-108 missions. The results of the forward smolder experiments from these flights are reported here. In forward smolder, the reaction front propagates in the same direction as the oxidizer flow. The heat released by the heterogeneous oxidation reaction is transferred ahead of the reaction heating the unreacted fuel. The resulting increase of the virgin fuel temperature leads to the onset of the smolder reaction, and propagates through the fuel. The MSC data are compared with normal gravity data to determine the effect of gravity on smolder.

Author

Smoldering; Spacecraft Environments; Microgravity; Combustion Physics

20040053516 NASA Glenn Research Center, Cleveland, OH, USA

Transport And Chemical Effects On Concurrent And Opposed-Flow Flame Spread At Microgravity

Son, Y.; Zouein, G.; Ronney, P. D.; Gokoglu, S.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 133-136; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Flame spread over flat solid fuel beds is a useful means of understanding more complex two-phase non-premixed spreading flames, such as those that may occur due to accidents in inhabited buildings and orbiting spacecraft. The role of buoyant convection on flame spread is substantial, especially for thermally-thick fuels. With suitable assumptions, deRis showed that the spread rate (S(sub f)) is proportional to the buoyant or forced convection velocity (U) and thus suggests that S(sub f) is indeterminate at mu g (since S(sub f) = U) unless a forced flow is applied. (In contrast, for thermally thin fuels, the ideal S(sub f) is independent of U.) The conventional view, as supported by computations and space experiments, is that for quiescent g conditions, S(sub f) must be unsteady and decreasing until extinction occurs due to radiative losses. However, this view does not consider that radiative transfer to the fuel surface can enhance flame spread. In recent work we have found

evidence that radiative transfer from the flame itself can lead to steady flame spread at mu g over thick fuel beds. Our current work focuses on refining these experiments and a companion modeling effort toward the goal of a space flight experiment called Radiative Enhancement Effects on Flame Spread (REEFS) planned for the International Space Station (ISS) c. 2007. Author

Flame Propagation; Microgravity; Transport Theory

20040053517 Drexel Univ., Philadelphia, PA, USA

Experiments And Model Development For The Investigation Of Sooting And Radiation Effects In Microgravity Droplet Combustion

Yozgatligil, Ahmet; Choi, Mun Young; Dryer, Frederick L.; Kazakov, Andrei; Dobashi, Ritsu; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 153-156; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-822; No Copyright; Avail: CASI; A01, Hardcopy

This study involves flight experiments (for droplets between 1.5 to 5 mm) and supportive ground-based experiments, with concurrent numerical model development and validation. The experiments involve two fuels: n-heptane, and ethanol. The diagnostic measurements include light extinction for soot volume fraction, two-wavelength pyrometry and thin-filament pyrometry for temperature, spectral detection for OH chemiluminescence, broadband radiometry for flame emission, and thermophoretic sampling with subsequent transmission electron microscopy for soot aerosol property calculations.

Author (revised)

Soot; Radiation Effects; Microgravity; Drops (Liquids); Combustion Physics

20040053518 NASA Glenn Research Center, Cleveland, OH, USA

Studies of Premixed Laminar and Turbulent Flames at Microgravity

Kwon, O. C.; Abid, M.; Porres, J.; Liu, J. B.; Ronney, P. D.; Struk, P. M.; Weiland, K. J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 197-200; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Several topics relating to premixed flame behavior at reduced gravity have been studied. These topics include: (1) flame balls; (2) flame structure and stability at low Lewis number; (3) experimental simulation of buoyancy effects in premixed flames using aqueous autocatalytic reactions; and (4) premixed flame propagation in Hele-Shaw cells. Because of space limitations, only topic (1) is discussed here, emphasizing results from experiments on the recent STS-107 Space Shuttle mission, along with numerical modeling efforts.

Author

Microgravity; Spaceborne Experiments; Premixed Flames; Turbulent Flames

20040053522 Naval Research Lab., Washington, DC, USA

Flame-Generated Vorticity Production in Premixed Flame-Vortex Interactions

Patnaik, G.; Kailasanath, K.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 225-228; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

In this study, we use detailed time-dependent, multi-dimensional numerical simulations to investigate the relative importance of the processes leading to FGV in flame-vortex interactions in normal gravity and microgravity and to determine if the production of vorticity in flames in gravity is the same as that in zero gravity except for the contribution of the gravity term. The numerical simulations will be performed using the computational model developed at NRL, FLAME3D. FLAME3D is a parallel, multi-dimensional (either two- or three-dimensional) flame model based on FLIC2D, which has been used extensively to study the structure and stability of premixed hydrogen and methane flames.

Author

Vorticity; Premixed Flames

20040053523 California Univ., Davis, CA, USA

Elimination of Gravity Influence on Flame Propagation Via Enhancement of the Saffman-Taylor Instability

Aldredge, R. C.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 229-232; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

In this analytical work the influence of the Saffman-Taylor instability on flame propagation is formulated for computational investigation. Specifically, it is of interest to examine the influence of this instability as a potential means of

eliminating the effect of gravitational acceleration on the development of thermoacoustic instability. Earlier experimental investigations of thermoacoustic instability employed tubes of large circular or annular cross-section, such that neither heat loss nor viscosity at the burner walls was of significant importance in influencing flame behavior. However, it has been demonstrated recently that flames propagating between closely spaced walls, may be subject to long-wavelength wrinkling associated with the Saffman-Taylor instability, known to be relevant when a less-viscous fluid pushes a more-viscous fluid through a porous medium or between two closely spaced walls.
Author
Flame Propagation; Gravitational Effects

20040053555 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA
Gravitational Influences on Flame Propagation Through Non-Uniform, Premixed Gas Systems
Miller, Fletcher J.; Easton, John; Marchese, Anthony; Hovermann, Fred; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 189-192; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-2521; No Copyright; Avail: CASI; A01, Hardcopy

Flame propagation through non-uniformly premixed (or layered) gases has importance both in useful combustion systems and in unintentional fires. As summarized recently and in previous Microgravity Workshop papers, non-uniform premixed gas combustion receives scant attention compared to the more usual limiting cases of diffusion or uniformly premixed flames, especially regarding the role gravity plays. This paper summarizes our recent findings on gravitational effects on layered combustion along a floor, in which the fuel concentration gradient exists normal to the direction of flame spread. In an effort to understand the mechanism by which the flames spread faster in microgravity (and much faster, in laboratory coordinates, than the laminar burning velocity for uniform mixtures), we have begun making pressure measurements across the spreading flame front that are described here. Earlier researchers, testing in 1g, claimed that hydrostatic pressure differences could account for the rapid spread rates. Additionally, we present the development of a new apparatus to study flame spread in free (i.e., far from walls), non-homogeneous fuel layers formed in a flow tunnel behind an airfoil that has been tested in normal gravity.
Author
Gravitational Effects; Flame Propagation; Premixing; Floors

20040053557 San Diego State Univ., San Diego, CA, USA
Extinction Criteria for Opposed-Flow Flame Spread in a Microgravity Environment
Bhattacharjee, Subrata; Paolini, Chris; Wakai, Kazunori; Takahashi, Shuhei; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 201-204; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

A simplified analysis is presented to extend a previous work on flame extinction in a quiescent microgravity environment to a more likely situation of a mild opposing flow. The energy balance equation, that includes surface re-radiation, is solved to yield a closed form spread rate expression in terms of its thermal limit, and a radiation number that can be evaluated from the known parameters of the problem. Based on this spread rate expression, extinction criterions for a flame over solid fuels, both thin and thick, have been developed that are qualitatively verified with experiments conducted at the MGLAB in Japan. Flammability maps with oxygen level, opposing flow velocity and fuel thickness as independent variables are extracted from the theory that explains the well-established trends in the existing experimental data.
Author
Extinction; Flame Propagation; Microgravity

20040053559 NASA Glenn Research Center, Cleveland, OH, USA
Flame-Vortex Studies to Quantify Markstein Numbers Needed to Model Flame Extinction Limits
Driscoll, James F.; Feikema, Douglas A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 217-220; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-656; No Copyright; Avail: CASI; A01, Hardcopy

This has quantified a database of Markstein numbers for unsteady flames; future work will quantify a database of flame extinction limits for unsteady conditions. Unsteady extinction limits have not been documented previously; both a stretch rate and a residence time must be measured, since extinction requires that the stretch rate be sufficiently large for a sufficiently long residence time. Ma was measured for an inwardly-propagating flame (IPF) that is negatively-stretched under microgravity conditions. Computations also were performed using RUN-1DL to explain the measurements. The Markstein number of an

inwardly-propagating flame, for both the microgravity experiment and the computations, is significantly larger than that of an outwardy-propagating flame. The computed profiles of the various species within the flame suggest reasons. Computed hydrogen concentrations build up ahead of the IPF but not the OPF. Understanding was gained by running the computations for both simplified and full-chemistry conditions. Numerical Simulations. To explain the experimental findings, numerical simulations of both inwardly and outwardly propagating spherical flames (with complex chemistry) were generated using the RUN-1DL code, which includes 16 species and 46 reactions.
Derived from text
Flames; Vortices; Extinction

20040053565 NASA Glenn Research Center, Cleveland, OH, USA
Localized Ignition And Subsequent Flame Spread Over Solid Fuels In Microgravity
Kashiwagi, T.; Nakamura, Y.; Prasad, K.; Baum, H.; Olson, S.; Fujita, O.; Nishizawa, K.; Ito, K.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 125-128; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-919; C-32090K; No Copyright; Avail: CASI; A01, Hardcopy

Localized ignition is initiated by an external radiant source at the middle of a thin solid sheet under external slow flow, simulating fire initiation in a spacecraft with a slow ventilation flow. Ignition behavior, subsequent transition simultaneously to upstream and downstream flame spread, and flame growth behavior are studied theoretically and experimentally. There are two transition stages in this study; one is the first transition from the onset of the ignition to form an initial anchored flame close to the sample surface, near the ignited area. The second transition is the flame growth stage from the anchored flame to a steady fire spread state (i.e. no change in flame size or in heat release rate) or a quasi-steady state, if either exists. Observations of experimental spot ignition characteristics and of the second transition over a thermally thin paper were made to determine the effects of external flow velocity. Both transitions have been studied theoretically to determine the effects of the confinement by a relatively small test chamber, of the ignition configuration (ignition across the sample width vs spot ignition), and of the external flow velocity on the two transitions over a thermally thin paper. This study is currently extending to two new areas; one is to include a thermoplastic sample such poly(methymethacrylate), PMMA, and the other is to determine the effects of sample thickness on the transitions. The recent results of these new studies on the first transition are briefly reported.
Author
Ignition; Flame Propagation; Microgravity

20040053567 NASA Glenn Research Center, Cleveland, OH, USA
Upward And Downward Flame Spreading And Extinction In Partial Gravity Environments
Sacksteder, Kurt R.; Feier, Ioan I.; Ferkul, Paul V.; Kumar, Amit; T'ien, James S.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 141-144; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The premise of this research effort has been to begin exploring the gap in the literature between studies of material flammability and flame spread phenomena in normal-gravity and those conducted in the microgravity environment, with or without forced flows. From a fundamental point of view, flame spreading in upward (concurrent) buoyant flow is considerably different from concurrent forced flow. The flow accelerates throughout the length of the buoyant flame bringing the streamlines and the flame closer to the fuel surface and strengthening the interaction between the flame and fuel. Forced flows are diverted around the flame and away from the fuel surface, except where the flow might be constrained by a finite duct. The differences may be most clearly felt as the atmospheric conditions, viz. pressure or oxygen content, approach the flammability limit. From a more practical point of view, flame spreading and material flammability behavior have not been studied under the partial gravity conditions that are the natural state in space exploration destinations such as the Moon and Mars. This effort constitutes the beginning of the research needed to engineer fire safety provisions for such future missions. In this program we have performed partial-gravity experiments (from 0.1 to 1 g/g(sub Earth)) considering both upward and downward flame spread over thin solid fuels aboard the NASA KC-135 aircraft. In those tests, the atmospheric pressure and the fuel sample width were varied. Steady flame spread rates and approximate extinction boundaries were determined. Flame images were recorded using video cameras and two-dimensional fuel surface temperature distributions were determined using an IR camera. These results are available, and complement our earlier work in downward spread in partial gravity varying oxygen content. In conjunction with the experiment, three-dimensional models of flame spreading in buoyant flow have been developed. Some of the computed results on upward spreading have been presented. A derivative three-dimensional model of downward spreading has

been developed. It is currently being used to evaluate the standard limiting oxygen index (LOI) measuring device and its potential performance in different gravity levels.
Author (revised)
Flame Propagation; Microgravity; Fuels; Buoyancy-Driven Flow

20040053568 NASA Glenn Research Center, Cleveland, OH, USA
Low Stretch Solid-Fuel Flame Transient Response to a Step Change in Gravity
Armstrong, J. B.; Olson, S. L.; T'ien, J. S.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 137-140; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The effect of a step change in gravity level on the stability of low stretch diffusion flames over a solid fuel is studied both numerically and experimentally. Drop tower experiments have been conducted in NASA Glenn Research Center's 5.2 Zero Gravity Facility. In the experiments burning PMMA cylinders, a dynamic transition is observed when the steadily burning 1g flame is dropped and becomes a 0g flame. To understand the physics behind this dynamic transition, a transient stagnation point model has been developed which includes gas-phase radiation and solid phase coupling to describe this dynamic process. In this paper, the experimental results are compared with the model predictions. Both model and experiment show that the interior of the solid phase does not have time to change significantly in the few seconds of drop time, so the experimental results are pseudo-steady in the gas-phase, but the solid is inherently unsteady over long time scales. The model is also used to examine the importance of fractional heat losses on extinction, which clearly demonstrates that as the feedback from the flame decreases, the importance of the ongoing heat losses becomes greater, and extinction is observed when these losses represent 80% or more of the flame feedback.
Author
Combustion Physics; Microgravity; Transient Response; Diffusion Flames

20040053569 California Univ., San Diego, CA, USA
Analysis Of MSL-1 Measurements Of Heptane Droplet Combustion
Ackerman, Malissa; Williams, Forman; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 145-148; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-769; No Copyright; Avail: CASI; A01, Hardcopy

A droplet combustion experiment (DCE) was performed on the MSL-1 mission of the Space Shuttle Columbia. There were two flights of this mission - STS-83 in April of 1997 and STS-94 in July of 1997. The reflight occurred because a fuel-cell power problem onboard the shuttle forced an early termination of the first flight; this was the only shuttle mission to be flown twice. DCE data were obtained during both flights. A fiber-supported droplet combustion (FSDC) experiment also was run on STS-94. This smaller 'glovebox' experiment, which investigated the combustion of fiber-supported droplets in Spacelab cabin air, had previously flown on the first USA Microgravity Laboratory (USML-1) mission of STS-73, but successful measurements with heptane as the fuel in this experiment were first obtained on STS-94. Although heptane droplet combustion in convective flow also was studied on STS-94, only data without forced convection are considered here. The objective of the present paper is to analyze the results on heptane droplet combustion in quiescent atmospheres.
Author
Heptanes; Combustion Physics; Drops (Liquids)

20040053570 Princeton Univ., NJ, USA
Recent Advances In Science Support For Isolated Droplet Combustion Experiments
Dryer, F. L.; Kazakov, A.; Urban, B. D.; Kroenlein, K.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 149-152; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-735; No Copyright; Avail: CASI; A01, Hardcopy

In a joint program involving Prof. F.A. Williams of the University of California, San Diego and Dr. V. Nayagam of the National Center for Microgravity Research, the combustion characteristics of isolated liquid fuel droplets of n-heptane, n-decane, methanol, methanol-water, ethanol and ethanol-water having initial diameters between about 1 mm and 6 mm continues to be investigated. The objectives of the work are to improve fundamental knowledge of droplet combustion dynamics for pure fuels and fuel-water mixtures through microgravity experiments and theoretical analyses. The Princeton contributions support the engineering design, data analysis, and data interpretation requirements for the study of initially single component, spherically symmetric, isolated droplet combustion studies through experiments and numerical modeling. UCSD contributions are described in a companion communication in this conference. The Princeton effort also addresses the analyses

of Fiber Supported Droplet Combustion (FSDC) experiments conducted with the above fuels and collaborative work with others who are investigating droplet combustion in the presence of steady convection. A thorough interpretation of droplet burning behavior for n-heptane and n-decane over a relatively wide range of conditions also involves the influences of sooting on the combustion behavior, and this particular aspect on isolated burning of droplets is under consideration in a collaborative program underway with Drexel University. This collaboration is addressed in another communication at this conference. The one-dimensional, time-dependent, numerical modeling approach that we have continued to evolve for analyzing isolated, quiescent droplet combustion data has been further applied to investigate several facets of isolated droplet burning of simple alcohols, n-heptane, and n-decane. Some of the new results are described below.
Author
Drops (Liquids); Microgravity; Combustion Physics; Liquid Fuels; Fuel Combustion

20040053572 NASA Glenn Research Center, Cleveland, OH, USA
Fan Beam Emission Tomography for Laminar Fires
Sivathanu, Yudaya; Lim, Jongmook; Feikema, Douglas; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 237-240; In English; See also 20040053504
Contract(s)/Grant(s): NAS3-01085; No Copyright; Avail: CASI; A01, Hardcopy

Obtaining information on the instantaneous structure of turbulent and transient flames is important in a wide variety of applications such as fire safety, pollution reduction, flame spread studies, and model validation. Durao et al. has reviewed the different methods of obtaining structure information in reacting flows. These include Tunable Laser Absorption Spectroscopy, Fourier Transform Infrared Spectroscopy, and Emission Spectroscopy to mention a few. Most flames emit significant radiation signatures that are used in various applications such as fire detection, light-off detection, flame diagnostics, etc. Radiation signatures can be utilized to maximum advantage for determining structural information in turbulent flows. Emission spectroscopy is most advantageous in the infrared regions of the spectra, principally because these emission lines arise from transitions in the fundamental bands of stable species such as CO2 and H2O. Based on the above, the objective of this work was to develop a fan beam emission tomography system to obtain the local scalar properties such as temperature and mole fractions of major gas species from path integrated multi-wavelength infrared radiation measurements.
Derived from text
Carbon Dioxide; Detection; Diagnosis; Emission Spectra; Fire Prevention; Flame Propagation; Turbulent Flow; Tomography

20040053573 Princeton Univ., NJ, USA
Oscillatory Extinction Of Spherical Diffusion Flames
Law, C. K.; Yoo, S. W.; Christianson, E. W.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 245-248; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Since extinction has been observed in an oscillatory manner in Le greater than 1 premixed flames, it is not unreasonable to expect that extinction could occur in an unsteady manner for diffusion flames. Indeed, near-limit oscillations have been observed experimentally under microgravity conditions for both candle flames and droplet flames. Furthermore, the analysis of Cheatham and Matalon on the unsteady behavior of diffusion flames with heat loss, identified an oscillatory regime which could be triggered by either a sufficiently large Lewis number (even without heat loss) or an appreciable heat loss (even for Le=1). In light of these recent understanding, the present investigation aims to provide a well-controlled experiment that can unambiguously demonstrate the oscillation of diffusion flames near both the transport- and radiation-induced limits. That is, since candle and jet flames are stabilized through flame segments that are fundamentally premixed in nature, and since premixed flames are prone to oscillate, there is the possibility that the observed oscillation of these bulk diffusion flames could be triggered and sustained by the oscillation of the premixed flame segments. Concerning the observed oscillatory droplet extinction, it is well-known that gas-phase oscillation in heterogeneous burning can be induced by and is thereby coupled with condensed-phase unsteadiness. Consequently, a convincing experiment on diffusion flame oscillation must exclude any ingredients of premixed flames and other sources that may either oscillate themselves or promote the oscillation of the diffusion flame. The present experiment on burner-generated spherical flames with a constant reactant supply endeavored to accomplish this goal. The results are further compared with those from computational simulation for further understanding and quantification of the flame dynamics and extinction.
Derived from text
Burners; Combustion; Diffusion Flames; Premixed Flames

20040053575 NASA Glenn Research Center, Cleveland, OH, USA

Gravity Effects Observed In Partially Premixed Flames

Puri, Ishwar K.; Aggarwal, Suresh K.; Lock, Andrew J.; Gauguly, Ranjan; Hegde, Uday; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 253-256; In English; See also 20040053504 Contract(s)/Grant(s): NCC3-688; No Copyright; Avail: CASI; A01, Hardcopy

Partially premixed flames (PPFs) contain a rich premixed fuel air mixture in a pocket or stream, and, for complete combustion to occur, they require the transport of oxidizer from an appropriately oxidizer-rich (or fuel-lean) mixture that is present in another pocket or stream. Partial oxidation reactions occur in fuel-rich portions of the mixture and any remaining unburned fuel and/or intermediate species are consumed in the oxidizer-rich portions. Partial premixing, therefore, represents that condition when the equivalence ratio (phi) in one portion of the flowfield is greater than unity, and in another section its value is less than unity. In general, for combustion to occur efficiently, the global equivalence ratio is in the range fuel-lean to stoichiometric. These flames can be established by design by placing a fuel-rich mixture in contact with a fuel-lean mixture, but they also occur otherwise in many practical systems, which include nonpremixed lifted flames, turbulent nonpremixed combustion, spray flames, and unwanted fires. Other practical applications of PPFs are reported elsewhere. Although extensive experimental studies have been conducted on premixed and nonpremixed flames under microgravity, there is a absence of previous experimental work on burner stabilized PPFs in this regard. Previous numerical studies by our group employing a detailed numerical model showed gravity effects to be significant on the PPF structure. We report on the results of microgravity experiments conducted on two-dimensional (established on a Wolfhard-Parker slot burner) and axisymmetric flames (on a coannular burner) that were investigated in a self-contained multipurpose rig. Thermocouple and radiometer data were also used to characterize the thermal transport in the flame.

Derived from text

Gravitational Effects; Premixed Flames; Combustion; Fires

20040053577 Maryland Univ., College Park, MD, USA

Characteristics of Gaseous Diffusion Flames with High Temperature Combustion Air in Microgravity

Ghaderi, M.; Gupta, A. K.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 265-268; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The characteristics of gaseous diffusion flames have been obtained using high temperature combustion air under microgravity conditions. The time resolved flame images under free fall microgravity conditions were obtained from the video images obtained. The tests results reported here were conducted using propane as the fuel and about 1000 C combustion air. The burner included a 0.686 mm diameter central fuel jet injected into the surrounding high temperature combustion air. The fuel jet exit Reynolds number was 63. Several measurements were taken at different air preheats and fuel jet exit Reynolds number. The resulting hybrid color flame was found to be blue at the base of the flame followed by a yellow color flame. The length and width of flame during the entire free fall conditions has been examined. Also the relative flame length and width for blue and yellow portion of the flame has been examined under microgravity conditions. The results show that the flame length decreases and width increases with high air preheats in microgravity condition. In microgravity conditions the flame length is larger with normal temperature combustion air than high temperature air.

Author

Gaseous Diffusion; Diffusion Flames; High Temperature Air; Microgravity; Propane

20040053585 Washington Univ., Seattle, WA, USA

Effects of Buoyancy and Forcing on Transitioning and Turbulent Lifted Flames

Kosaly, George; Kramlich, John C.; Riley, James J.; Nichols, Joseph W.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 297-300; In English; See also 20040053504 Contract(s)/Grant(s): NAG3-2517; No Copyright; Avail: CASI; A01, Hardcopy

The objectives of this paper are two-fold. First, a numerical scheme for the simulation of a buoyant, reacting jet is presented with special attention given to boundary conditions. In the absence of coflow, a jet flame is particularly sensitive to boundary conditions enforced upon the computational domain. However, careful consideration of proper boundary conditions can minimize their effect upon the overall simulation. Second, results of some preliminary simulations are presented over a range of Froude and Damkohler numbers. This range was chosen so as to produce lifted flames in both normal gravity and microgravity environments.

Author

Buoyancy; Numerical Analysis; Turbulent Flames; Microgravity

20040053642 National Inst. of Standards and Technology, Gaithersburg, MD

Air-Kerma-Rate Coefficients for Selected Photon-Emitting Radionuclide Sources

Seltzer, S. M.; Mar. 2003; 16 pp.; In English

Report No.(s): PB2004-104098; NISTIR-7092; No Copyright; Avail: CASI; A03, Hardcopy

Calculations have been done to provide estimates of the air-kerma rate, as a function of distance in air that can be expected from the photons emerging from sealed sources containing pure (sup 241)Am, (sup 57)Co, (sup 133)Ba, (sup 137)Cs, (sup 228)Th (and daughters, in secular equilibrium), and (sup 60)Co. A number of encapsulation geometries are considered, including those planned for possible deployment in support of newly developed standards for the routine testing of radiological detection and measuring instruments to meet homeland-security requirements.

NTIS

Radioactive Isotopes; Encapsulating

20040055274 Lawrence Livermore National Lab., Livermore, CA

Modeling Chemical Detection Senstivities of Acitve and Passive Remote Sensing Systems

Scharlemann, E. T.; Jul. 28, 2003; 18 pp.; In English

Report No.(s): DE2004-15006448; UCRL-JC-151751; No Copyright; Avail: Department of Energy Information Bridge

During nearly a decade of remote sensing programs under the auspices of the U. S. Department of Energy (DOE), LLNL has developed a set of performance modeling codes - called APRS - for both Active and Passive Remote Sensing systems. These codes emphasize chemical detection sensitivity in the form of minimum detectable quantities with and without background spectral clutter and in the possible presence of other interfering chemicals. The codes have been benchmarked against data acquired in both active and passive remote sensing programs at LLNL and Los Alamos National Laboratory (LANL). The codes include, as an integral part of the performance modeling, many of the data analysis techniques developed in the DOE's active and passive remote sensing programs (e.g., 'band normalization' for an active system, principal component analysis for a passive system).

NTIS

Remote Sensing; Chemical Detection

20040055393 Search for Extraterrestrial Intelligence Inst., Mountain View, CA, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA

Stimulated Mid-Infrared Luminescence Experiment: Contribution to the Study of Pre-Earthquake Phenomena and UV Absorption by Interstellar Dust

Freund, Friedemann; Freund, Minoru M.; Tsay, Si-Chee; Ouzounov, Dimitar; April 16, 2004; 18 pp.; In English

Contract(s)/Grant(s): NAG5-12658; No Copyright; Avail: CASI; A03, Hardcopy

The work performed under this proposal is based on the experimentally supported observation - or inference - that a small fraction of the oxygen anions in silicate minerals in igneous and high-grade metamorphic rocks on Earth may not be in the usual 2- oxidation state, O(sup 2-), but in a higher oxidation state, as O(sup -). If this is true, the same would likely apply to the fine dust that fills the diffuse interstellar medium. An (sup -) in a matrix of O(sup 2-) represents a defect electron in the valence band, also known as positive hole or p-hole for short. When two O(sup -) combine, they undergo spin-pairing and form a positive hole pair, PHP. Chemically speaking a PHP is a peroxy bond. In an oxide matrix a peroxy bond takes the form of a peroxy anion, O2(sup 2-). In a silicate matrix it probably exists in the form of peroxy links between adjacent [SiO4] tetrahedral, O3Si00\SiO3. From a physics perspective a PHP is an electrically inactive point defect, which contains dormant electronic charge carriers. When the peroxy bond breaks, p-hole charge carriers are released. These p-holes are diffusively mobile and spread through the O 2p-dominated valence band of the otherwise insulating mineral matrix.

Derived from text

Luminescence; Infrared Imagery; Earthquakes; Ultraviolet Absorption; Interstellar Matter; Dust

20040055655 Ceskoslovenska Akademie Ved, Prague

Investigation of Chemical Generation of Atomic Iodine for a COIL, and its Testing in the Supersonic COIL, Using a Diode Probe

Spalek, Otomar; Jirasek, Vit; Censky, Miroslav; Kodymova, Jarmila; Jan. 27, 2004; 63 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421794; No Copyright; Avail: CASI; A04, Hardcopy

The research on atomic iodine generation in the framework of this grant follows-up the previous contracts but the

experimental work has moved up in the case of 'chlorine' system from the small-scale devices to the supersonic COIL. The Iodine Scan Laser Diode Probe diagnostics was used for the parametric COIL testing. This diagnostics lent to our COIL Laboratory from the US AFRL at the Kirtland AFE was necessary for this investigation.
DTIC
Atoms; Diodes; Iodine

26
METALS AND METALLIC MATERIALS

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

20040052833 Air Force Missile Development Center, Holloman AFB, NM, USA
Study of the Micro-Nonuniformity of the Plastic Deformation of Steel
Chechulin, B. B.; Fizuka Metallov i Metallovedenie (Physics Of Metals I Physical Metallurgy); August 1957; Volume 1, No. 2, pp. 251-260; In English
Report No.(s): NACA/TM-1411; No Copyright; Avail: CASI; A03, Hardcopy

The plastic flow during deformation of real polycrystalline metals has specific characteristics which distinguish the plastic deformation of metals from the deformation of ordinary isotropic bodies. One of these characteristics is the marked micro-nonuniformity of the plastic deformation of metals. P.O. Pashkov demonstrated the presence of a considerable micro-nonuniformity of the plastic deformation of coarse-grained steel wit medium or low carbon content. Analogous results in the case of tension of coarse-grained aluminum were obtained by W. Boas, who paid particular attention to the role of the grain boundaries in plastic flow. The nonuniformit of the plastic deformation in microvolumes was also recorded by T.N. Gudkova and others, on the alloy KhN80T. N.F. Lashko pointed out the nonuniformity of the plastic deformation for a series of pure polycrystalline metals and one-phase alloys. In his later reports, P.O. Pashkov arrives at he conclusion that the nonuniformity of the distribution of the deformation along the individual grains has a significant effect on the strength and plastic characteristics of polycrystalline metals in the process of plastic flow. However, until now there has not existed any systematic investigation of the general rules of the microscopic nonuniformit of plastic deformation even though the real polycrystalline metals are extremely simple with regard to structure. In the present report, an attempt is made to study the micrononuniformity of the flow of polycrystalline metals by the method of statistical analysis of the variation of the frequency diagrams of the nonuniformity of the grains in the process of plastic deformation.
Author
Nonuniformity; Plastic Deformation; Mechanical Properties; Microstructure; Polycrystals; Austenitic Stainless Steels

20040053542 NASA Glenn Research Center, Cleveland, OH, USA
A Carbon Arc Apparatus For Production Of Nanotubes In Microgravity
Alford, J. M.; Mason, G. R.; Feikema, D. A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 69-72; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Although many methods are available for production of single-walled carbon nanotubes (SWNTs), the conventional carbon arc process remains the most popular due to its simplicity and large production rate. However, high temperatures inside the carbon arc generate strong buoyancy driven convection, and it is hypothesized that the non-uniform environment created by this flow will have large effects on the growth and morphology of SWNTs produced by the arc process. Indeed, using normal gravity experiments, Marin et al. have demonstrated that changes in the buoyant convection plume produced by altering the arc electrode orientation can be used to change the diameter distribution of the SWNTs produced; an effect they attribute to changes in the temperature of the local nanotube growth environment. While these experiments present convincing evidence that buoyant convection has a strong effect on nanotube growth, normal gravity experiments are severely limited in scope. The ideal way to study the effect of buoyancy on SWNT production is to remove it completely. Toward this goal, a microgravity carbon arc reactor has been designed for use in the NASA Glenn 2.2 and 5 second drop towers. Although simple in principle, conventional carbon arc machines, which generally employ large reaction chambers and require heavy duty welding power supplies capable of supplying kilowatts of power, are not suitable for microgravity experiments. Here we describe a miniature carbon arc machine for SWNT production that fits into a conventional drop rig for use on the NASA

Glenn 2.2 and 5 second drop towers, but that has a performance (production rate) that is better than most large ground-based machines.
Author
Carbon Nanotubes; Carbon Arcs; Plumes; Nanostructure Growth; Gravitational Effects; Microgravity; Buoyancy-Driven Flow

20040053635 Helsinki Univ. of Technology, Espoo, Finland
Study of Submerged ARC, Laser and Hybrid Weld Properties of Shipbuilding Steels. Residual Stresses CSS-Curves and Fractography
Gripenberg, H.; 2003; In English
Report No.(s): PB2004-102765; TKK-MTR-2/03; Copyright; Avail: National Technical Information Service (NTIS)
The trend in industry towards a lighter and stronger welded structures demands thorough understanding of the mechanical capacity of the materials and the weldments. A reliable assessment of the structural strength of a fatigue loaded weldment requires knowledge of material properties, such as the cyclic stress-strain curve for the base and weld material. The cyclic stress-strain properties of two structural steels were studied. The steels were butt-welded using three methods: submerged arc welding (SAW), laser and hybrid welding. The cyclic stress-strain curves were determined for the base materials and the welds. The effects of mechanical fatigue loading on the residual stresses in the weldments were studied at two positions: in the heat affected zone (HAZ) and in the base material. The fractured specimens were studied by scanning electron microscopy (SEM) in order to determine the fatigue crack growth rate (CGR) by striation spacing measurements.
NTIS
Steels; Residual Stress; Welded Joints

20040053690 National Inst. for Occupational Safety and Health, Washington, DC, USA
Beryllium Disease Natural History and Exposure-Response
Newman, L. S.; Jan. 24, 2003; 24 pp.; In English
Report No.(s): PB2004-104519; No Copyright; Avail: CASI; A03, Hardcopy
The granulomatous lung disorder chronic beryllium disease (CBD) occurs in beryllium workers who develop a cell-mediated immune response to beryllium. Cases continue to occur in the modern beryllium industry, despite efforts to reduce exposure. Workplace screening for beryllium sensitization using the blood beryllium lymphocyte proliferation test (blood BeLPT) identifies workers with (1) clinically significant, symptomatic CBD that has been misdiagnosed or gone undetected, (2) asymptomatic subclinical granulomatous lung disease, and (3) asymptomatic beryllium sensitization with no lung disease at the time of clinical evaluation (BeS). Some individuals with BeS progress to CBD and some with subclinical CBD develop clinical disease, although the frequency with which this occurs is not known. Several surveillance studies using the blood BeLPT to screen beryllium-exposed workforces found process-related risks of BeS and disease as well as genetic risk factors.
NTIS
Beryllium; Occupational Diseases

20040055459 Army Research Lab., Aberdeen Proving Ground, MD
Analysis of Erosion Transition in Tungsten-Alloy Rods into Aluminum Targets
Segletes, Steven B.; Mar. 2004; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421229; ARL-TR-3153; No Copyright; Avail: CASI; A04, Hardcopy
This work extends and refines the phenomenological understanding of ballistic penetration in the vicinity of the erosion-threshold velocity, for the case of hemispherical- nosed tungsten rods striking ductile targets. Analysis, supported by experimentation, indicates a period of noneroding penetration for these configurations, which results from lateral support exerted by the target crater upon the deforming, yet noneroding, penetrator. Experiments indicate that the magnitude of the lateral support, the direct result of an interference fit between rod and crater, must be on the order of the target's ballistic-penetration resistance, and does not vary with the impact velocity over the range studied. Analysis suggests that the duration of the noneroding portion of the ballistic event is neither governed by a fixed time, nor by a fixed depth of penetration, but rather by a fixed, permissible level of deformation in the penetrator.
DTIC
Aluminum; Erosion; Rods; Targets; Tungsten Alloys

20040055589 Naval Surface Warfare Center, Bethesda, MD

SIDER Testing of a Damaged Section of Mast From the Mirabella V Superyacht

Ratchliffe, Colln P.; Crane, Roger M.; Sep. 2003; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421444; NSWCCD-65-TR-2003/38; No Copyright; Avail: CASI; A03, Hardcopy

This report documents work performed by the Naval Surface Warfare Center, Carderock Division in support of The Technical Cooperation Program (TTCP), composite panel TP-7, Operating Assignment 026, on the durability assessment of composites in the service environment. This is part of KTA-101 composite performance and long-term durability under dynamic, thermal and shock loading. This report presents the results of a single Structural Irregularity and Damage Evaluation Routine (SIDER) inspection of one section of the new mast of the Mirabella V superyacht. The section that was tested had known manufacturing defects. Prior to the SIDER testing, the decision had been made by VT Palmatic Limited, Portchester Shipyard, Hamilton Road, Portsmouth, UK to remake the component. Therefore, the work reported here was conducted on a structurally unacceptable component that was not going to be used in service.

DTIC

Beams (Supports); Mechanical Shock; Thermodynamic Properties

20040055643 Army Research Office, Research Triangle Park, NC

Titanium Structures for Army Systems

Mullins, W. M.; May 11, 2001; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421722; No Copyright; Avail: CASI; A03, Hardcopy

Presentation on the use of titanium structures in Army systems/Army applications.

DTIC

Titanium

20040056020 NASA Langley Research Center, Hampton, VA, USA

Multiscale Modeling of Metallic Materials Containing Embedded Particles

Phillips, Dawn R.; Iesulauro, Erin; Glaessgen, Edward H.; March 25, 2004; 8 pp.; In English; 45th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 19-22 Apr. 2004, Palm Springs, CA, USA

Contract(s)/Grant(s): NAS1-00135; NAG1-02051; 706-63-51

Report No.(s): AIAA Paer 2004-1699; No Copyright; Avail: CASI; A02, Hardcopy

Multiscale modeling at small length scales (10(exp -9) to 10(exp -3) m) is discussed for aluminum matrices with embedded particles. A configuration containing one particle surrounded by about 50 grains and subjected to uniform tension and lateral constraint is considered. The analyses are performed to better understand the effects of material configuration on the initiation and progression of debonding of the particles from the surrounding aluminum matrix. Configurational parameters considered include particle aspect ratio and orientation within the surrounding matrix. Both configurational parameters are shown to have a significant effect on the behavior of the materials as a whole. For elliptical particles with the major axis perpendicular to the direction of loading, a particle with a 1:1 aspect ratio completely debonds from the surrounding matrix at higher loads than particles with higher aspect ratios. As the particle major axis is aligned with the direction of the applied load, increasing amounts of load are required to completely debond the particles.

Author

Models; Metal Matrix Composites; Embedding; Debonding (Materials); Aluminum Alloys

20040056033 Army Research Lab., Hampton, VA, USA

Selective Reinforcement to Improve Fracture Toughness and Fatigue Crack Growth Resistance in Metallic Structures

Farley, Gary L.; Newman, John A.; James, Mark A.; [2004]; 13 pp.; In English; 45th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 19-22 Apr. 2004, Palm Springs, CA, USA

Contract(s)/Grant(s): 23-762-55-LE

Report No.(s): AIAA Paper 2004-1924; No Copyright; Avail: CASI; A03, Hardcopy

Experimental and analytical investigations of the fatigue crack growth and fracture response of aluminum selectively reinforced compact tension specimens were performed. It was shown that selective reinforcement significantly improved these responses primarily through load sharing by the reinforcement. With the appropriate combination of reinforcement architecture and mechanical properties, as well as reinforcement to base aluminum interface properties, fatigue cracks can be arrested using selective reinforcement. Maximum load associated with fracture increased up to 20 percent for the cases investigated and crack growth at maximum load increased as much as 150 percent. For both fatigue crack growth and fracture,

the three most influential properties identified within the bounds of this investigation that influence this response are reinforcement width, reinforcement stiffness and interface stiffness. Considerable coupling occurs between the different fiber architecture and material properties and how they influence fatigue crack growth and fracture responses.
Author
Aluminum; Crack Propagation; Fatigue (Materials); Fracture Strength

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*.

20040052868 NASA Langley Research Center, Hampton, VA, USA
Quasi-Uniform High Speed Foam Crush Testing Using a Guided Drop Mass Impact
Jones, Lisa E., Technical Monitor; Kellas, Sotiris; April 2004; 25 pp.; In English
Contract(s)/Grant(s): GSA-GS-00F0067M; WU 23-376-70-30-07
Report No.(s): NASA/CR-2004-213009; L-71773D; No Copyright; Avail: CASI; A03, Hardcopy

A relatively simple method for measuring the dynamic crush response of foam materials at various loading rates is described. The method utilizes a drop mass impact configuration with mass and impact velocity selected such that the crush speed remains approximately uniform during the entire sample crushing event. Instrumentation, data acquisition, and data processing techniques are presented, and limitations of the test method are discussed. The objective of the test method is to produce input data for dynamic finite element modeling involving crash and energy absorption characteristics of foam materials.
Author
Crushing; Data Processing; Dynamic Response; Energy Absorption; Foams; Impact Velocity

20040053447 Ohio Aerospace Inst., Cleveland, OH, USA
Thermo-Mechanical Optimization of a Gold Thick-film based SiC Die-attach Assembly using Finite Element Analysis
Lin, Shun-Tien; Chen, Liang-Yu; Packaging Technology for SiC High Temperature Circuits Operable up to 500 C; [2002]; 11 pp.; In English; 6th International High Temperature Electronics Conference, 2-5 Jun. 2002, Albuquerque, NM, USA; See also 20040053446; Original contains black and white illustrations
Contract(s)/Grant(s): NCC-867; No Copyright; Avail: CASI; A03, Hardcopy

A parametric study of the thermomechanical reliability of a Au thick-film based Sic-die- attach assembly using nonlinear finite element analysis (FEA) was conducted to optimize the die-attach thermo-mechanical performance for operation at temperatures from room temperature to 500 ‘C. This parametric study centered on material selection, structure design and process control. The die-attach assembly is composed of a 1 mm x 1 mm S i c die attached to a ceramic substrate (either 96% aluminum oxide (A1203) or aluminum nitride (AlN)) with a gold (Au) thick-film attach layer. The effects of die-size, Au attach layer thickness, substrate material, and stress relaxing temperature on the stress/strain distribution and relative fatigue lifetime of the die-attach assembly were numerically analyzed. By comparing the calculated permanent strain in the thick-film attach layer, FEA results indicate that AlN is superior to Al2O3. Thicker Au attach layers and smaller die sizes are recommended to reduce the permanent strain in thick-film die attach layer. Thicker S i c die also reduces the stress near the (top) surface region of the die. A stress relaxing temperature close to the midpoint of the operating temperature range further reduces the maximum stress/strain, thereby improving die-attach thermo-mechanical reliability. These recommendations present guidelines to optimize the thermo-mechanical performance of the die-attach assembly and are valid for a wide range of thermal environments.
Author
Microelectromechanical Systems; Silicon Carbides; Mechanical Properties

20040055584 Nebraska Univ., Lincoln, NE
Polymers and Oligomers of Carbon-Sulfur Helicenes
Rajca, Andrzej; Mar. 23, 2004; 6 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0550
Report No.(s): AD-A421423; No Copyright; Avail: CASI; A02, Hardcopy

Synthetic approaches to racemic and enantiomerically pure helical oligomers (helicenes)were developed. The molecular

shape of the oligomers were modified with substituents to control the solid state packing; one of such oligomers was found to form a nearly isotropic chiral molecular glass with a significant rotatory power.
DTIC
Carbon; Oligomers; Sulfur

20040055878 Department of the Navy, Washington, DC
Process for Continuous Foam Extrusion of Thermoplastic Polymers Via Syntactic and Chemical Foaming Agents
Beauregard, Donald V., Inventor; Schott, Nick R., Inventor; Orroth, Stephen A., Inventor; Trainer, Lawrence J., Inventor; Jones, Judith A., Inventor; Aug. 11, 2003; 22 pp.; In English
Patent Info.: Filed 11 Aug. 2003; US-Patent-Appl-SN-10641584
Report No.(s): AD-D020133; No Copyright; Avail: Defense Technical Information Center (DTIC)

A process for producing an electrical insulative material. First there is produced a composition including a thermoplastic polymer resin selected from the group consisting of a polyethylene octene, a polyethylene hexene, a polyethylene heptene, a polyethylene nonene and a polyethylene decene; a filler selected from the group consisting of expandable polymer microballoons and glass microspheres; and a blowing agent comprising a physical blowing% agent and% a chemical blowing agent. The chemical-blowing agent is selected from one or more of the group consisting of an exothermic blowing agent and an endothermic blowing agent. This composition is then continuously foam extruded.
DTIC
Extruding; Foaming; Foams; Patent Applications; Thermoplastic Resins; Thermoplasticity

20040055982 NASA Langley Research Center, Hampton, VA, USA
A Hybrid Actuation System Demonstrating Significantly Enhanced Electromechanical Performance
Su, Ji; Xu, Tian-Bing; Zhang, Shujun; Shrout, Thomas R.; Zhang, Qiming; February 19, 2004; 7 pp.; In English; SPIE 11th Annual International Symposium on Smart Structures and Materials, 14-18 Mar. 2004, San Diego, CA, USA
Report No.(s): LAR-16698-1; No Copyright; Avail: CASI; A02, Hardcopy

A hybrid actuation system (HYBAS) utilizing advantages of a combination of electromechanical responses of an electroactive polymer (EAP), an electrostrictive copolymer, and an electroactive ceramic single crystal, PZN-PT single crystal, has been developed. The system employs the contribution of the actuation elements cooperatively and exhibits a significantly enhanced electromechanical performance compared to the performances of the device made of each constituting material, the electroactive polymer or the ceramic single crystal, individually. The theoretical modeling of the performances of the HYBAS is in good agreement with experimental observation. The consistence between the theoretical modeling and experimental test make the design concept an effective route for the development of high performance actuating devices for many applications. The theoretical modeling, fabrication of the HYBAS and the initial experimental results will be presented and discussed.
Author
Electromechanical Devices; Single Crystals; Electroactive Polymers; Ceramics

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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*.

20040053390 Research and Technology Organization, Neuilly-sur-Seine, France
Internal Aerodynamics in Solid Rocket Propulsion
January 2004; 468 pp.; In English; RTO/VKI Special Course: International Aerodynamics in Solid Rocket Propulsion, 27-31 May 2002, Rhode-Saint-Genese, Belgium; See also 20040053391 - 20040053401
Contract(s)/Grant(s): N00014-95-I-1338; AGTSR-98-02-SR072; F49620-99-I-0118
Report No.(s): RTO-EN-023; AC/323(AVT-096)TP/70; Copyright; Avail: CASI; A20, Hardcopy; C01, CD-ROM

Considerations of the optimal approaches to adapt space launchers to a changing market should lead to significant breakthroughs in solid rocket propulsion technology, mainly in the areas of reduced costs and improved performance characteristics. The goal of this NATO Research and Technology Organization (RTO) sponsored lecture series was to provide a forum for the review of various scientific and industrial aspects of solid rocket propulsion and an assessment of recent advances with emphasis on internal aerodynamics. The present lecture notes are intended as a natural follow-up to the

AGARD-LS-180 Combustion of Solid Propellants organized in 1991. These RTO-AVT / VKI Special Course notes provide the state of the art in internal aerodynamics in solid rocket propulsion, in a way accessible to attendees coming from both academic and industrial areas. Two families of solid motors can be identified: tactical rockets and large boosters for launch vehicles. The military rockets are subjected to combustion instabilities while vortex shedding drives the instabilities in the large boosters. After an overview of the motor internal flow dynamics, combustion of solid propellants and metal particulates were presented. Numerical modeling of internal flow aerodynamics, two-phase flow and flow/structural interactions were addressed, before focusing on the motor flow and combustion instabilities.
Author
Aerodynamics; Solid Propellant Combustion

20040053506 Poitiers Univ., France
Detailed Description Of The Structure Of A Low Velocity Laminar Diffusion Flame In Microgravity
Cordeiro, Pierre; Legros, Guillaume; Rouvreau, Sebastien; Joulain, Pierre; Torero, Jose L.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 93-96; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

This paper reports on a detailed experimental study of the velocity fields across a combustion chamber and the associated CH* and soot extinction measurements performed on the diffusion flame. Experiments were conducted with a gas fuel burner and on board of the Airbus A300. The measurements revealed the detailed three-dimensional nature of the flow and its influence on flame geometry and flame length. Experimental results have been compared with numerical simulations showing good agreement. CH* measurement have been used to define the reaction zone and incorporate a corrective factor to the soot extinction measurements leading to a more precise mapping of soot concentrations around the flame. Preliminary agreement has been observed for radiation heat losses between radiometer data and the analytical expressions developed using soot concentration evaluations.
Author
Low Speed; Diffusion Flames; Combustion Chambers; Soot; Three Dimensional Flow; Flames; Velocity Distribution

20040053511 AeroChem Research Labs., Inc., Princeton, NJ, USA
Particle Generation And Evolution In Silane (SiH4)/Acetylene (C2H2) Flames In Microgravity
Keil, D. G.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 353-356; In English; See also 20040053504
Contract(s)/Grant(s): NAS3-01092; No Copyright; Avail: CASI; A01, Hardcopy

The objective of this experimental program is to advance the understanding of the coupling of particle formation with gas phase combustion processes. The work utilizes the unique SiH4/C2H2 combustion system which generates particulate products ranging from high purity, white SiC to carbonaceous soot depending on equivalence ratio (Ref. 1). A goal of this work is to identify gas phase or particle formation processes that provide the enthalpy release needed to drive the combustion wave, and to locate the steps of the particle formation process that determine SiC stoichiometry and crystallinity. In a real sense, these SiH4/C2H2 flames act like highly sooty hydrocarbon flames, but with simpler chemistry. This simplification is expected to allow them to be used as surrogates to advance understanding of soot formation in such rich hydrocarbon flames. It is also expected that this improved understanding of SiC particle generation and evolution in these self-sustaining flames will advance the commercial potential of the flame process for the generation of high purity SiC powders.
Author
Microgravity; Combustion Chemistry; Flames

20040053512 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Microgravity Superagglomerates Produced By Silane And Acetylene
Gokoglu, Suleyman, Technical Monitor; Bundy, Matthew; Mulholland, George W.; Manzello, Samuel; Yang, Jiann; Scott, John Henry; Sivathanu, Yudaya; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 57-60; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The size of the agglomerates produced in the upper portion of a flame is important for a variety of applications. Soot particle size and density effect the amount of radiative heat transfer from a fire to its surroundings. Particle size determines the lifetime of smoke in a building or in the atmosphere, and exposure hazard for smoke inhaled and deposited in the lungs. The visibility through a smoke layer and dectectability of the smoke are also greatly affected by agglomerate size. Currently there is limited understanding of soot growth with an overall dimension of 10 m and larger. In the case of polystyrene, smoke

agglomerates in excess of 1 mm have been observed raining out from large fires. Unlike hydrocarbon fuels, silane has the advantage that silica particles are the major combustion product resulting in a particle volume fraction a factor of ten greater than that for a carbonaceous smoke. There are two very desirable properties of silica aero-gels that are important for both space and earth based applications. The first important property is its inertness to most oxidizing and reducing atmospheres. Therefore, silica aero-gels make excellent fire ablatives and can be used in very demanding applications. The second important property is that silica aero-gels are expected to have very high porosity (greater than 0.999), making them lightweight and ideal for aerospace applications. The added benefit of the high porosity is that they can be used as extremely efficient filters for many earth based applications as well. Evidence of the formation of superagglomerates in a laminar acetylene/air diffusion flame was found by Sorensen et al. [1]. An interconnecting web of super-agglomerates was observed to span the width of the soot plume in the region just above the flame tip and described as a gel state. It was observed that this gel state immediately breaks up into agglomerates as larges as 100 m due to buoyancy induced turbulence. Large soot agglomerates were observed in microgravity butane jet diffusion flames by Ito et al.[2]. Several other works to date have studied the effect of flame structure on soot volume fraction and agglomeration size in a microgravity environment.[3-4]. In microgravity the absence of buoyant convective flows increases the residence time in the flame and causes a broadening of the high temperature region in the flame. Both of these factors play a significant role in gas phase radiation and soot formation
Derived from text
Silanes; Agglomeration; Temperature Effects; Soot; Radiative Heat Transfer; Microgravity; Hydrocarbon Fuels; Diffusion Flames

20040053514 Nagoya Univ., Nagoya, Japan
Modeling Deformation Of Melted Polymer On Wire Insulation Burning In Microgravity
Uchida, M.; Umemura, A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 97-100; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

In the present study, the mechanism of Polyethylene-insulated wire burning is examined using the deformable coating pyrolysis model. Though the flame shape and length of coating gasifying region are different from the results of the previous study [1], the roles of core wire as both heating and cooling medium are confirmed. However, the present model needs some improvement because the melted coating shape obtained in the present study differs from that of the experimental results.
Author
Wire; Polymers; Insulation; Flames; Deformation

20040053528 NASA Glenn Research Center, Cleveland, OH, USA
Development of PIV for Microgravity Diffusion Flames
Greenberg, Paul S.; Wernet, Mark P.; Yanis, William; Urban, David L.; Sunderland, Peter B.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 381-384; In English; See also 20040053504
Contract(s)/Grant(s): RTOP 101-12-0A; No Copyright; Avail: CASI; A01, Hardcopy

Results are presented from the application of Particle Image Velocimetry(PIV) to the overfire region of a laminar gas jet diffusion flame in normal gravity. A methane flame burning in air at 0.98 bar was considered. The apparatus demonstrated here is packaged in a drop rig designed for use in the 2.2 second drop tower.
Author
Particle Image Velocimetry; Diffusion Flames

20040053548 California Univ., Davis, CA, USA
Bi-Component Droplet Combustion in Reduced Gravity
Shaw, B. D.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 165-168; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

This research deals with reduced-gravity combustion of bi-component droplets initially in the mm size range or larger. The primary objectives of the research are to study the effects of droplet internal flows, thermal and solutal Marangoni stresses, and species volatility differences on liquid species transport and overall combustion phenomena (e.g., gas-phase unsteadiness, burning rates, sooting, radiation, and extinction). The research program utilizes a reduced-gravity environment so that buoyancy effects are rendered negligible. Use of large droplets also facilitates visualization of droplet internal flows, which is important for this research. In the experiments, droplets composed of low- and high-volatility species are burned. The low-volatility components are initially present in small amounts. As combustion of a droplet proceeds, the liquid surface mass

fraction of the low-volatility component will increase with time, resulting in a sudden and temporary decrease in droplet burning rates as the droplet rapidly heats to temperatures close to the boiling point of the low-volatility component. This decrease in burning rates causes a sudden and temporary contraction of the flame. The decrease in burning rates and the flame contraction can be observed experimentally. Measurements of burning rates as well as the onset time for flame contraction allow effective liquid-phase species diffusivities to be calculated, e.g., using asymptotic theory. It is planned that droplet internal flows will be visualized in flight and ground-based experiments. In this way, effective liquid species diffusivities can be related to droplet internal flow characteristics. This program is a continuation of extensive ground based experimental and theoretical research on bi-component droplet combustion that has been ongoing for several years. The focal point of this program is a flight experiment (Bi-Component Droplet Combustion Experiment, BCDCE). This flight experiment is under development. However, supporting ground-based studies have been performed. This ground-based research is summarized below.
Author
Drops (Liquids); Microgravity; Combustion Physics; Marangoni Convection; Extinction; Flames; Flow Characteristics

20040053554 Princeton Univ., NJ, USA
Cellular Instabilities and Self-Acceleration of Expanding Spherical Flames
Law, C. K.; Kwon, O. C.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 181-184; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

In the present investigation we aim to provide experimental information on and thereby understanding of the generation and propagation of spark-ignited, outwardly propagating cellular flames, with three major focuses. The first is to unambiguously demonstrate the influence of the four most important parameters in inducing hydrodynamic and diffusional-thermal cellularities, namely thermal expansion, flame thickness, non-unity Lewis number, and global activation energy. The second is to investigate the critical state for the onset of cellularity for the stretch-affected, expanding flame. The third is to identify and consequently quantify the phenomena of self-acceleration and possibly auto-turbulization of cellular flames. Due to space limitation the effects of activation energy and the critical state for the onset of cellularity will not be discussed herein. Experiments were conducted using C3H8-air and H2-O2-N2 mixtures for their opposite influences of non-equidiffusivity. The additional system parameters varied were the chamber pressure (p) and the mixture composition including the equivalence ratio (phi). From a sequence of the flame images we can assess the propensity of cell formation, and determine the instantaneous flame radius (R), the flame propagation rate, the global stretch rate experienced by the flame, the critical flame radius at which cells start to grow, and the average cell size.
Author
Flames; Thermal Expansion; Flame Propagation; Activation Energy; Equivalence; Sparks; Ignition

20040053562 Cornell Univ., Ithaca, NY, USA
Preliminary Assessment Of The Burning Dynamics Of Jp8 Droplets In Microgravity
Bae, J. H.; Avedisian, C. T.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 113-116; In English; See also 20040053504
Contract(s)/Grant(s): NAG3-2224; No Copyright; Avail: CASI; A01, Hardcopy

In this report we present new data for fuel droplet combustion in microgravity to examine the influence of ambient gas and fuel composition on flame structure and sooting dynamics for droplets with initial diameters in the range of 0.4mm to 0.5mm. The fuels are JP8 (a kerosene derivative) and nonane. The ambient gas is air and a mixture of 30% oxygen and 70% helium, the latter having been examined for burning under conditions where soot formation is minimal. Some data at elevated pressures are also reported. The burning process shows a nonlinear D2 progression which is independent of soot formation as burning in a helium inert showed the same nonlinear trend. Flames were proportionally farther from the droplet surface in helium than they were in air. A nondimensional parameter is presented that consolidates the three standoff distances for the droplet, flame and soot shell diameters within the initial diameter ranges examined.
Author
Combustion; Drops (Liquids); Fuel Combustion; Microgravity; Gas Composition

20040053564 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
High-Pressure Transport Properties Of Fluids: Theory And Data From Levitated Drops At Combustion-Relevant Temperatures
Bellan, Josette; Harstad, Kenneth; Ohsaka, Kenichi; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 117-120; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Although the high pressure multicomponent fluid conservation equations have already been derived and approximately validated for binary mixtures by this PI, the validation of the multicomponent theory is hampered by the lack of existing mixing rules for property calculations. Classical gas dynamics theory can provide property mixing-rules at low pressures exclusively. While thermal conductivity and viscosity high-pressure mixing rules have been documented in the literature, there is no such equivalent for the diffusion coefficients and the thermal diffusion factors. The primary goal of this investigation is to extend the low pressure mixing rule theory to high pressures and validate the new theory with experimental data from levitated single drops. The two properties that will be addressed are the diffusion coefficients and the thermal diffusion factors. To validate/determine the property calculations, ground-based experiments from levitated drops are being conducted.
Author
Transport Properties; High Pressure; Thermal Conductivity; Fluids; Combustion Temperature; Gas Dynamics

20040053566 NASA Glenn Research Center, Cleveland, OH, USA
Field Effects of Buoyancy on Lean Premixed Turbulent Flames
Cheng, R. K.; Johnson, M. R.; Greenberg, P. S.; Wernet, M. P.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 221-224; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The study of field effects of buoyancy on premixed turbulent flames is directed towards the advancement of turbulent combustion theory and the development of cleaner combustion technologies. Turbulent combustion is considered the most important unsolved problem in combustion science and laboratory studies of turbulence flame processes are vital to theoretical development. Although buoyancy is dominant in laboratory flames, most combustion models are not yet capable to consider buoyancy effects. This inconsistency has impeded the validation of theories and numerical simulations with experiments. Conversely, the understanding of buoyancy effects is far too limited to help develop buoyant flame models. Our research is also relevant to combustion technology because lean premixed combustion is a proven method to reduce the formation of oxides of nitrogen (NOx). In industrial lean premixed combustion systems, their operating conditions make them susceptible to buoyancy thus affecting heat distribution, emissions, stability, flashback and blowoff. But little knowledge is available to guide combustion engineers as to how to avoid or overcome these problems. Our hypothesis is that through its influence on the mean pressure field, buoyancy has direct and indirect effects on local flame/turbulence interactions. Although buoyancy acts on the hot products in the farfield the effect is also felt in the nearfield region upstream of the flame. These changes also influence the generation and dissipation of turbulent kinetic energy inside the flame brush and throughout the flowfield. Moreover, the plume of an open flame is unstable and the periodic fluctuations make additional contributions to flame front dynamics in the farfield. Therefore, processes such as flame wrinkling, flow acceleration due to heat release and flame-generated vorticity are all affected. Other global flame properties (e.g. flame stabilization limits and flame speed) may all be coupled to buoyancy. This problem poses major challenges to combustion modeling due to its need for a computation domain extending into the farfield and full specifications of upstream, wall and downstream boundary conditions.
Derived from text
Buoyancy; Turbulent Flames; Premixed Flames; Combustion Chemistry; Nitrogen Oxides

20040053571 NASA Glenn Research Center, Cleveland, OH, USA
Quantitative Species Measurements In Microgravity Combustion Flames
Chen, Shin-Juh; Pilgrim, Jeffrey S.; Silver, Joel A.; Piltch, Nancy D.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 241-244; In English; See also 20040053504
Contract(s)/Grant(s): NAS3-99140; NAS3-01007; No Copyright; Avail: CASI; A01, Hardcopy

The capability of models and theories to accurately predict and describe the behavior of low gravity flames can only be verified by quantitative measurements. Although video imaging, simple temperature measurements, and velocimetry methods have provided useful information in many cases, there is still a need for quantitative species measurements. Over the past decade, we have been developing high sensitivity optical absorption techniques to permit in situ, non-intrusive, absolute concentration measurements for both major and minor flames species using diode lasers. This work has helped to establish wavelength modulation spectroscopy (WMS) as an important method for species detection within the restrictions of microgravity-based measurements. More recently, in collaboration with Prof. Dahm at the University of Michigan, a new methodology combining computed flame libraries with a single experimental measurement has allowed us to determine the concentration profiles for all species in a flame. This method, termed ITAC (Iterative Temperature with Assumed Chemistry) was demonstrated for a simple laminar nonpremixed methane-air flame at both 1-g and at 0-g in a vortex ring flame. In this paper, we report additional normal and microgravity experiments which further confirm the usefulness of this approach. We also present the development of a new type of laser. This is an external cavity diode laser (ECDL) which has the unique

capability of high frequency modulation as well as a very wide tuning range. This will permit the detection of multiple species with one laser while using WMS detection.
Derived from text
Electromagnetic Absorption; Frequency Modulation; Flames; Nonintrusive Measurement; Microgravity; Gravitational Effects

20040053587 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA
Effects Of Electric Field On Hydrocarbon-Fueled Flames
Yuan, Z.-G.; Hegde, U.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 305-308; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-544; No Copyright; Avail: CASI; A01, Hardcopy

It has been observed that flames are susceptible to electric fields that are much weaker than the breakdown field strength of the flame gases. When an external electric field is imposed on a flame, the ions generated in the flame reaction zone drift in the direction of the electric forces exerted on them. The moving ions collide with the neutral species and change the velocity distribution in the affected region. This is often referred to as ionic wind effect. In addition, the removal of ions from the flame reaction zone can alter the chemical reaction pathway of the flame. On the other hand, the presence of space charges carried by moving ions affects the electric field distribution. As a result, the flame often changes its shape, location and color once an external electric field is applied. The interplay between the flame movement and the change of electric field makes it difficult to determine the flame location for a given configuration of electrodes and fuel source. In normal gravity, the buoyancy-induced flow often complicates the problem and hinders detailed study of the interaction between the flame and the electric field. In this work, the microgravity environment established at the 2.2 Second Drop Tower at the NASA Glenn Research Center is utilized to effectively remove the buoyant acceleration. The interaction between the flame and the electric field is studied in a one-dimensional domain. A specially designed electrode makes flame current measurements possible; thus, the mobility of ions, ion density, and ionic wind effect can be evaluated.
Derived from text
Electric Fields; Flames; Hydrocarbon Fuels; Microgravity

20040053594 McGill Univ., Montreal, Quebec, Canada
Microgravity Apparatus And Ground-Based Study Of The Flame Propagation And Quenching In Metal Dust Suspensions
Goroshin, Sam; Kolbe, Massimilliano; Bellerose, Julie; Lee, John; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003; 4 pp.; In English; See also 20040053504
Contract(s)/Grant(s): CSA-9F007-9-6042/001/SR; No Copyright; Avail: CASI; A01, Hardcopy

Due to particle sedimentation and relatively low laminar flame speeds in dust suspensions, microgravity environment is essential for the observation of laminar dust flames in a wide range of particle sizes and fuel concentrations [1]. The capability of a reduced-gravity environment to facilitate study of dust combustion was realized by researchers long before current microgravity programs were established by the various national Space Agencies. Thus, several experimentalists even built their own, albeit very short-duration, drop tower facilities to study flames in particle and droplet suspensions [2,3]. About ten years ago, authors of the present paper started their dust combustion reduced gravity research with the investigation of the constant volume dust flames in a spherical-bomb on board a parabolic flight aircraft [4]. However it was soon realized that direct observation of the constant-pressure flame might be more beneficial. Thus, microgravity apparatus, permitting examination of the freely propagating flames in open-end tubes, was tested in parabolic flights three years later [5]. The improved design of the newlyconstructed apparatus for the experiments on board the NASA KC-135 aircraft is also based on the observation of the dust flame propagating in semi-opened tubes with free expansion of the combustion products that are continuously vented overboard. The apparatus design and results of its extensive ground-based testing are presented below.
Author
Microgravity; Dust; Combustion

20040053595 NASA Marshall Space Flight Center, Huntsville, AL, USA
Low Reynolds Number Droplet Combustion In CO2 Enriched Atmospheres In Microgravity
Hicks, M. C.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 345-348; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The effect of radiative feedback from the gas phase in micro-gravity combustion processes has been of increasing concern because of the implications in the selection and evaluation of appropriate fire suppressants. The use of CO2, an optically thick

gas in the infrared region of the electromagnetic spectrum, has garnered widespread acceptance as an effective fire suppressant for most ground based applications. Since buoyant forces often dominate the flow field in 1-g environments the temperature field between the flame front and the fuel surface is not significantly affected by gas phase radiative absorption and re-emission as these hot gases are quickly swept downstream. However, in reduced gravity environments where buoyant-driven convective flows are negligible and where low-speed forced convective flows may be present at levels where gas phase radiation becomes important, then changes in environment that enhance gas phase radiative effects need to be better understood. This is particularly true in assessments of flammability limits and selection of appropriate fire suppressants for future space applications. In recognition of this, a ground-based investigation has been established that uses a droplet combustion configuration to systematically study the effects of enhanced gas phase radiation on droplet burn rates, flame structure, and radiative output from the flame zone.
Author
Carbon Dioxide; Flammability; Fire Extinguishers; Microgravity

20040055656 Southwest Research Inst., San Antonio, TX
Synthetic Fuel Lubricity Evaluations
Frame, Edwin A.; Alvarez, Ruben A.; Sep. 2003; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421822; TFLRF-367; No Copyright; Avail: CASI; A03, Hardcopy

Synthetic fuel designated S-5 was evaluated for fuel lubricity properties in bench scale and rotary injection pump tests. S-5 fuel was evaluated in the BOCLE SLBOCLE and HFRR bench tests. The effect of MIL-PRF-2501 7 additive on S-5 lubricity was determined in the bench tests. Rotary injection pump tests were conducted for up to 500 hours using S-5 fuel and S-5 fuel additized with MIL-PRF-25017. Neat S-5 fuel exhibited poor lubricity in bench screening and in full-scale rotary injection pump evaluations. The addition of MIL-PRF- 25017 at recommended treatment rates improved S-5 lubricity to satisfactory levels in the rotary injection pump tests. The SLBOCLE and HFRR bench tests did not detect the lubricity improvement within test repeatabilities when MIL-PRF-25017 was present. The standard BOCLE fuel lubricity test did show reduced wear scar with the additive present.
DTIC
Lubricants; Synthetic Fuels

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*.

20040053294 NASA Ames Research Center, Moffett Field, CA, USA
Resuspension of Particles by Aerodynamic Deagglomeration
Fonda, Mark; Petach, Mike; Rogers, C. Fred; Huntington, Judith; Stratton, David; Nishioka, Kenji; Tipo, Mark; July 28, 1998; 44 pp.; In English
Contract(s)/Grant(s): RTOP 185-52-72-03; Copyright; Avail: CASI; A03, Hardcopy

A deagglomerator system was developed, characterized by laboratory tests and flown under low gravity (low-g) microgravity conditions. Requirements for a dry powder deagglomeration system were generated by university and National Aeronautics and Space Administration (NASA) scientists from diverse fields of interest including exobiology, planetary sciences, and atmospheric sciences. Existing deagglomeration methods and devices are reviewed. An aerosol generation method suitable for dry powders over a large range of particles sizes and types at high concentrations with consistent deagglomeration efficiency was evaluated. Development of a pulsed-flow laboratory device and experimental approaches to meet the requirements without being g- dependent are described. Results of laboratory one-g quantitative characterization on one type of dry powder particle generator is discussed. Data from NASA low-g tests are summarized.
Author
Agglomeration; Powder (Particles); Microgravity; Atmospheric Physics; Atmospheric Chemistry

20040053580 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA
Experimental And Numerical Evaluation Of Gaseous Agents For Suppressing Cup-Burner Flames In Low Gravity
Takahashi, Fumiaki; Linteris, Gregory T.; Katta, Viswanath R.; Seventh International Workshop on Microgravity Combustion

and Chemically Reacting Systems; August 2003, pp. 277-280; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Longer duration missions to the moon, to Mars, and on the International Space Station (ISS) increase the likelihood of accidental fires. NASA's fire safety program for human-crewed space flight is based largely on removing ignition sources and controlling the flammability of the material on-board. There is ongoing research to improve the flammability characterization of materials in low gravity; however, very little research has been conducted on fire suppression in the low-gravity environment. Although the existing suppression systems aboard the Space Shuttle (halon 1301, CF3Br) and the ISS (CO2 or water-based form) may continue to be used, alternative effective agents or techniques are desirable for long-duration missions. The goal of the present investigation is to: (1) understand the physical and chemical processes of fire suppression in various gravity and O2 levels simulating spacecraft, Mars, and moon missions; (2) provide rigorous testing of analytical models, which include detailed combustion-suppression chemistry and radiation sub-models, so that the model can be used to interpret (and predict) the suppression behavior in low gravity; and (3) provide basic research results useful for advances in space fire safety technology, including new fire-extinguishing agents and approaches.

Derived from text

Microgravity; Burners; Flames; Gases; Mathematical Models; Fire Prevention

20040053582 NASA Glenn Research Center, Cleveland, OH, USA

The Water-Mist Fire Suppression Experiment (Mist): Preliminary Results From The STS-107 Mission

Abbud-Madrid, Angel; McKinnon, J. Thomas; Amon, Francine; Gokoglu, Suleyman; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 281-284; In English; See also 20040053504

Contract(s)/Grant(s): NCC8-238; No Copyright; Avail: CASI; A01, Hardcopy

An investigation of the effect of water mists on premixed flame propagation has been conducted onboard the Space Shuttle to take advantage of the prolonged microgravity environment to study the effect of uniformly distributed clouds of polydisperse water mists on the speed and shape of propagating propane-air premixed flames. The suspension of a quiescent and uniform water mist cloud was confirmed during the microgravity tests. Preliminary results show good agreement with trends obtained by the numerical predictions of a computational model that uses a hybrid Eulerian-Lagrangian formulation to simulate the two-phase, flame/mist interaction. Effective flame suppression is observed at progressively higher water loadings and smaller water droplet sizes. Other unusual flame behavior, such as flame front breakup and pulsating flames, is still under investigation. The promising results from the microgravity tests will be used to assess the feasibility of using water mists as fire suppressants on Earth and on spacecraft.

Derived from text

Flame Propagation; Premixed Flames; Space Transportation System; Mist; Flame Retardants; Water; Spaceborne Experiments; NASA Space Programs; Microgravity

20040053586 NASA Glenn Research Center, Cleveland, OH, USA

CO2 Suppression of PMMA Flames In Low-Gravity

Ruff, G. A.; Hicks, M.; Mell, W.; Pettegrew, R.; Malcolm, A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 301-304; In English; See also 20040053504

Contract(s)/Grant(s): NRA-99-HEDS-04; No Copyright; Avail: CASI; A01, Hardcopy

Even though much has been learned about the effects of microgravity on material flammability, flame spread, and suppressant effectiveness, uncertainties remain regarding some of the practical aspects of fire protection in spacecraft. The experiments and simulations underway in this project are aimed directly at testing, understanding and improving NASA's existing policies and practices toward fire safety in spacecraft and extraterrestrial habitats. Specifically, the objectives of this research are: 1) Determine systematically the conditions that will ignite onboard flammable materials upon passage of an initial premixed gas, firebrand, or aerosol flame over these materials; 2) Test the effect of firebrands and configuration spacing; and 3) Determine the effectiveness of the flow of CO2 extinguisher or other extinguishing agents. Experimental and computational investigations are planned to achieve each of the three objectives above. Even though progress has been made in all of the areas, the majority of data has been collected for objective (3). Current results from these investigations are discussed.

Derived from text

Carbon Dioxide; Polymethyl Methacrylate; Flames; Microgravity

20040053591 Bremen Univ., Germany

The CIR Insert EHPI (Former: DCI) European High Pressure/High Temperature Insert

Eigenbrod, C.; Siemer, J.; Jordan, M.; Bellossi, F.; Schmidt-Harms, C.; Seventh International Workshop on Microgravity

Combustion and Chemically Reacting Systems; August 2003, pp. 325-328; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The European Space Agency (ESA) has performed a feasibility study for an experiment insert to NASA's Combustion Integrated Rack (CIR)enabling experiments under conditions of elevated pressure and/or temperature. Initially based upon a European microgravity research program on droplet- and spray vaporization and combustion, the industrial study team was additionally collecting the different interests of scientists from Europe, Japan and the U.S.A. on such a facility in order to enhance the applicability of the inserts basic design. As the outcome of the study an insert appears to be feasible that allows for experiments on droplet and droplet array vaporization-, autoignition- and combustion investigations under pressure conditions up to 50 bar and initial temperature conditions up to 1000 K. The insert's structure is modular to enable later modifications for other experiments needs. These experiments could be on spray- and particle cloud combustion or on investigations on autoignition of prevaporized premixtures. The study was also regarding the compatibility of the experiments with the CIR s diagnostic environment.

Author

Combustion; High Pressure; High Temperature; Inserts; Microgravity; Spontaneous Combustion; Space Laboratories; Research Facilities

20040053599 Drexel Univ., Philadelphia, PA, USA

High Pressure Cool Flames At Microgravity

Miller, David L.; Cernansky, Nicholas P.; Pearlman, Howard; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 369-372; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The primary objective of this program is to extend subatmospheric work on low temperature oxidation reactions, cool flames, and auto-ignition in unstirred, static reactors to higher pressures (1atm<P<10atm). Specifically, the work will: (1) Develop ignition diagrams (phase-plots of temperature versus pressure and mixture stoichiometry) for heavy hydrocarbon-air and hydrocarbon-oxygen mixtures at elevated pressures in the range of 1-10atm, (2) Measure and record the one-dimensional flame speed, integrated spatial distribution of uv and visible light, 2D formaldehyde and temperature distribution, and induction times(s) associated with high pressure cool flames and auto-ignition fronts, (3) Develop chemical kinetic models for high pressure, low-temperature reactions in a microgravity environment and compare the results to the experimental measurements, and (4) Compare the results to those obtained by other researcher efforts that have used CSTR's, heated flow tubes, and motored engines. To accomplish these objectives, a team of researchers with experimental and modeling experience in low temperature oxidation and cool flames has developed a program that includes laboratory and reduced gravity experimental development and testing, detailed kinetic modeling, and LIF diagnostic development and implementation. The U.S. participants will focus on the experiment development and modeling, while the German Co-Investigators will focus on LIF diagnostics and testing. This study will be a testbed for a LIF disk laser system being developed by the German Space Agency.

Derived from text

Flame Temperature; High Pressure; Microgravity; Cooling

20040055011 Payload Systems, Inc., Cambridge, MA, USA, NASA Ames Research Center, Moffett Field, CA, USA

Cell Culture Unit

Parrish, Joe; Searsy, Nancy; [2002]; 6 pp.; In English; 4th Canadian Space Exploration Workshop, 14-16 Nov. 2002, Ottawa, Ontario, Canada

Contract(s)/Grant(s): NAS2-96001; No Copyright; Avail: CASI; A02, Hardcopy

The unique capabilities of the Cell Culture Unit and hardware differences between the Science Evaluation Unit and the Flight Unit are briefly presented in this document.

Derived from text

Culture Techniques; Bioreactors

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*.

20040055938 Westat Research, Inc., Rockville, MD

2002 Status of the Armed Forces Survey -- Workplace and Gender Relations: Statistical Methodology Report

George, Barbara J.; Kroeger, Kent R.; Jun. 2003; 124 pp.; In English

Contract(s)/Grant(s): M67004-98-D-002/014

Report No.(s): AD-A417455; DMDC-2003-014; No Copyright; Avail: CASI; A06, Hardcopy

The 2002 Status of the Armed Forces Survey Workplace and Gender Relations gathered information on issues concerning workplace and gender relations. This report describes the survey sampling design, sample selection, missing data compensation procedures, and estimation. The first section of Statistical Methodology Report presents a general overview of the survey and the sampling design. The second section provides information on the statistical methods used in weighting, response rate calculations, and variance estimation.

DTIC

Armed Forces; Employee Relations; Surveys

20040055940 Westat Research, Inc., Rockville, MD

Tabulations of Responses from the 2002 Status of the Armed Forces Survey-Workplace and Gender Relations: Volume 2, Gender Related Experiences in the Military and Gender Relations

Greenlees, James B.; Deak, Mary Ann; Rockwell, David; Lee, Kimya; Perry, Shelley; Aug. 2003; 979 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): M67004-98-D-002/014

Report No.(s): AD-A408200; DMDC-2003-013; No Copyright; Avail: CASI; A99, Hardcopy

The 2002 Status of the Armed Forces Survey - Workplace and Gender Relations gathered information on demographics, workplace information, mentoring, readiness, and health and well-being, gender related experiences in the military and gender relations. Survey results are tabulated for DoD as a whole and for subgroups defined by member Service, paygrade category, and gender. Background information, survey administration, and analytical procedures are discussed in the preface of this report.

DTIC

Armed Forces; Surveys

20040055941 Ministry of Defence, Paris

2002 Status of the Armed Forces Survey- Workplace and Gender Relations: Administration, Datasets, and Codebook

Willis, Elizabeth J.; Lipari, Rachel N.; Mohamed, Sally S.; May 2002; 265 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): M67004-99-D-0001/0011

Report No.(s): AD-A417454; DMDC-2002-010; No Copyright; Avail: CASI; A12, Hardcopy

The 2002 Status of the Armed Forces Survey - Workplace and Gender Relations gathered information on demographics, workplace information, mentoring, readiness, and health and well-being, gender related experiences in the military and gender relations. Survey results are tabulated for DoD as a whole and for subgroups defined by member Service, paygrade category, and gender. Background information, survey administration, and analytical procedures are discussed in the preface of this report.

DTIC

Armed Forces; Surveys

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*.

20040051106 Communications Research Lab., Tokyo, Japan

Correcting Instable Signal in Near-Field Antenna Gain Measurement

Miura, Amane; Tanaka, Masato; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 173-181; In English; See also 20040051097; Copyright; Avail: Other Sources

This paper describes a technique for correcting errors caused by a signal's drift over time during a near-field antenna gain measurement. Our error correction technique is composed of the following two steps. (1) A near-field signal is corrected by using the reference signal power curve. The reference signal powers at a certain position of the probe antenna are measured during NFM for both a standard gain antenna (SGA) and the antenna under test (AUT). (2) The signal power difference between the end and start of the first antenna measurement is used to correct the signal power of the second antenna measurement. The second step is newly introduced in the paper. When a signal radiated from an offset parabolic-reflector antenna was measured twice consecutively at 28 GHz, the gain difference between the two measurements obtained using error correction techniques (1) and (2) was 0.06 dB; without error correction it was -0.24 dB; with error correction (1) only it was -0.59 dB. The measurement results at 40 GHz indicated a similar trend. The gain differences, which can be measurement errors caused by the signal drift, almost satisfied the requirement for measurement accuracy.

Author

Antenna Gain; Near Fields; Reflector Antennas; Stability; Signal Processing

20040051114 Communications Research Lab., Tokyo, Japan

Radar Cross Section Reduction Sheet

Ojima, Takeyuki, Inventor; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 183-184; In English; See also 20040051097; Copyright; Avail: Other Sources

This invention pertains to a sheet to be applied or affixed to a radar reflective body for the purpose of eliminating erroneous images that appear on radar screens. The sheet achieves this effect by reducing the radar cross section and decreasing the radar reflection strength. As shown in the diagram below, a specific metal shape (rectangular, circular, polygonal) arranged in a checkered pattern on the sheet disperses the reflection of incident waves almost uniformly, thus minimizing the reflection strength in specific directions. In providing this effect, the design of the metal section, and the dielectric constant and magnetic permeability of the sheet, significantly affect the resultant reflection characteristics. Furthermore, by inserting a resistive film into the sheet, the applicable frequency band can be widened. This invention enables considerable reductions in the thickness and weight of a radar cross section reduction sheet, relative to the use of conventional ferrite. When used on large bridges and structures that cause undesirable reflection or scattering of television waves, this invention can eliminate radio interference. When it is used on the walls inside an office, the invention can effectively minimize the leakage of radio waves of a wireless LAN.

Author

Radar Cross Sections; Images; Electromagnetic Radiation; Technology Utilization

20040053427 Bilkent Univ., Ankara, Turkey

The Modelling and Simulation of a Messaging System of a Model Brigade

Can, Ibrahim; Sabuncuoglu, Ihsan; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 15-1 - 15-13; In English; See also 20040053408; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The need of information on tactical battlefield will increase in future battles. Not only to gain information on battlefield, but also to convey it where it is needed on time, will be very important. The next generation mobile tactical communications systems will provide a robust, reliable, secure and flexible network to the mobile users of tactical battlefield. However, it is a question under interest to predict the impacts of different battle conditions on their performance. We conducted a simulation study of a messaging system of a model brigade which mobile users use TDMA (Time Division Multiple Access) radios and TDMA technique for channel access. We identify a set of components, which are called Mobile Subscriber Terminals, Personal

Subscriber Terminals and Radio Access Points that make up mobile wireless network. The mobile wireless network can provide networking facilities and many simultaneous voice and data connections to the mobile users. The focus of this study is to construct a simulation model of a messaging system of a model brigade on tactical battlefield and to determine if the system is capable of supporting the data exchange in performance criteria under different conditions. The simulation is performed by using Arena 7.0 simulation program and results are analysed by using SPSS statistical package program.
Author
Mobile Communication Systems; Radio Equipment; Simulation

20040053474 NASA Ames Research Center, Moffett Field, CA, USA
IpexT: Integrated Planning and Execution for Military Satellite Tele-Communications
Plaunt, Christian; Rajan, Kanna; [2004]; 8 pp.; In English; AIPS 1998, 7-13 Jun. 1998, Pittsburgh, PA, USA
Contract(s)/Grant(s): NAS2-14217; No Copyright; Avail: CASI; A02, Hardcopy

The next generation of military communications satellites may be designed as a fast packet-switched constellation of spacecraft able to withstand substantial bandwidth capacity fluctuation in the face of dynamic resource utilization and rapid environmental changes including jamming of communication frequencies and unstable weather phenomena. We are in the process of designing an integrated scheduling and execution tool which will aid in the analysis of the design parameters needed for building such a distributed system for nominal and battlefield communications. This paper discusses the design of such a system based on a temporal constraint posting planner/scheduler and a smart executive which can cope with a dynamic environment to make a more optimal utilization of bandwidth than the current circuit switched based approach.
Author
Communication Satellites; Satellite Communication; Military Spacecraft; Jamming; Design Analysis

20040053499 Pennsylvania State Univ., University Park, PA, USA
Basic Lidar Principles And Techniques
Kane, Tim; Lidar for Meteorologists 101; [2004]; 39 pp.; In English; See also 20040053498; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: General Lidar Systems. Scattering: Aerosol Lidar. Rayleigh Lidar. Doppler Lidar. DIAL. Raman Lidar. Resonance Lidar. Hard Target. Noise, Hardware, Safety & other Practicalities.
Derived from text
Doppler Radar; Optical Radar; Aerosols

20040053501 Los Alamos National Lab., NM, USA
Scattering of Laser Light: More Than Just Smoke and Mirrors
Davis, Anthony; Lidar for Meteorologists 101; [2004]; 39 pp.; In English; See also 20040053498; Original contains color illustrations; No Copyright; Avail: Other Sources

No abstract available
Lasers; Optical Radar

20040053502 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Applications II: Water Vapor and Atmospheric Dynamics
Demoz, Belay; Lidar for Meteorologists 101; [2004]; 34 pp.; In English; See also 20040053498; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: 1. Introduction. A case for using lidars in atmospheric dynamics will be made. 2. Scales of motion. Will discuss atmospheric scales of motion and lidar role in probing this various events. 3. Examples. We will discuss applications of lidars into atmospheric dynamics using data from case studies that illustrate different atmospheric phenomenon. Concluding statement. Water Vapor and Atmospheric Dynamics.
Derived from text
Atmospheric Circulation; Water Vapor

20040053503 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Regional and Global Lidar Data Available Now and in the Near Future
Schwemmer, Geary; Lidar for Meteorologists 101; [2004]; 20 pp.; In English; See also 20040053498; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: Brief History of Lidar. Long-Term Monitoring Lidars. Lidars in Field Campaigns. Ground-Based Lidar Networks. Satellite Lidars.
Derived from text
Optical Radar; Data Processing; Ground Support Equipment

20040053689
Impact of Wireless Data Systems on the Transportation Systems of the Future
Mason, S. J.; Magableh, G. M.; Kutanoglu, E.; Sep. 05, 2002; 58 pp.; In English
Report No.(s): PB2004-104517; MBTC-2023; No Copyright; Avail: CASI; A04, Hardcopy

The explosion in both the capability of and the number of applications for wireless data systems has allowed both personal and business consumers to become better connected to the world around them. The entire transportation industry is starting to benefit from the resulting improved connectivity, as trucking carriers are now able to communicate with their drivers more effectively. Improved fleet connectivity may results in other potential benefits to the transportation infrastructure as well as to the industry's carriers and shippers. The authors present an overview of wireless logistics systems, followed by the results of a transportation marketplace survey to assess current applications of wireless data systems. Further, the authors discuss future applications of wireless data systems from the viewpoint of both end users (consumers and shippers) and carriers.
NTIS
Wireless Communication; Transportation Networks

20040055275 Lawrence Livermore National Lab., Livermore, CA
Steganography: Past, Present, Future
Judge, J. C.; Dec. 01, 2001; 38 pp.; In English
Report No.(s): DE2004-15006450; UCRL-ID-151879; No Copyright; Avail: Department of Energy Information Bridge

Steganography (a rough Greek translation of the term Steganography is secret writing) has been used in various forms for 2500 years. It has found use variously in military, diplomatic, personal and intellectual property applications. Briefly stated, steganography is the term applied to any number of processes that will hide a message within an object, where the hidden message will not be apparent to an observer. This paper will explore steganography from its earliest instances through potential future application.
NTIS
Messages; Steganography

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*.

20040052850 Ljubljana Univ., Ljubljana, Slovenia
Electrotechnical Review, Volume 70, No. 4
Zajc, Baldomir, Editor; Solina, Franc, Editor; Bajd, Tadej, Editor; Brglez, Franc, Editor; Divjak, Sasa, Editor; Drnovsek, Janko, Editor; Furlan, Joze, Editor; Groselj, Bojan, Editor; Gubina, Ferdo, Editor; Horvat, Bogomir, Editor, et al.; 2003; ISSN 0013-5852; 84 pp.; In English; In Slovene; Copyright; Avail: Other Sources

Contents include the following: Effect of ion size electrical double in planar, cylindrical and spherical layers. Comparative Analysis of the Direct Current Control Method. Influence of direct stray current on differential protection switch. A new concept of the voltage-collapse protection. Impact of magnetic saturation on the steady-state operation of the controlled induction motor. Broadband impedance parameters of symmetric coupled coplanar CMOS interconnects. An Evolutionary Algorithm for Concurrent Scheduling and Allocation in the Process of Integrated-Circuit Design. Hybrid Modeling and Optimal Control of an Asphalt Base Process. The CPLD-based Takagi-Sugeno type fuzzy controller. Matrix Formulation of the Multilayered Perceptron with a Denoising Unit. Selection of an optimal substructure in the distributed arithmetic FIR Digital Filter. Multiple-Input Multiple-Output Wireless Systerns. Non-geostationary Satellite Constellations for the Access to Broadband Communication Services.
CASI
Algorithms; Cylindrical Bodies; Digital Filters; Electric Potential; Steady State; Telecommunication

20040053446 Ohio Aerospace Inst., Cleveland, OH, USA
Packaging Technology for SiC High Temperature Circuits Operable up to 500 C
Chen, Lian-Yu; [2002]; 15 pp.; In English; See also 20040053447 - 20040053447
Contract(s)/Grant(s): NCC3-867
Report No.(s): OAI-02-043; No Copyright; Avail: CASI; A03, Hardcopy

New high temperature low power 8-pin packages have been fabricated using commercial fabrication service. These packages are made of aluminum nitride and 96% alumina with Au metallization. The new design of these packages provides the chips inside with EM shielding. Wirebond geometry control has been achieved for precise mechanical tests. Au wirebond samples with 450 heel-angle have been tested using wireloop test module. The geometry control improves the consistency of measurement of the wireloop breaking point.Also reported on is a parametric study of the thermomechanical reliability of a Au thick-film based Sic-die- attach assembly using nonlinear finite element analysis (FEA) was conducted to optimize the die-attach thermo-mechanical performance for operation at temperatures from room temperature to 500 'C. This parametric study centered on material selection, structure design and process control.
Derived from text
Circuits; Electronic Packaging; Microelectromechanical Systems

20040053588 California Univ., La Jolla, CA, USA
Electric Fields, Flames, And Microgravity
Dunn-Rankin, Derek; Weinberg, Felix J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 309-312; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The object of this paper is to review some of the recent investigations carried out at the University of California, Irvine and Imperial College London into the utilization of electric fields in combustion research, and their particular applicability to microgravity environments. In the absence of earth gravity, the use of such fields to manipulate dispersions and trajectories of electrically charged droplets and particles, and to control convection using the drag exercised on flame ions by electric fields, can be especially useful. The paper will explore several such topics in particular: The control of convection in diffusion flames, the spraying of liquid dispersions using a combination of electrohydrodynamics and gas assist atomization, and the use of ion winds to produce flow of a neutral gas. Because much of this work has appeared in archival publications, this paper briefly summarizes some of the findings and then references the more complete documentation.
Derived from text
Electric Fields; Microgravity; Combustion; Diffusion Flames

20040053625 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the 15th International Symposium on Integrated Ferroelectrics, Volume 59, Part 8
Joshi, V.; Aggarwal, S.; Ramesh, R.; Mar. 2003; In English; 15th International Symposium on Integrated Ferroelectrics, March 9 - 12, 2003, Colorado Springs, CO, USA
Report No.(s): PB2004-101706; Copyright; Avail: National Technical Information Service (NTIS)

The 15th International Symposium on Integrated Ferroelectrics was held at the Historic Broadmoor Hotel in Colorado Springs from March 9th through 12th, 2003. There were 354 attendees, including 321 researchers and engineers from all over the world who presented their work either in the form of oral presentation or poster presentation. The symposium gut under way with four tutorials conducted on Sunday to cover various topics related to ferroelectric thin film materials. The first two tutorials presented by Dr. Bruce Tuttle and Dr. Susan Trolier-McKinstry were oriented towards introducing the materials science and engineering of ferroelectric thin films. The other two tutorials presented by Mr. Tom Davenport and Mr. Joe Evens were geared towards highlighting the various aspects of thin film integration and device characterization. The overall tutorial package was complete in and offered the student a thorough understanding of the ferroelectric thin film integration technology. NTIS
Ferroelectric Materials; Conferences; Ferroelectricity

20040053643 National Inst. of Standards and Technology, Gaithersburg, MD, USA
DC Conductivity Measurements of Metal
Janezic, M. D.; Kaiser, R. F.; Baker-Jarvis, J.; Free, G.; Jan. 2004; 28 pp.; In English
Report No.(s): PB2004-104103; NIST/TN-1531; No Copyright; Avail: CASI; A03, Hardcopy

We examine a measurement method for characterizing the dc conductivity of metal alloys commonly used in the manufacture of weapons. From accurate measurements of the voltage and current across a cylindrical metal sample, we

calculate the metal's dc conductivity. Equations for the dc conductivity are derived from first principles, including a detailed uncertainty analysis. In a measurement comparison with a National Institute of Standards and Technology (NIST) Standard Reference Material (SRM) for conductivity, we verified the performance of our measurement system. Using this system, we measured the dc conductivity of ten metal alloys over a temperature range of 15 to 40 degrees C.
NTIS
Metals; Electrical Resistivity

20040055371 NASA Ames Research Center, Moffett Field, CA, USA
Towards a Visual Quality Metric for Digital Video
Watson, Andrew B.; July 21, 1998; 3 pp.; In English; EUSIPCO'98: IEEE Transactions on Image Processing, 8-11 Sep. 1998, Rhodes, Greece
Contract(s)/Grant(s): RTOP 199-06-11-04; No Copyright; Avail: CASI; A01, Hardcopy

The advent of widespread distribution of digital video creates a need for automated methods for evaluating visual quality of digital video. This is particularly so since most digital video is compressed using lossy methods, which involve the controlled introduction of potentially visible artifacts. Compounding the problem is the bursty nature of digital video, which requires adaptive bit allocation based on visual quality metrics. In previous work, we have developed visual quality metrics for evaluating, controlling, and optimizing the quality of compressed still images. These metrics incorporate simplified models of human visual sensitivity to spatial and chromatic visual signals. The challenge of video quality metrics is to extend these simplified models to temporal signals as well. In this presentation I will discuss a number of the issues that must be resolved in the design of effective video quality metrics. Among these are spatial, temporal, and chromatic sensitivity and their interactions, visual masking, and implementation complexity. I will also touch on the question of how to evaluate the performance of these metrics.
Derived from text
Digital Television; Visual Signals; Visual Discrimination; Automatic Control; Image Resolution

20040055510 Air Force Research Lab., Rome, NY
Diamond-Shaped Semiconductor Ring Lasers for Analog to Digital Photonic Converters
Green, Malcolm; Jan. 2004; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-C-0220; Proj-528D
Report No.(s): AD-A421293; AFRL-SN-RS-TR-2003-308; No Copyright; Avail: CASI; A03, Hardcopy

Photonic/ optoelectronic analog to digital converters (ADCs) have advantages in areas such as precise sampling times, narrow sampling apertures, and the ability to sample without contaminating the incident signal. They also have potential to offer the highest sampling rates and bandwidths. Significant challenges remain in the development of photonic ADC architectures and associated components (e.g. compactness, reduce power consumption v. efficiency, improved mechanical and thermal stability, etc.). Monolithically integrated photonic solutions may be the best avenue to address these issues. The bi-directional ring laser is a promising approach to achieving the basic combinational digital photonic logic functions. This study investigated the switching capabilities of diamond shaped ring lasers. Future expectation is that these devices can be used as accurate comparators for optical signals at speeds of 10GHz and above. Switching has been shown with injected powers of less than 2 micro watts and speeds of 10GB/s. Extinction ratios are in the region of 10dB. The comparators can be used as either optical amplitude comparators or wavelength comparators, due to the 0. 5L wavelength working range of the devices. It is believed that with further technical investigation and development, these devices will be an aid in fast optical ADC and switching applications.
DTIC
Analog to Digital Converters; Diamonds; Photonics; Ring Lasers; Semiconductor Lasers

20040055517 Yale Univ., New Haven, CT
Atomically Smooth Epitaxial Ferroelectric (Piezoelectric) Thin Films for the Development of a Nonvolatile, Ultrahigh Density, Fast, Low Voltage, Radiation- Hard Memory
Ahn, C. H.; Nov. 30, 2003; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0330; Proj-2301; Proj-2305
Report No.(s): AD-A421305; AFRL-SR-AR-TR-04-0177; No Copyright; Avail: CASI; A02, Hardcopy

The goal of this research program is to develop atomically smooth, nanostructured, single crystalline, epitaxial complex oxide thin films as the basic building block for a nonvolatile, ultrahigh density, fast, low voltage, radiation-hard memory.

Oxide materials exhibit a broad diversity of behavior: transport properties that include superconducting, metallic, semiconducting and insulating ground states; magnetic properties ranging from ferromagnetism and colossal magnetoresistance to antiferromagnetism; and dielectric properties ranging from high-k insulating behavior to ferroelectricity, piezoelectricity, and pyroelectricity. The chemical and structural similarity of perovskite oxides makes it possible to combine these various functionalities into epitaxial heterostructures. In this work, the crystallinity and surface quality of epitaxial films and the quality of the interfaces between different oxides are important factors determining device performance.
DTIC
Computer Storage Devices; Epitaxy; Ferroelectric Materials; Ferroelectricity; Low Voltage; Piezoelectricity; Radiation Hardening; Thin Films

20040055525 Colorado Univ., Boulder, CO
Injectable Ceramic Microcast Silicon Carbonitride (SiCN) microelectromechanical System (MEMS) for Extreme Temperature Environments with Extension: Micro Packages for Nano-Devices
Bright, Victor M.; Raj, Rishi; Dunn, Martin L.; Daily, John W.; Jan. 2004; 134 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-2-0543; Proj-E117
Report No.(s): AD-A421314; AFRL-IF-RS-TR-2004-2; No Copyright; Avail: CASI; A07, Hardcopy

MEMS that can survive ultrahigh-temperatures and corrosive environments are important in a variety of unique applications. This work develops an innovative microfabrication technology for high temperature MEMS: microcasting of injectable polymer-derived SiCN ceramic materials. The techniques allow realization of MEMS with complex, three-dimensional and multilayer geometry useable to 1500 C. Our approach is easy and low cost. Several MEMS were realized and evaluated. The objectives of the extension research project are to investigate a new micro-packaging technology to create a high-vacuum, sealed environment for nano-devices integrated with other electronic or RF circuits. The process fits standard manufacturing infrastructure, and can be scaled to package MEMS or nano devices. Such a micro- package will be critical to the advancement of devices such as nano sized resonators that require high vacuum and clean environment to maintain Q's on the order of 10,000 or higher, or very advanced RF MEMS where packaging can greatly affect performance. Two challenges were identified in the initial proposal: the precision creation of the micro-cap, and the deposition of glass droplets in vacuum. The final deliverable for this project was to demonstrate a MEMS sensor hermetically sealed in vacuum. The sensors performance was measured as a function of time to demonstrate the vacuum and hermetic sealing levels.
DTIC
Ceramics; Microelectromechanical Systems; Silicon; Silicon Nitrides

20040055534 Oregon Univ., Eugene, OR
Spatial-Spectral Holographic Approaches to the Storage, Processing, and Manipulation of Optical Data Streams
Mossberg, Thomas W.; Mar. 2000; 9 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0214; Proj-2305
Report No.(s): AD-A421327; AFRL-SR-AR-TR-04-0178; No Copyright; Avail: CASI; A02, Hardcopy

The results of a comprehensive study of optical interactions with frequency-selective recording materials are reported along with ancillary results related to high-speed tuning and reference-free stabilization of associated lasers. Frequency-selective recording materials provide the physical basis for time-space or 4D holography wherein the full spatial and temporal information contained in an optical signal can be stored and/or processed. It is shown that 4D holographic recall signals can be substantially stronger than previously believed possible. Innovative external cavity diode laser designs supportive of very high-speed laser tuning and dynamic stabilization are also reported. Preliminary work on the use of composite grating devices to emulate the functionality normally associated with frequency-selective materials is also presented. Composite grating devices provide a basis for robust optical signal processing operative over extensive ranges of bandwidths and are entirely free of the constraints normally associated with intrinsically frequency-selective materials.
DTIC
Data Flow Analysis; Holography; Optical Memory (Data Storage); Spectra

20040055537 Arizona Univ., Tucson, AZ
Nanocomposite Materials and Microstructured Devices for Optical Limiting and Switching and Photovoltaic Applications
Perry, Joseph; Bredas, Jean-Luc; Kippelen, Bernard; Marder, Seth R.; Mar. 12, 2004; 40 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0358; Proj-2303
Report No.(s): AD-A421333; AFRL-SR-AR-TR-04-0172; No Copyright; Avail: CASI; A03, Hardcopy

This is a multi-investigator program, involving an integrated theory and modeling, synthesis, nonlinear optical spectroscopy, and electronic characterization effort, that is being undertaken by the Perry, Bredas, Kippelen and Marder groups. The activities being pursued under this AFOSR program are: 1) development two-photon absorbing molecules with large two-photon cross sections and excited-state absorption cross sections for optical power limiting applications, 2) chromophore/ nanoparticle assemblies with enhanced nonlinearity for optical power limiting applications, and 3) advanced organic transport materials for photovoltaic/photoconducting applications.
DTIC
Microstructure; Nanocomposites; Nanostructures (Devices); Optical Switching; Photovoltaic Effect

20040055539 California Inst. of Tech., Pasadena, CA
Optically Programmable Field Programmable Gate Arrays (FPGA) Systems
Mumbru, Jose; Panotopoulos, George; Psaltis, Demetri; Jan. 2004; 118 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-1-0199; Proj-A28E
Report No.(s): AD-A421336; AFRL-IF-RS-TR-2004-21; No Copyright; Avail: CASI; A06, Hardcopy

This report presents the results of research in the use of holographic modules in optoelectronic systems, their applications, and the characterization of polymer materials on which to record volume holograms for these modules. The first chapter makes the case that a direct interface between an optical memory and a chip integrating detectors and logic circuitry can better utilize the high parallelism inherent in holographic modules. Introduced also is the idea of reconfigurable computing and Field Programmable Gate Arrays (FPGAs) as the framework in which to design a hybrid system, the Optically Programmable Gate Array (OPGA), that outperforms its electronic counterpart by reducing its reconfiguration time by three orders of magnitude. The OPGA is the combination of three elements: an addressing device to selectively recall holographic data pages, an optical memory, and an optoelectronic chip. We also present a system that uses holograms to extract spatial and color information (4-D imaging) of a specimen and project it on to a 2-D space on the detector. By multiplexing several holograms many depth slices and color bands can be sent in parallel, making unnecessary the use of sophisticated and time-consuming scanning schemes.
DTIC
Electro-Optics; Field-Programmable Gate Arrays

20040055612 Old Dominion Univ., Norfolk, VA
Monte Carlo Transport Studies of GaN High Electron Mobility Transistors (HEMTs) for Microwave Applications
Joshi, Ravindra P.; Mar. 2004; 71 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0617
Report No.(s): AD-A421515; ARO-41419.5-EL; No Copyright; Avail: CASI; A04, Hardcopy

Calculations of the electronic mobility and drift velocity have been carried out for bulk GaN and AlGaN-GaN heterojunctions based on a Monte Carlo approach. Very good agreement with available experiments has been obtained, and the calculations yielded a set of best-fit transport parameters. The calculations were then extended for the large- signal nonlinear response characteristics of HEMTs with particular emphasis on inter-modulation distortion (lMD). The results demonstrated an optimal operating point for low lMD at reasonably large output power due to a minima in the lMD curve. An increase in dynamic range with temperature has been predicted, due to a relative suppression of interface roughness scattering. The results indicate Increasing the mole fraction for the barrier layer, reducing the transit length, and introducing a thin AIN interfacial layer for suppressing real space transfer performance enhancements. Simulations were also carried Out to probe possible enhancements in Gun effect oscillators, it has been shown that repetitive structures with serial segments to fashion a 'multiple domain' device could lead to significant improvements in Output power over conventional, single-transit structure, and so such multiple (IaN diodes merit serious experimental study. Monte Carlo studies of GaN HEMTs also probed the effects of scattering due to edge dislocations strains. For self-consistency, numerical solution of Schr^odinger, Poisson, and charge balance equations were used for the eigen-functions. Electron mobilities predictions around 1.711 x 10(3) cm2/Vs, are in close agreement with reported data. At the highest dislocation density of 10(10) cm-2, mobility reductions of 16.8 percent and 8.6 percent are predicted for 77 K and 300 K, respectively.
DTIC
Gallium Nitrides; High Electron Mobility Transistors; Microwaves; Monte Carlo Method

20040055627 Defence Science and Technology Organisation, Salisbury
Construction Techniques for LC Highpass and Lowpass Filters Used in the 1 MHz to 1 GHz Frequency Range
Martinsen, W.; Oct. 2003; 142 pp.; In English
Report No.(s): AD-A421651; DSTO-TN-0531; DODA-AR-012-994; No Copyright; Avail: CASI; A07, Hardcopy

This technical note describes construction techniques for building passive LC highpass and lowpass filters whose intended use spans several octaves of bandwidth. It examines limitations in the frequency domain of the two basic components, inductors and capacitors, used to build these filters, the unwanted effects of the distributed reactance of opposite sign to the wanted within these components and the electro-magnetic coupling between these components when used to build a filter. The impact these unwanted characteristics have on the filter's overall performance is then examined. Recommendations are given on the various steps that may be taken to reduce these unwanted effects minimizing the deviation from a filter's ideal performance.
DTIC
Construction; High Pass Filters; Low Pass Filters; Microwave Frequencies

20040055876 Department of the Navy, Washington, DC
An Apparatus for Deploying and Recovering a Towed Acoustic Line Array from an Unmanned Undersea Vehicle
Ead, Richard M., Inventor; Dec. 8, 2003; 17 pp.; In English
Patent Info.: Filed 8 Dec. 2003; US-Patent-Appl-SN-10730341
Report No.(s): AD-D020131; No Copyright; Avail: Defense Technical Information Center (DTIC)
A free flooded section of an unmanned undersea vehicle (UUV) contains a rotating cylindrical drum, which serves as a spool for a towed line array cable. At the end of the cable is a reverse thruster with the ability to propel itself away from the UUV when the UUV is submerged. The thruster moves away from the UUV, pulling the cable and unspooling it as it does so in order to deploy the array. To recover the array, the cylindrical drum rotates to reel in the cable. The cable is guided through a series of winding guides that allow the cable to be wound evenly on the drum.
DTIC
Acoustic Delay Lines; Acoustic Measurement; Arrays; Deployment; Patent Applications; Underwater Vehicles

20040055918 NASA Langley Research Center, Hampton, VA, USA
Development of a Bio-nanobattery for Distributed Power Storage Systems
King, Glen C.; Choi, Sang H.; Chu, Sang-Hyon; Kim, Jae-Woo; Park, Yeonjoon; Lillehei, Peter; Watt, Gerald D.; Davis, Robert; Harb, John N.; [2004]; 7 pp.; In English; SPIE 11th Anual International Symposium on Smart Structures and Materials, 14-18 Mar. 2004, San Diego, CA, USA
Contract(s)/Grant(s): NCC1-02005; NCC1-02043; No Copyright; Avail: CASI; A02, Hardcopy
Currently available power storage systems, such as those used to supply power to microelectronic devices, typically consist of a single centralized canister and a series of wires to supply electrical power to where it is needed in a circuit. As the size of electrical circuits and components become smaller, there exists a need for a distributed power system to reduce Joule heating, wiring, and to allow autonomous operation of the various functions performed by the circuit. Our research is being conducted to develop a bio-nanobattery using ferritins reconstituted with both an iron core (Fe-ferritin) and a cobalt core (Co-ferritin). Both Co-ferritin and Fe-ferritin were synthesized and characterized as candidates for the bio-nanobattery. The reducing capability was determined as well as the half-cell electrical potentials, indicating an electrical output of nearly 0.5 V for the battery cell. Ferritins having other metallic cores are also being investigated, in order to increase the overall electrical output. Two dimensional ferritin arrays were also produced on various substrates, demonstrating the necessary building blocks for the bio-nanobattery. The bio-nanobattery will play a key role in moving to a distributed power storage system for electronic applications.
Author
Autonomy; Electric Batteries; Iron; Resistance Heating

20040055993 NASA Langley Research Center, Hampton, VA, USA
Theoretical Evaluation of Electroactive Polymer Based Micropump Diaphragm for Air Flow Control
Xu, Tian-Bing; Su, Ji; Zhang, Qiming; February 19, 2004; 10 pp.; In English; SPIE 11th Annual International Symposium on Smart Structures and Materials, 14-18 Mar. 2004, San Diego, CA, USA
Contract(s)/Grant(s): 274-00-00; No Copyright; Avail: CASI; A02, Hardcopy
An electroactive polymer (EAP), high energy electron irradiated poly(vinylidene fluoride-trifluoroethylene) [P(VDFTrFE)] copolymer, based actuation micropump diaphragm (PAMPD) have been developed for air flow control. The displacement strokes and profiles as a function of amplifier and frequency of electric field have been characterized. The volume stroke rates (volume rate) as function of electric field, driving frequency have been theoretically evaluated, too. The PAMPD exhibits high volume rate. It is easily tuned with varying of either amplitude or frequency of the applied electric field.

In addition, the performance of the diaphragms were modeled and the agreement between the modeling results and experimental data confirms that the response of the diaphragms follow the design parameters. The results demonstrated that the diaphragm can fit some future aerospace applications to replace the traditional complex mechanical systems, increase the control capability and reduce the weight of the future air dynamic control systems. KEYWORDS: Electroactive polymer (EAP), micropump, diaphragm, actuation, displacement, volume rate, pumping speed, clamping ratio.
Author
Numerical Analysis; Electroactive Polymers; Controllability; Dynamic Control; Air Flow

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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*.

20040040065 NASA Langley Research Center, Hampton, VA, USA
Effects of Wing Leading Edge Penetration with Venting and Exhaust Flow from Wheel Well at Mach 24 in Flight
Gnoffo, Peter A.; October 29, 2003; 16 pp.; In English; JANNAF 27th Airbreathing Propulsion/21st Propulsion Hazard/3rd Modeling and Simulation Joint Subcommittee Meeting, USA
Contract(s)/Grant(s): 23-372-20-80; No Copyright; Avail: CASI; A03, Hardcopy

A baseline solution for CFD Point 1 (Mach 24) in the STS-107 accident investigation was modified to include effects of: (1) holes through the leading edge into a vented cavity; and (2) a scarfed, conical nozzle directed toward the centerline of the vehicle from the forward, inboard corner of the landing gear door. The simulations were generated relatively quickly and early in the investigation because simplifications were made to the leading edge cavity geometry and an existing utility to merge scarfed nozzle grid domains with structured baseline external domains was implemented. These simplifications in the breach simulations enabled: (1) a very quick grid generation procedure; and (2) high fidelity corroboration of jet physics with internal surface impingements ensuing from a breach through the leading edge, fully coupled to the external shock layer flow at flight conditions. These simulations provided early evidence that the flow through a two-inch diameter (or larger) breach enters the cavity with significant retention of external flow directionality. A normal jet directed into the cavity was not an appropriate model for these conditions at CFD Point 1 (Mach 24). The breach diameters were of the same order or larger than the local, external boundary-layer thickness. High impingement heating and pressures on the downstream lip of the breach were computed. It is likely that hole shape would evolve as a slot cut in the direction of the external streamlines. In the case of the six-inch diameter breach the boundary layer is fully ingested. The intent of externally directed jet simulations in the second scenario was to approximately model aerodynamic effects of a relatively large internal wing pressure, fueled by combusting aluminum, which deforms the corner of the landing gear door and directs a jet across the windside surface. These jet interactions, in and of themselves, were not sufficiently large to explain observed aerodynamic behavior.
Author
Computational Fluid Dynamics; Aerothermodynamics; Mach Number; Accident Investigation; Space Transportation System Flights; Exhaust Flow Simulation; Hole Geometry (Mechanics)

20040051129 NASA Glenn Research Center, Cleveland, OH, USA
Wind Tunnel Test Results for Gas Flows Inside Axisymmetric Cavities on Cylindric Bodies with Nose Cones
Shvets, A. L.; Gilinsky, M.; Blankson, I. M.; [2004]; 11 pp.; In English; AIAA 12th International Space Planes and Hypersonic Systems and Technologies Conference, 15-19 Dec. 2003, Norfolk, VA, USA
Contract(s)/Grant(s): NAG1-2249; NAG3-2422; NCC3-1037
Report No.(s): AIAA Paper 2003-7064; Copyright; Avail: CASI; A03, Hardcopy

Experimental test results of air flow inside and at the cylindrical cavity located on axisymmetric body are presented. These tests were conducted in the wind tunnel A-7 of Institute of Mechanics at Moscow State University. Pressure distribution along the cavities and optical measurements were obtained. Dependence of these characteristics of length of a cavity in the range: L/D = 0.5 - 14 and free stream Mach in the range: M(sub infinity) = 0.6 - 3.0 was determined. Flow structure inside the cavity, cause of flow regime change, separation zones geometry and others were studied. In particular, the flow modes of with open and closed separation zones are determined.
Author
Wind Tunnel Tests; Gas Flow; Axisymmetric Bodies; Cavities; Nose Cones

20040051140 George Washington Univ., USA
Experiments in the Thermal and Fluid Sciences
Cutler, Andrew D.; [2002]; 5 pp.; In English
Contract(s)/Grant(s): NCC1-370; No Copyright; Avail: CASI; A01, Hardcopy

The Principal Investigator (PI) & students of the George Washington University Joint Institute for the Advancement of Flight Sciences have designed, implemented, and evaluated experiments in the thermal and fluid sciences at the NASA Langley Research Center. This research was conducted cooperatively with NASA employees using, where necessary, equipment and facilities provided by the US. Government.
Author
Flight Mechanics; Computational Fluid Dynamics; Thermodynamics; Air Breathing Engines; NASA Programs

20040052867 NASA Langley Research Center, Hampton, VA, USA
Active Flow Control on a Boundary-Layer-Ingesting Inlet
Gorton, Susan Althoff; Owens, Lewis R.; Jenkins, Luther N.; Allan, Brian G.; Schuster, Ernest P.; [2004]; 12 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): WBS 714-80-UD
Report No.(s): AIAA Paper 2004-1203; Copyright; Avail: CASI; A03, Hardcopy

Boundary layer ingestion (BLI) is explored as means to improve overall system performance for Blended Wing Body configuration. The benefits of BLI for vehicle system performance benefit are assessed with a process derived from first principles suitable for highly-integrated propulsion systems. This performance evaluation process provides framework within which to assess the benefits of an integrated BLI inlet and lays the groundwork for higher-fidelity systems studies. The results of the system study show that BLI provides a significant improvement in vehicle performance if the inlet distortion can be controlled, thus encouraging the pursuit of active flow control (AFC) as a BLI enabling technology. The effectiveness of active flow control in reducing engine inlet distortion was assessed using a 6% scale model of a 30% BLI offset, diffusing inlet. The experiment was conducted in the NASA Langley Basic Aerodynamics Research Tunnel with a model inlet designed specifically for this type of testing. High mass flow pulsing actuators provided the active flow control. Measurements were made of the onset boundary layer, the duct surface static pressures, and the mass flow through the duct and the actuators. The distortion was determined by 120 total pressure measurements located at the aerodynamic interface plane. The test matrix was limited to a maximum freestream Mach number of 0.15 with scaled mass flows through the inlet for that condition. The data show that the pulsed actuation can reduce distortion from 29% to 4.6% as measured by the circumferential distortion descriptor DC60 using less than 1% of inlet mass flow. Closed loop control of the actuation was also demonstrated using a sidewall surface static pressure as the response sensor.
Author
Boundary Layers; Active Control; Ingestion (Engines); Blended-Wing-Body Configurations; Fluid Flow; Engine Inlets; Control Systems Design; Scale Models

20040053293 Sterling Software, Inc., USA, Eloret Corp., USA
Generation of an Aerothermal Data Base for the X33 Spacecraft
Roberts, Cathy; Huynh, Loc; June 17, 1998; 9 pp.; In English; 1998 National Society of Womens Engineering Convention, 16-20 Jun. 1998, Houston, TX, USA
Contract(s)/Grant(s): NAS2-13210; NAS2-14301; NCC8-115; No Copyright; Avail: CASI; A02, Hardcopy

The X-33 experimental program is a cooperative program between industry and NASA, managed by Lockheed-Martin Skunk Works to develop an experimental vehicle to demonstrate new technologies for a single-stage-to-orbit, fully reusable launch vehicle (RLV). One of the new technologies to be demonstrated is an advanced Thermal Protection System (TPS) being designed by BF Goodrich (formerly Rohr, Inc.) with support from NASA. The calculation of an aerothermal database is crucial to identifying the critical design environment data for the TPS. The NASA Ames X-33 team has generated such a database using Computational Fluid Dynamics (CFD) analyses, engineering analysis methods and various programs to compare and interpolate the results from the CFD and the engineering analyses. This database, along with a program used to query the database, is used extensively by several X-33 team members to help them in designing the X-33. This paper will describe the methods used to generate this database, the program used to query the database, and will show some of the aerothermal analysis results for the X-33 aircraft.
Author
Aerothermodynamics; X-33 Reusable Launch Vehicle; Computational Fluid Dynamics; Thermal Protection

20040053360 NASA Glenn Research Center, Cleveland, OH, USA

Enhancement of Mixing and Heat Transfer by Corrugated Permeable Walls

Gilinsky, M.; Sinkine, N.; Akyurtlu, J.; Akyurtlu, A.; Blankson, I. M.; Maron, V. I.; [2003]; 8 pp.; In English; AIAA 12th International Space Planes and Hypersonic Systems and Technologies Conference, 15-19 Dec. 2003, Norfolk, VA, USA

Contract(s)/Grant(s): NAG3-2422; NCC3-1037

Report No.(s): AIAA Paper 2003-7016; No Copyright; Avail: CASI; A02, Hardcopy

A re-circulation method that is based on the static pressure recovery in the divergent part of a converging-diverging flow channel is discussed. This method can be used to design a static device that can be used to increase the residence time of the fluid and the mixing in the transverse and/or flow directions in compressible and incompressible fluids flowing at subsonic velocities. The device with external reverse flow channels will produce mixing in both transverse and flow directions. If mixing in the flow direction is not desired, the concept can be used to design an insert to provide only transverse mixing. Theoretical relationships for a re-circulating one-dimensional incompressible flow around a converging-diverging channel were obtained. Attempts at numerical simulation of re-circulation in compressible fluids were not successful. Qualitative experimental verification of re-circulating flows for incompressible and compressible fluids were obtained.

Author

Incompressible Flow; Heat Transfer; Walls; Incompressible Fluids

20040053361 NASA Glenn Research Center, Cleveland, OH, USA

Spike-Nosed Bodies and Forward Injected Jets in Supersonic Flow

Gilinsky, M.; Washington, C.; Blankson, I. M.; Shvets, A. I.; [2002]; 12 pp.; In English; 38th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 7-10 Jul. 2002, Indianapolis, IN, USA

Contract(s)/Grant(s): NAG3-2422; CRDF-RE1-2068

Report No.(s): AIAA Paper 2002-3918; No Copyright; Avail: CASI; A03, Hardcopy

The paper contains new numerical simulation and experimental test results of blunt body drag reduction using thin spikes mounted in front of a body and one- or two-phase jets injected against a supersonic flow. Numerical simulations utilizing the NASA CFL3D code were conducted at the Hampton University Fluid Mechanics and Acoustics Laboratory (FM&AL) and experimental tests were conducted using the facilities of the IM/MSU Aeromechanics and Gas Dynamics Laboratory. Previous results were presented at the 37th AIAA/ASME/SAE/ASEE Joint Propulsion Conference. Those results were based on some experimental and numerical simulation tests for supersonic flow around spike-nosed or shell-nosed bodies, and numerical simulations were conducted only for a single spike-nosed or shell-nosed body at zero attack angle, alpha = 0 degrees. In this paper, experimental test results of gas, liquid and solid particle jet injection against a supersonic flow are presented. In addition, numerical simulation results for supersonic flow around a multiple spike-nosed body with non-zero attack angles and with a gas and solid particle forward jet injection are included. Aerodynamic coefficients: drag, C (sub D), lift, C(sub L), and longitudinal momentum, M(sub z), obtained by numerical simulation and experimental tests are compared and show good agreement.

Author

Blunt Bodies; Drag Reduction; Spikes (Aerodynamic Configurations); Liquid Injection; Noses (Forebodies); Supersonic Jet Flow

20040053510 Michigan State Univ., East Lansing, MI, USA

Large Eddy Simulation Of Gravitational Effects In Transitional And Turbulent Gas-Jet Diffusion Flames

Jaberi, Farhad A.; Givi, Peyman; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 293-296; In English; See also 20040053504

Contract(s)/Grant(s): NAG3-225; No Copyright; Avail: CASI; A01, Hardcopy

The influence of gravity on the spatial and the compositional structures of transitional and turbulent hydrocarbon diffusion flames are studies via large eddy simulation (LES) and direct numerical simulation (DNS) of round and planar jets. The subgrid-scale (SGS) closures in LES are based on the filtered mass density function (FMDF) methodology. The FMDF represents the joint probability density function (PDF) of the SGS scalars, and is obtained by solving its transport equation. The fundamental advantage of LES/FMDF is that it accounts for the effects of chemical reaction and buoyancy exactly. The methodology is employed for capturing some of the fundamental influences of gravity in equilibrium flames via realistic chemical kinetic schemes. Some preliminary investigation of the gravity effects in non-equilibrium flames is also conducted, but with idealized chemical kinetics models.

Author

Diffusion Flames; Gas Jets; Gravitational Effects; Large Eddy Simulation; Mathematical Models; Turbulent Diffusion

20040053524 Texas Univ., Austin, TX, USA

Characteristics Of Turbulent Nonpremixed Jet-Flames And Jet-Flames In Crossflow In Normal- And Low-Gravity

Clemens, N. T.; Boxx, I. G.; Idicheria, C. A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 289-292; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-667; No Copyright; Avail: CASI; A01, Hardcopy

It is well known that buoyancy has a major influence on the flow structure of turbulent nonpremixed jet flames. For example, previous studies have shown that transitional and turbulent jet flames exhibit flame lengths that are as much as a factor of two longer in microgravity than in normal gravity. The objective of this study is to extend these previous studies by investigating both mean and fluctuating characteristics of turbulent nonpremixed jet flames under three different gravity levels (1 g, 20 mg and 100 micrograms). This work is described in more detail elsewhere. In addition, we have recently initiated a new study into the effects of buoyancy on turbulent nonpremixed jet flames in cross-flow (JFICF). Buoyancy has been observed to play a key role in determining the centerline trajectories of such flames.6 The objective of this study is to use the low gravity environment to study the effects of buoyancy on the turbulent characteristics of JFICF.

Derived from text

Cross Flow; Microgravity; Jet Mixing Flow; Turbulent Jets

20040053543 NASA Glenn Research Center, Cleveland, OH, USA

Droplet Combustion in a Slow Convective Flow

Nayagam, V.; Hicks, M. C.; Ackerman, M.; Haggard, J. B., Jr.; Williams, F. A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 157-160; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The influences of slow convective flow on droplet combustion, particularly in the low Reynolds number regime, have received very little attention in the past. Most studies in the literature are semi-empirical in nature and they were motivated by spray combustion applications in the moderate to high Reynolds number regime. None of the limited number of fundamental theoretical studies applicable to low Reynolds numbers have been verified by rigorous experimental data. Moreover, many unsteady phenomena associated with fluid-dynamic unsteadiness, such as impulsive starting or stopping of a burning droplet, or flow acceleration/deceleration effects, have not been investigated despite their importance in practical applications. In this study we investigate the effects of slow convection on droplet burning dynamics both experimentally and theoretically. The experimental portion of the study involves both ground-based experiments in the drop towers and future flight experiments on board the International Space Station. Heptane and methanol are used as test fuels, and this choice complements the quiescent-environment studies of the Droplet Combustion Experiment (DCE). An analytical model that employs the method of matched asymptotic expansions and uses the ratio of the convective velocity far from the droplet to the Stefan velocity at its surface as the small parameter for expansion has also been developed as a part of this investigation. Results from the ground-based experiments and comparison with the analytical model are presented in this report.

Author

Drops (Liquids); Combustion Physics; Convective Flow

20040053547 California Univ., Irvine, CA, USA

Computational And Experimental Studies Of Three-Dimensional Flame Spread Over Liquid Fuel Pools

Ross, Howard D., Technical Monitor; Cai, Jinsheng; Liu, Feng; Sirignano, William A.; Miller, Fletcher J.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 81-84; In English; See also 20040053504

Contract(s)/Grant(s): NAG3-2024; No Copyright; Avail: CASI; A01, Hardcopy

Schiller, Ross, and Sirignano (1996) studied ignition and flame spread above liquid fuels initially below the flashpoint temperature by using a two-dimensional computational fluid dynamics code that solves the coupled equations of both the gas and the liquid phases. Pulsating flame spread was attributed to the establishment of a gas-phase recirculation cell that forms just ahead of the flame leading edge because of the opposing effect of buoyancy-driven flow in the gas phase and the thermocapillary-driven flow in the liquid phase. Schiller and Sirignano (1996) extended the same study to include flame spread with forced opposed flow in the gas phase. A transitional flow velocity was found above which an originally uniform spreading flame pulsates. The same type of gas-phase recirculation cell caused by the combination of forced opposed flow, buoyancy-driven flow, and thermocapillary-driven concurrent flow was responsible for the pulsating flame spread. Ross and Miller (1998) and Miller and Ross (1998) performed experimental work that corroborates the computational findings of Schiller, Ross, and Sirignano (1996) and Schiller and Sirignano (1996). Cai, Liu, and Sirignano (2002) developed a more comprehensive three-dimensional model and computer code for the flame spread problem. Many improvements in modeling

and numerical algorithms were incorporated in the three-dimensional model. Pools of finite width and length were studied in air channels of prescribed height and width. Significant three-dimensional effects around and along the pool edge were observed. The same three-dimensional code is used to study the detailed effects of pool depth, pool width, opposed air flow velocity, and different levels of air oxygen concentration (Cai, Liu, and Sirignano, 2003). Significant three-dimensional effects showing an unsteady wavy flame front for cases of wide pool width are found for the first time in computation, after being noted previously by experimental observers (Ross and Miller, 1999). Regions of uniform and pulsating flame spread are mapped for the flow conditions of pool depth, opposed flow velocity, initial pool temperature, and air oxygen concentration under both normal and microgravity conditions. Details can be found in Cai et al. (2002, 2003). Experimental results recently performed at NASA Glenn of flame spread across a wide, shallow pool as a function of liquid temperature are also presented here.

Author

Liquid Fuels; Computational Fluid Dynamics; Air Flow; Buoyancy-Driven Flow; Computer Assisted Instruction

20040053574 National Center for Microgravity Research on Fluids and Combusiton, Cleveland, OH, USA

A Role of the Reaction Kernel in Propagation and Stabilization of Edge Diffusion Flames of C1-C3 Hydrocarbons

Takahashi, Fumiaki; Katta, Viswanath R.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 249-252; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Diffusion flame stabilization is of essential importance in both Earth-bound combustion systems and spacecraft fire safety. Local extinction, re-ignition, and propagation processes may occur as a result of interactions between the flame zone and vortices or fire-extinguishing agents. By using a computational fluid dynamics code with a detailed chemistry model for methane combustion, the authors have revealed the chemical kinetic structure of the stabilizing region of both jet and flat-plate diffusion flames, predicted the flame stability limit, and proposed diffusion flame attachment and detachment mechanisms in normal and microgravity. Because of the unique geometry of the edge of diffusion flames, radical back-diffusion against the oxygen-rich entrainment dramatically enhanced chain reactions, thus forming a peak reactivity spot, i.e., reaction kernel, responsible for flame holding. The new results have been obtained for the edge diffusion flame propagation and attached flame structure using various C1-C3 hydrocarbons.

Derived from text

Diffusion Flames; Combustion; Fire Extinguishers; Flat Plates; Microgravity; Reaction Kinetics

20040053583 NASA Glenn Research Center, Cleveland, OH, USA

Buoyancy Effects in Fully-Modulated, Turbulent Diffusion Flames

Hermanson, J. C.; Johari, H.; Ghaem-Maghami, E.; Stocker, D. P.; Hegde, U. G.; Page, K. L.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 285-288; In English; See also 20040053504

Contract(s)/Grant(s): NCC3-673; No Copyright; Avail: CASI; A01, Hardcopy

Pulsed combustion appears to have the potential to provide for rapid fuel/air mixing, compact and economical combustors, and reduced exhaust emissions. The objective of this experiment (PuFF, for Pulsed-Fully Flames) is to increase the fundamental understanding of the fuel/air mixing and combustion behavior of pulsed, turbulent diffusion flames by conducting experiments in microgravity. In this research the fuel jet is fully-modulated (i.e., completely shut off between pulses) by an externally controlled valve system. This gives rise to drastic modification of the combustion and flow characteristics of flames, leading to enhanced fuel/air mixing compared to acoustically excited or partially-modulated jets. Normal-gravity experiments suggest that the fully-modulated technique also has the potential for producing turbulent jet flames significantly more compact than steady flames with no increase in exhaust emissions. The technique also simplifies the combustion process by avoiding the acoustic forcing generally present in pulsed combustors. Fundamental issues addressed in this experiment include the impact of buoyancy on the structure and flame length, temperatures, radiation, and emissions of fully-modulated flames.

Derived from text

Buoyancy; Diffusion Flames; Turbulent Diffusion; Combustion Chambers; Jet Mixing Flow

20040053677 Lawrence Livermore National Lab., Livermore, CA

Special Session: Computational Predictability of Natural Convection Flows In Enclosures

Christon, M. A.; Gresho, P. M.; Sutton, S. B.; Aug. 14, 2000; 22 pp.; In English

Report No.(s): DE2004-15006259; No Copyright; Avail: Department of Energy Information Bridge

Modern thermal design practices often rely on a predictive simulation capability--although predictability is rarely quantified and often difficult to confidently achieve in practice. The computational predictability of natural convection in enclosures is a significant issue for many industrial thermal design problems. One example of this is the design for mitigation of optical distortion due to buoyancy-driven flow in large-scale laser systems. In many instances the sensitivity of buoyancy-driven enclosure flows can be linked to the presence of multiple bifurcation points that yield laminar thermal convective processes that transition from steady to various modes of unsteady flow. This behavior is brought to light by a problem as simple as a differentially-heated tall rectangular cavity (8:1 height/width aspect ratio) filled with a Boussinesq fluid with Pr= 0.71--which defines, at least partially, the focus of this special session. For the authers purposes, the differentially-heated cavity provides a virtual fluid dynamics laboratory. In conclusion, they emphasize that the differentially-heated cavity, in addition to its relevance as a model of convective heat transfer, turns out to be a real fluid mechanics laboratory in itself. The spatial structure of the flow is made of vertical and horizontal boundary layers, of corner structures, of a stratified core, which depend very sensitively on the aspect ratio, Prandtl number and thermal boundary conditions (even a fly-wheel structure can be found at low Pr). All these features cooperate to give rise to very complex time behaviors resulting from several instability mechanisms, traveling waves in the vertical boundary layers, thermal instabilities along the horizontal walls in particular, which can interact strongly with internal wave dynamics.
NTIS
Computation; Convective Heat Transfer; Boundary Conditions; Buoyancy-Driven Flow; Prediction Analysis Techniques

20040055535 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA
Development and Testing of the Virginia Tech Doppler Global Velocimeter
Fussell, John D.; Simpson, Roger L.; May 15, 2003; 190 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0420
Report No.(s): AD-A421330; VPI-AOE-285; No Copyright; Avail: CASI; A09, Hardcopy
Repairs and modifications were made to a flow velocity measurement system designed to measure a planar area of unsteady three component velocities in a single realization using a velocity measurement technique referred to as Doppler Global Velocimetry (DGV). Several hardware components in the system were modified and new hardware was added. Significant improvements were made to the procedures used in acquiring DGV data as well as the procedures used in reducing the acquired DGV data. Though hardware problems were - encountered successful iodine cell calibrations were acquired and attempts were made to acquire DGV velocity data from a calibration wheel and in the wake of a 6:1 prolate spheroid. These attempts were hampered by poor performance of the Nd:YAG laser and one of the digital cameras used in this research. While the magnitudes of the velocities acquired from the calibration wheel were noticeably higher than those calculated from the angular velocity and large fluctuations were present in these reduced velocities the general trends measured by the IT DGV system matched those calculated from the angular velocity: The attempt to acquire flow field data in the wake of a 6:1 prolate spheroid model was unsuccessful due to insufficient seed particle density in the area where data were to be obtained. The results of this research indicate that while significant improvements have been made to the system, there are still some significant problems to overcome.
DTIC
Doppler Effect; Flow Velocity; Velocity Measurement

20040055579 Stanford Univ., Stanford, CA
Direct Numerical Simulation of Turbulent Drag Reduction: Molecular Modeling Molecular Optimization and Modeling without Consititutive Equations
Shaqfeh, E. S.; Moln, P.; Lele, S.; Dubief, Y.; Dimitropoulos, C.; Jan. 2003; 22 pp.; In English
Contract(s)/Grant(s): MDA972-01-C-0041; ARPA ORDER K042/31
Report No.(s): AD-A421417; No Copyright; Avail: CASI; A03, Hardcopy
We present numerical simulations of turbulent drag reduction in wall-bounded flows by additives. The bulk of the work concentrates on polymer additives. A multiscale approach was used to study the fine details of polymer dynamics in turbulence and the transfer of energy between polymers and turbulence. It was shown that polymers extract energy from near-wall vortices and release energy in high-speed streaks very close to the wall. We derived a conceptual model which applies to the two, statistically distinct regimes of polymer drag reduction, namely low drag reduction (LDR) and high drag reduction (HDR). Another additive, fibres, was found to obey to a different mechanism which requires close interaction of multiple vortices.
DTIC
Direct Numerical Simulation; Drag; Drag Reduction; Turbulence; Turbulent Boundary Layer

20040055618 Naval Postgraduate School, Monterey, CA

Analysis of the Sensitivity of Multi-Stage Axial Compressors to Fouling at Various Stages

Baker, Jonathan D.; Sep. 2002; 76 pp.; In English

Report No.(s): AD-A421547; No Copyright; Avail: CASI; A05, Hardcopy

This thesis presents a simple, meanline analysis of the impact of blade roughness on the mass flow, work coefficient, and efficiency of a three-stage axial compressor as a function of the location of fouling. First, an extensive review is presented on the state-of-the-art of measuring compressor degradation and on the impact of roughness on loss and deviation in a compressor cascade. The performance of a baseline, three-stage compressor, which has hydrodynamically smooth blades, is predicted. Using this baseline geometry, the influence of roughness in the front, middle and rear stages is calculated using empirical data for the enhanced losses and increased deviation, with a stage stacking technique. Influence coefficients that relate percentage changes in one parameter to percentage changes in other parameters are calculated. This analysis predicts that the most sensitive parameter for predicting fouling in the front stages is the percentage change in mass flow and the most sensitive parameter for predicting fouling in the rear stages is the efficiency.

DTIC

Compressors; Fouling; Gas Turbines; Mass Flow; Sensitivity; Surface Roughness; Turbocompressors

20040055623 Army Tank-Automotive Research and Development Command, Warren, MI

Compressible Fluid Suspension Performance Testing

Hoogterp, Francis B.; Wray, Andrea C.; Garabedian, Scott; Brown, Kevin; Davis, Richard; Jun. 2003; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421579; TARDEC-TR-13881; No Copyright; Avail: CASI; A03, Hardcopy

Mobility testing was conducted on two HMMWVs at the U.S. Army Yuma Proving Grounds by the U.S. Army Tank-automotive Research, Development and Engineering Center (TARDEC), and Davis Technologies International, Inc. (DTI) of Addison, Texas during the period of 23-27 September 2002. One of the vehicles tested was a standard HMMWV and the second was a HMMWV with a very low bandwidth active compressible fluid suspension system that was designed and installed on the vehicle by DTI. The purpose of the tests was to evaluate the possible performance benefits of the compressible fluid suspension system. Ride quality performance was quantified over three separate cross-country courses. Each vehicle s driver limited speed was also measured over discrete half- round obstacles of 4, 6, and 8-inch heights. Vehicle maneuverability was also evaluated by testing over a lane- change course and a slalom course at a variety of vehicle speeds. Limited vehicle roll down tests were also conducted to get a comparison of the rolling resistance of the two vehicles.

DTIC

Compressible Fluids; Performance Tests

20040055877 Department of the Navy, Washington, DC

Vortex-Assisted Pressure Control at Inlet of Underwater Launch System

Gieseke, Thomas J., Inventor; Apr. 2, 2004; 14 pp.; In English

Patent Info.: Filed 29 Oct. 2003; US-Patent-Appl-SN-10695497

Report No.(s): AD-D020132; No Copyright; Avail: Defense Technical Information Center (DTIC)

The present invention relates generally to controlling the flow of a surrounding environmental fluid into an inlet formed in a moving vehicle, and more particularly to a system that uses vortices to control such a flow at the inlet of, for example, an underwater vehicle's underwater launch system. Many underwater launch systems used by underwater vehicles utilize the forward motion of the vehicle and underwater pressure to develop a dynamic pressure head for launch initiation. An inlet formed in the vehicle's hull admits water as the vehicle moves forward. A launch pressurization system coupled to the inlet pressurizes and directs the water flow to a launch tube. The inlet can be open at all times or fitted with a door that is kept closed and flush with the vehicle's hull until a launch is required. A vortex-assisted pressure control system is provided for controlling fluid flow into an inlet formed in a vehicle where such fluid flow into the inlet occurs during vehicle movement. A vortex generator, or generators, is positioned forward of the inlet with respect to the forward movement of the vehicle to generate streamwise vortices in the fluid as the vehicle moves through the fluid. Each vortex generator is controllable so as to adjust the strength of the streamwise vortices and the lateral position of the streamwise vortices relative to the inlet. Sensors are used to detect the lateral position of the streamwise vortices relative to the inlet, and the pressure of the fluid that has entered the inlet. A controller adjusts the vortex generator based on sensor measurements to control the lateral position of the streamwise vortices and the pressure of the fluid entering the vehicle via the inlet. Still another object of the present invention is to provide

a vortex generating system for a vehicle that minimizes an acoustic signature associated therewith when the system is not in use.
DTIC
Adaptive Control; Fluid Flow; Launchers; Launching; Patent Applications; Pressure Measurement; Pressure Regulators; Underwater Vehicles; Vortex Generators; Vortices

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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*.

20040051215 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
ENVISAT Land Surface Processes, Phase 2
vandenHurk, B. J. J. M.; Su, Z.; Verhoef, W.; Menenti, M.; Li, Z.-L.; Wan, Z.; Moene, A. F.; Roerink, G.; Jia, I.; 2002; ISSN 0169-1651; 54 pp.; In English
Contract(s)/Grant(s): NAS5-31370; BCRS-4.2/AP-I4
Report No.(s): KNMI-WR-2002-06-Phase-2; NUSP-2-02-03-Phase-2; Copyright; Avail: Other Sources

This is a progress report of the 2nd phase of the project ENVISAT- Land Surface Processes, which has a 3-year scope. In this project, preparative research is carried out aiming at the retrieval of land surface characteristics from the ENVISAT sensors MERIS and AATSR, for assimilation into a system for Numerical Weather Prediction (NWP). Where in the 1st phase a number of first shot experiments were carried out (aiming at gaining experience with the retrievals and data assimilation procedures), the current 2nd phase has put more emphasis on the assessment and improvement of the quality of the retrieved products. The forthcoming phase will be devoted mainly to the data assimilation experiments and the assessment of the added value of the future ENVISAT products for NWP forecast skill. Referring to the retrieval of albedo, leaf area index and atmospheric corrections, preliminary radiative transfer calculations have been carried out that should enable the retrieval of these parameters once AATSR and MERIS data become available. However, much of this work is still to be carried out. An essential part of work in this area is the design and implementation of software that enables an efficient use of MODTRAN(sub 4) radiative transfer code, and during the current project phase familiarization with these new components has been achieved. Significant progress has been made with the retrieval of component temperatures from directional ATSR-images, and the calculation of surface turbulent heat fluxes from these data. The impact of vegetation cover on the retrieved component temperatures appears manageable, and preliminary comparison of foliage temperature to air temperatures were encouraging. The calculation of surface fluxes using the SEBI concept,which includes a detailed model of the surface roughness ratio, appeared to give results that were in reasonable agreement with local measurements with scintillometer devices. The specification of the atmospheric boundary conditions appears a crucial component, and the use of first guess estimates from the RACMO models partially explains the success. Earlier data assimilation experiments with directional surface temperatures have been analysed a bit further and were also compared to results obtained from directly modeling the surface roughness ratio. Results between these calculations and the data assimilation results appeared well comparable, but a full test in which the surface roughness model is allowed to play a free role during the data assimilation process has yet to be carried out. A considerable number of tasks that have yet to be carried out during Phase 3 has been formulated.
Author
Albedo; Boundary Conditions; Turbulent Heat Transfer; Surface Temperature; Numerical Weather Forecasting

20040053462 Universities Space Research Association, Boulder, CO, USA
COR1 Engineering Test Unit Measurements at the Mauna Loa Solar Observatory, September 2003
Thompson, William; Reginald, Nelson; Streander, Kim; October 09, 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-12049; No Copyright; Avail: CASI; A03, Hardcopy

The COR1 Engineering Test Unit (ETU), which had been previously tested at the NCAR/HAO and NRL test facilities, was modified into an instrument capable of observing the Sun. It was then taken to the Mauna Loa Solar Observatory to observe the corona. The changes made to observe the Sun were as follows: 1. The plate scale was changed to accommodate the smaller Apogee camera. This change had already been made for the NRL tests. 2. The previous Oriel polarizer was replaced with a commercial Polarcor polarizer from Newport to be more flight-like. However, because of cost and availability

considerations, this polarizer was smaller than those which will be used for flight. 3. A structure was placed around the back section of the instrument, to protect it from stray light. 4. A pointing spar borrowed from HAO was used to track the Sun. A few days into the test, it became evident that some artifacts were appearing in the data, and these artifacts were changing as the polarizer was rotated. It was decided to test two other polarizers, the Oriel polarizer which had been used in the previous tests at HAO and NRL, and a Nikon polarizer which was borrowed from a camera belonging to one of the observatory staff members. These three polarizers had much different qualities are shown.
Author
Apogees; Sun; Solar Observatories; Polarizers; Coronas

20040053509 Physical Sciences, Inc., Andover, MA, USA
Hyperspectral Infrared Imaging of Flames
Rawlins, W. T.; Oakes, D. B.; Wehe, S. D.; Hammer, D. X.; Marinelli, W. J.; Allen, M. G.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 233-236; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The instrument, named AIRIS (Adaptive Infrared Imaging Spectroradiometer), is a computer-controlled, rapidly scanning Fabry-Perot etalon, coupled to an infrared camera and an optical collection system, which is capable of imaging flame radiance spectra in the infrared. The device combines the imaging capability of an infrared camera with the fast spectral scanning capability of a Fabry-Perot etalon, at medium spectral resolutions in the infrared. Through rapid stepping of the etalon through a series of pre-programmed wavelengths, a series of images of the scene at each wavelength is produced over a short (<1 second) time frame, resulting in a hyperspectral cube of spectral radiance as a function of height, width, and wavelength. During the currently funded project, we are using the AIRIS instrument in laboratory flame measurements to characterize its performance, to develop the necessary data analysis tools, and to examine its potential for microgravity investigations of flame spread phenomena over solid fuels. Ultimately, the AIRIS instrument can use four mirror sets to operate over the spectral ranges 2.5 to 3.3 m, 3.7 to 5.0 m, 5.0 to 6.5 m, and 8 to 11 m, encompassing the spectral features of H2O, CO2, CO, NO, hydrocarbons, and fuel surface emissions. The present work focuses on spectrally scanning imaging measurements in the 2.6 to 2.9 and 3.7 to 5.0 m regions.
Author
Etalons; Flames; Infrared Imagery

20040053558 NASA Glenn Research Center, Cleveland, OH, USA
An Earth-Based Equivalent Low Stretch Apparatus to Assess Material Flammability for Microgravity and Extraterrestrial Fire-Safety Applications
Olson, S. L.; Beeson, H.; Haas, J. P.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 213-216; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The objective of this project is to modify the standard oxygen consumption (cone) calorimeter (described in ASTM E 1354 and NASA STD 6001 Test 2) to provide a reproducible bench-scale test environment that simulates the buoyant or ventilation flow that would be generated by or around a burning surface in a spacecraft or extraterrestrial gravity level. This apparatus will allow us to conduct normal gravity experiments that accurately and quantitatively evaluate a material's flammability characteristics in the real-use environment of spacecraft or extra-terrestrial gravitational acceleration. The Equivalent Low Stretch Apparatus (ELSA) uses an inverted cone geometry with the sample burning in a ceiling fire configuration that provides a reproducible bench-scale test environment that simulates the buoyant or ventilation flow that would be generated by a flame in a spacecraft or extraterrestrial gravity level. Prototype unit testing results are presented in this paper. Ignition delay times and regression rates for PMMA are presented over a range of radiant heat flux levels and equivalent stretch rates which demonstrate the ability of ELSA to simulate key features of microgravity and extraterrestrial fire behavior.
Author
Calorimeters; Flammability; Microgravity Applications; Spacecraft Environments

20040055326 Bovie Medical Corp., Hampton Bays, NY, USA
Can the Electronic Tongue be Given a Taste for Life?
Konesky, G. A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 43; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

An integrated array of electrochemical sensors, termed the 'electronic tongue,' has been developed for in-situ

determination of extraterrestrial geochemistry. By noting the ability of a microorganism to modify its environment, but also making minimal assumptions otherwise, such a sensor array can be used as an electrochemically-based growth sensor. A complimentary approach relies on the collection and detection of respiratory electrons, again without relying on any specific terminal electron acceptor. Both approaches, unfortunately, are susceptible to local geochemistry posing as biochemistry. By combining strategies, along with techniques of variable sample size influence on time-resolved activity, a robust and reproducible system results for the remote detection of microbial life. Spaceflight hardware realizations benefit from small size, low weight, low power requirements, low data rates, and simple construction which is tolerant to shock and vibration. Experimental results are discussed.
Author
Arrays; Electrochemistry; Chemical Analysis; In Situ Measurement; Exobiology

20040055366 Bern Univ., Bern, Switzerland
A Highly Miniaturized Laser Ablation Time-of-Flight Mass Spectrometer for Planetary Exploration
Wurz, Peter; Rohner, Urs; Whitby, James A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 96-97; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

We report the development and testing of two highly miniaturized mass spectrometers intended to be deployed on an airless planetary surface to measure the elemental and isotopic composition of solids. We designed and built two instruments, a larger unit for use on a fixed landing spacecraft and a smaller unit intended for use in a small mobile plat form roving on a planetary surface. Both instruments were designed and built with the intention for implementation in the Mercury Surface Element (MSE) of the proposed BepiColombo mission to the planet Mercury, either in the landing spacecraft itself or on the rover. Both mass spectrometers are time-of-flight instruments using ion mirrors to increase the ion path length and increase the mass resolution by time-focussing.
Author
Laser Ablation; Time of Flight Spectrometers; Mass Spectrometers; Spacecraft Instruments

20040055383 NASA Langley Research Center, Hampton, VA, USA
Automatic Assessment and Reduction of Noise using Edge Pattern Analysis in Non-Linear Image Enhancement
Jobson, Daniel J.; Rahman, Zia-Ur; Woodell, Glenn A.; Hines, Glenn D.; March 03, 2004; 9 pp.; In English; SPIE Defense and Security Symposium, 12-16 Apr. 2004, Orlando, FL, USA
Contract(s)/Grant(s): NCC1-01030; 23-728-60-30; No Copyright; Avail: CASI; A02, Hardcopy

Noise is the primary visibility limit in the process of non-linear image enhancement, and is no longer a statistically stable additive noise in the post-enhancement image. Therefore novel approaches are needed to both assess and reduce spatially variable noise at this stage in overall image processing. Here we will examine the use of edge pattern analysis both for automatic assessment of spatially variable noise and as a foundation for new noise reduction methods.
Author
Noise Reduction; Image Processing; Image Enhancement; Visibility

20040055395 NASA Langley Research Center, Hampton, VA, USA
Enhanced Images for Checked and Carry-on Baggage and Cargo Screening
Woodell, Glenn; Rahman, Zia-ur; Jobson, Daniel J.; Hines, Glenn; [2004]; 8 pp.; In English; SPIE Defense and Security Symposium, 12-16 Apr. 2004, Orlando, FL, USA
Contract(s)/Grant(s): 728-60-30; No Copyright; Avail: CASI; A02, Hardcopy

The current X-ray systems used by airport security personnel for the detection of contraband, and objects such as knives and guns that can impact the security of a flight, have limited effect because of the limited display quality of the X-ray images. Since the displayed images do not possess optimal contrast and sharpness, it is possible for the security personnel to miss potentially hazardous objects. This problem is also common to other disciplines such as medical Xrays, and can be mitigated, to a large extent, by the use of state-of-the-art image processing techniques to enhance the contrast and sharpness of the displayed image. The NASA Langley Research Center's Visual Information Processing Group has developed an image enhancement technology that has direct applications to this problem of inadequate display quality. Airport security X-ray imaging systems would benefit considerably by using this novel technology, making the task of the personnel who have to interpret the X-ray images considerably easier, faster, and more reliable. This improvement would translate into more accurate screening as well as minimizing the screening time delays to airline passengers. This technology, Retinex, has been optimized for consumer applications but has been applied to medical X-rays on a very preliminary basis. The resultant technology could

be incorporated into a new breed of commercial x-ray imaging systems which would be transparent to the screener yet allow them to see subtle detail much more easily, reducing the amount of time needed for screening while greatly increasing the effectiveness of contraband detection and thus public safety.
Author
Cargo; Image Processing; Image Enhancement; X Ray Imagery

20040055396 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The COR1 Inner Coronagraph for STEREO-SECCHI
Thompson, William T.; Davila, Joseph M.; Fisher, Richard R.; Orwig, Larry E.; Mentzell, John E.; Hetherington, Samuel E.; Derro, Rebecca J.; Ferderline, Robert E.; Clark, David C.; Chen, Philip T., et al.; Proceedings of SPIE: Innovative Telescopes and Instrumentation for Solar Astrophysics; [2004]; ISSN 0227-786X; Volume 4853, pp. 1-11; In English
Contract(s)/Grant(s): NAG5-12049; Copyright; Avail: Other Sources

The Solar Terrestrial Relations Observatory (STEREO) is a pair of identical satellites that will orbit the Sun so as to drift ahead of and behind Earth respectively, to give a stereo view of the Sun. STEREO is currently scheduled for launch in November 2005. One of the instrument packages that will be own on each of the STEREO spacecrafts is the Sun Earth Connection Coronal and Heliospheric Investigation (SECCHI), which consists of an extreme ultraviolet imager, two coronagraphs, and two side-viewing heliospheric imagers to observe solar coronal mass ejections all the way from the Sun to Earth. We report here on the inner coronagraph, labeled COR1. COR1 is a classic Lyot internally occulting refractive coronagraph, adapted for the first time to be used in space. The field of view is from 1.3 to 4 solar radii. A linear polarizer is used to suppress scattered light, and to extract the polarized brightness signal from the solar corona. The optical scattering performance of the coronagraph was first modeled using both the ASAP and APART numerical modeling codes, and then tested at the Vacuum Tunnel Facility at the National Center for Atmospheric Research in Boulder, Colorado. In this report, we will focus on the COR1 optical design, the predicted optical performance, and the observed performance in the lab. We will also discuss the mechanical and thermal design, and the cleanliness requirements needed to achieve the optical performance.
Author
Coronagraphs; Refractivity; Solar Observatories; Space Missions; Sun; Solar Terrestrial Interactions; Mechanical Engineering; Instrument Packages

20040055467 Army Research Lab., Aberdeen Proving Ground, MD
The Effect of Variability in Stereo Camera Calibration and Registration Parameters on Three-Dimensional Reconstruction Distance Estimates
Oberle, William F.; Feb. 2004; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421239; ARL-TR-31-40; No Copyright; Avail: CASI; A04, Hardcopy

The process of calculating distance front binocular or stereo vision is tented three-dimensional (3-D) reconstruction. Unlike some other approaches for estimating distance, e.g., LADAR (laser detection and ranging), this is not a direct measurement but is a geometric analysis requiring the knowledge of experimentally measured and mathematically derived parameters. Variability in these parameters results in variability in the calculated distances. This report investigates the effect that the variability in these parameters has on computed 3-D reconstruction distances. Results indicate that sub-pixel and milliradian accuracy are required for the parameters in order to have less than a 10% variation in the 3-D reconstruction process.
DTIC
Binoculars; Calibrating; Cameras; Estimates; Variability

20040055570 Florida Univ., Gainesville, FL
Electrophotographic Solid Freeform Fabrication
Kumar, Ashok; Dec. 30, 2003; 40 pp.; In English
Contract(s)/Grant(s): N00014-98-1-0694
Report No.(s): AD-A421397; ONR-ESFF-10-2003; No Copyright; Avail: CASI; A03, Hardcopy

A method for solid freeform fabrication based on electrophotographic powder deposition was investigated to study its potentials and to identity design and implementation challenges. In this technique powder is printed layer-by-layer in the shape of the cross-sections of the part using electrophotography, which is a very widely used non-impact printing method. The electrophotography process involves picking and depositing powder using an electrostatically charged photoconducting

surface. Each layer of powder is consolidated by fusing before the next layer of powder is printed. A fully automated test bed was constructed that consists of a printing system, fusing/ heating plate, a build platform that has two-degrees of freedom as well as software that drives the system. Electrophotography provides high printing resolution and accuracy that is particularly suited for printing fine powder (5-20 microns) to build small objects. In addition to rapid prototyping, applications of this process include layered manufacturing of a variety of micro and meso-scaled objects and assemblies.
DTIC
Electro-Optical Photography; Fabrication

20040055592 Naval Surface Warfare Center, Dahlgren, VA
RFC Validation - Statistical On-Time Comparison With In-Situ Methods
Pawlak, Robert; Stapleton, Janet; Thornton, William; Nov. 2002; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421452; NSWCDD/TR-02/112; No Copyright; Avail: CASI; A03, Hardcopy

The ability to extract a refractivity profile from in-situ data is a valuable capability for today's radar systems. To date, most investigations have centered upon the use of ancillary sensors to accomplish this task, with varying degrees of success. The purpose of this paper is to quantify the performance of an approach that does not require any ancillary sensors. The results show that under certain conditions, this approach yields results comparable to those obtained from in-situ data collected via rocketsonde, but in its current form, it cannot yet compete with helicopter- derived profiles.
DTIC
Refraction

20040055630 Defence Science and Technology Organisation, Salisbury
Transcription of Multiple Speakers Using Speaker Dependent Speech Recognition
Sep. 2003; 53 pp.; In English
Report No.(s): AD-A421660; DSTO-TR-1498; DSTO-AR-012-899; No Copyright; Avail: CASI; A04, Hardcopy

Speech recognition can potentially aid in producing transcripts of discussions, interviews, meetings, and other collaborative efforts. This report presents a concept demonstrator of an automatic transcription system that produces text and audio records using speaker dependent speech recognition. It is defined and discussed in terms of how it works, how users operate it, and its similarities and differences with other transcription systems.
DTIC
Audio Tapes; Speech Recognition; Teleconferencing

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MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20040053468 NASA Glenn Research Center, Cleveland, OH, USA
Optimized Shapes of Ocsillating Resonators for Generating High-Amplitude Pressure Waves
Li, Xiao-Fan; Finkbeiner, Joshua; Daniels, Christopher; Steinetz, Bruce M.; December 29, 2003; 34 pp.; In English
Contract(s)/Grant(s): NCC3-798; No Copyright; Avail: CASI; A03, Hardcopy

It is well known that the resonator geometry strongly influences the resonant frequencies of an acoustical resonator and the generated nonlinear standing pressure waveform. Maximizing the ratio of maximum to minimum gas pressure at an end of an oscillating resonator by optimizing the cavity contour is investigated numerically. A quasi-Newton type scheme is used to find optimized axisymmetric resonator shapes to achieve the maximum pressure compression ratio. The acoustical field is solved using a one-dimensional model, and the resonance frequency shift and hysteresis effects are obtained through an automation scheme based on continuation methods. Results are presented from optimizing cone, horn-cone, and cosine resonator geometries. Significant performance improvement is found in the optimized shapes over others previously published. Different optimized shapes are found when starting with different initial guesses, indicating multiple local extrema. The numerical model is validated by comparing with the experimental results of a horn-cone shaped resonator.
Author
Gas Pressure; Resonators; Resonant Frequencies; Waveforms; Oscillations

20040053473 NASA Ames Research Center, Moffett Field, CA, USA
Simple Two-Dimensional Corrections for One-Dimensional Pulse Tube Models
Lee, J. M.; Kittel, P.; Timmerhaus, K. D.; Radebaugh, R.; [2004]; 9 pp.; In English
Contract(s)/Grant(s): RTOP 632-20-00; No Copyright; Avail: CASI; A02, Hardcopy

One-dimensional oscillating flow models are very useful for designing pulse tubes. They are simple to use, not computationally intensive, and the physical relationship between temperature, pressure and mass flow are easy to understand when used in conjunction with phasor diagrams. They do not possess, however, the ability to directly calculate thermal and momentum diffusion in the direction transverse to the oscillating flow. To account for transverse effects, lumped parameter corrections, which are obtained though experiment, must be used. Or two-dimensional solutions of the differential fluid equations must be obtained. A linear two-dimensional solution to the fluid equations has been obtained. The solution provides lumped parameter corrections for one-dimensional models. The model accounts for heat transfer and shear flow between the gas and the tube. The complex Nusselt number and complex shear wall are useful in describing these corrections, with phase relations and amplitudes scaled with the Prandtl and Valensi numbers. The calculated ratio, a, between a two-dimensional solution of the oscillating temperature and velocity and a one-dimensional solution for the same shows a scales linearly with Va for Va less than 30. In this region alpha less than 0.5, that is, the enthalpy flow calculated with a two-dimensional model is 50% of a calculation using a one-dimensional model. For Va greater than 250, alpha = 0.8, showing that diffusion is still important even when it is confined to a thing layer near the tube wall.
Author
Two Dimensional Models; Mechanical Devices; Pipes (Tubes); Orifice Flow; Cooling Systems; Oscillating Flow

20040053600 University of Southern California, Los Angeles, CA, USA
Thermal Transpiration Based Microscale Propulsion And Power Generation Devices
Ochoa, F.; Eastwood, C.; Ronney, P. D.; Dunn, B.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 373-376; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

With the continually decreasing size and weight of communication, control and instrumentation systems for aerospace vehicles due to advances in microelectronics and micro electro-mechanical systems (MEMS), there is considerable interest in miniaturizing the propulsion and power systems as well. While many miniature space and airbreathing propulsion system concepts have been proposed, most require moving parts. All miniaturized propulsion devices with moving parts experience more difficulties with heat and friction losses due to higher surface to volume ratios than their macroscale counterparts. Moreover sealing, fabrication and assembly are much more difficult at small scales because microfabrication processes have much poorer relative precision than convectional macroscale processes. Additionally, all air and space vehicles, regardless of size, require electrical power. The use of combustion processes for electrical power generation provides enormous advantages over batteries both in terms of energy storage per unit mass and in terms of power generation per unit volume, even when the conversion efficiency in the combustion process from thermal energy to electrical energy is taken into account. Most current micro-scale power generation concepts employ scaled-down versions of existing macroscale devices, in particular internal combustion engines, though again such micro-devices experience more difficulties with heat losses, friction, sealing, fabrication, assembly etc. than their macroscale counterparts. Consequently, the advantages of combustion processes over batteries for small-scale electrical power sources have not yet been exploited, though research is ongoing. Because of these difficulties, we propose a microscale or mesoscale propulsion system with no moving parts and not requiring precision manufacturing, applicable to either space or airbreathing vehicles, based on a catalytic combustion-driven thermal transpiration pump.
Derived from text
Transpiration; Thermal Energy; Microelectromechanical Systems; Electric Generators; Fabrication; Mechanical Devices

20040053644 Transportation Research Board, Washington, DC, Scentczar Corp., Fredericksburg, VA, USA
Continuous Locomotive Emissions Analyzer
Roehl, J. E.; Feb. 2004; 42 pp.; In English
Report No.(s): PB2004-104104; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this project was to evaluate the use of Ion Mobility Spectrometry (IMS) sensors to continuously monitor NOx levels in the exhaust stream of diesel electric locomotives. The output signals from such sensors could potentially be used as input to a system that continuously controls injector settings to achieve an optimum balance between engine efficiency and exhaust emissions. The IMS-based system could adjust engine parameters to maximize engine efficiency while meeting EPA NOx emission standards. Laboratory tests conducted during this project provided some preliminary indication that the IMS

has potential for incorporation into this type of system. However, the results of full-scale testing of the sensors on a stationary 1500 horsepower diesel engine proved inconclusive due to problems with calibration procedures and data collection equipment.
NTIS
Locomotives; Exhaust Emission; Air Pollution

20040053687 Idaho Univ., Moscow, ID, USA
Modeling and Application of Catalytic Ignition in Internal Combustion Engines
Steciak, J.; Beyerlein, S.; Mar. 2004; 68 pp.; In English
Report No.(s): PB2004-104488; No Copyright; Avail: CASI; A04, Hardcopy

The authors progressed toward our ultimate goal of developing catalytic igniters for aqueous ethanol as a transportation fuel with three different actions. (1) Developing a test matric to compare the performance of the same passenger van converted to operating with gasoline and aqueous ethanol. The authors used a steady-state chassis dynamometer approximating urban and rural driving cycles to develop the test matrix that makes it possible to compare vehicle performance on gasoline and ethanol-water and quantify differences in performance and emissions. (2) Determining the average temperature when surface reactions occur on a heated platinum wire catalyst. The authors compared results from the study of ignition of catalyst wire temperatures over-predicted the temperatures by only three percent and indicated that axial conduction dominated heat losses. The authors modeled the terman decomposition and combustion kinetics of gas-phase 100 percent ethanol oxidation. The output was compared with flow reactor data and reasonable agreement was found. The FEA modeling indicates that thermal breaks and/or substrates with lower thermal conductivity will reduce heat losses from catalytic igniters. (3) Theoretically modeling the impact of water on the gas-phase oxidation of ethanol, which permits us to determine the optimal ignition and combustion conditions needed to reduce the formation of toxins and environmental contaminants from renewable transportation fuels.
NTIS
Internal Combustion Engines; Transportation; Fuels

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20040053461 Universities Space Research Association, Boulder, CO, USA
COR1 Engineering Test Unit Measurements at the NCAR/HAO Vacuum Tunnel Facility, October-November 2002
Thompson, William; December 06, 2002; 27 pp.; In English
Contract(s)/Grant(s): NAG5-12049; No Copyright; Avail: CASI; A03, Hardcopy

The Engineering Test Unit (ETU) of COR1 was made in two configurations. The first configuration, ETU-1, was for vibration testing, while the second, ETU-2, was for optical testing. This is a report on the optical testing performed on ETU-2 at the NCAR/HAO Vacuum Tunnel Facility during the months of October and November, 2002. This was the same facility used to test the two previous breadboard models. In both configurations, the first two tube sections were complete, with all optical elements aligned. The vibration model ETU-1 had the remaining tube sections attached, with mass models for the remaining optics, for the various mechanisms, and for the focal plane assembly. It was then converted into the optical model ETU-2 by removing tube sections 3 to 5, and mounting the remaining optics on commercial mounts. (The bandpass filter was also installed into tube 2, which had been replaced in ETU-1 by a mass model, so that pre- and post-vibration optical measurements could be made.) Doublet 2 was installed in a Newport LP-2 carrier, and aligned to the other optics in the first two tube sections. The LP-2 adjustment screws were then uralened so that the alignment could be maintained during shipping. Because neither the flight polarizer nor Hollow Core Motor were available, they were simulated by a commercial polarizer and rotational mount, both from Oriel corporation. The Oriel rotational stage was not designed for vacuum use, but it was determined after consultation with the company, and lab testing, that the stage could be used in the moderate vacuum conditions at the NCAR/HAO facility. The shutter and focal plane assembly were simulated with the same camera used for the previous two breadboard tests. The focal plane mask was simulated with a plane of BK7 glass with a mask glued on, using the same procedure as for the Lyot spot on Doublet 1, and mounted in an adjustable LP-2 carrier. Two masks were made, one made to the precise specifications of the optical design, the other slightly bigger to make alignment easier.
Author
Vibration Measurement; Test Equipment; Optical Measurement; Optical Equipment; Design Analysis

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*.

20040053358 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Evaluation of Data Retention and Imprint Characteristics of FRAMs Under Environmental Stresses for NASA Applications

Sharma, Ashok K.; Teverovsky, Alexander; Dowdy, Terry W.; Hamilton, Brett; [2000]; 8 pp.; In English; NVMTS 2002 Conference, November 4-8 2002, Honolulu, Hawaii, USA; No Copyright; Avail: CASI; A02, Hardcopy

A major reliability issue for all advanced nonvolatile memory (NVM) technology devices including FRAMs (Ferroelectric random access memories) is the data retention characteristics over extended period of time, under environmental stresses and exposure to total ionizing dose (TID) radiation effects. For this testing, 256 Kb FRAMs in 28-pin plastic DIPS, rated for industrial grade temperature range of -40 C to +85 C, were procured. These are two-transistor, two-capacitor (2T-2C) design FRAMs. In addition to data retention characteristics, the parts were also evaluated for imprint failures, which are defined as the failure of cells to change from a 'preferred' state, where it has been for a significant period of time to an opposite state (e.g., from 1 to 0, or 0 to 1). These 256 K FRAMs were subjected to scanning acoustic microscopy (C-SAM); 1,000 temperature cycles from -65 C to +150 C; high temperature aging at 150 C, 175 C, and 200 C for 1,000 hours; highly accelerated stress test (HAST) for 500 hours; 1,000 hours of operational life test at 125 C; and total ionizing dose radiation testing. As a preconditioning, 10 K read/write cycles were performed on all devices. Interim electrical measurements were performed throughout this characterization, including special imprint testing and final electrical testing. Some failures were observed during high temperature aging test at 200 C, during HAST testing, and during 1,000 hours of operational life at 125 C. The parts passed 10 Krad exposure, but began showing power supply current increases during the dose increment from 10 Krad to 30 Krad, and at 40 Krad severe data retention and parametric failures were observed. Failures from various environmental group testing are currently being analyzed.

Author

Ferroelectricity; Random Access Memory; Aging (Materials); Technology Utilization; Accelerated Life Tests; Stress Analysis

20040053680 Lawrence Livermore National Lab., Livermore, CA

Tracking and Motion Analysis of Crack Propagations in Crystals for Molecular Dynamics

Tsap, L. V.; Duchaineau, M.; Goldgof, D. B.; May 14, 2001; 12 pp.; In English

Report No.(s): DE2004-15006267; UCRL-JC-143820; No Copyright; Avail: Department of Energy Information Bridge

This paper presents a quantitative analysis for a discovery in molecular dynamics. Recent simulations have shown that velocities of crack propagations in crystals under certain conditions can become supersonic, which is contrary to classical physics. In this research, we present a framework for tracking and motion analysis of crack propagations in crystals. It includes line segment extraction based on Canny edge maps, feature selection based on physical properties and subsequent tracking of primary and secondary wavefronts. This tracking is completely automated; it runs in real time on three 834-image sequences using forty 250 MHZ processors. Results supporting physical observations are presented in terms of both feature tracking and velocity analysis.

NTIS

Crack Propagation; Crystals; Extraction; Molecular Dynamics

20040055403 Virginia Univ., Charlottesville, VA, USA

Testing the Predictive Capability of the High-Fidelity Generalized Method of Cells Using an Efficient Reformulation

Arnold, Steven M., Technical Monitor; Bansal, Yogesh; Pindera, Marek-Jerzy; April 2004; 66 pp.; In English

Contract(s)/Grant(s): NAG3-2524; WBS 22-714-70-11

Report No.(s): NASA/CR-2004-213043; E-14480; No Copyright; Avail: CASI; A04, Hardcopy

The High-Fidelity Generalized Method of Cells is a new micromechanics model for unidirectionally reinforced periodic multiphase materials that was developed to overcome the original model's shortcomings. The high-fidelity version predicts the local stress and strain fields with dramatically greater accuracy relative to the original model through the use of a better displacement field representation. Herein, we test the high-fidelity model's predictive capability in estimating the elastic moduli of periodic composites characterized by repeating unit cells obtained by rotation of an infinite square fiber array through an angle about the fiber axis. Such repeating unit cells may contain a few or many fibers, depending on the rotation

angle. In order to analyze such multi-inclusion repeating unit cells efficiently, the high-fidelity micromechanics model's framework is reformulated using the local/global stiffness matrix approach. The excellent agreement with the corresponding results obtained from the standard transformation equations confirms the new model's predictive capability for periodic composites characterized by multi-inclusion repeating unit cells lacking planes of material symmetry. Comparison of the effective moduli and local stress fields with the corresponding results obtained from the original Generalized Method of Cells dramatically highlights the original model's shortcomings for certain classes of unidirectional composites.
Author
Micromechanics; Deformation; Composite Materials; Stress Distribution; Modulus of Elasticity; Mathematical Models

20040055934 Army Construction Engineering Research Lab., Champaign, IL
Condition Assessment of William Beaumont General Hospital Historic Building at Fort Bliss, Texas
Napier, Thomas R.; McCarthy, Sheila A.; Sep. 2002; 170 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MIPR-2042-96
Report No.(s): AD-A421608; ERDC/CERL-TR-02-26; No Copyright; Avail: CASI; A08, Hardcopy

The facilities and landscape features in the William Beaumont General Hospital Historic District at Fort Bliss, Texas are eligible for inclusion in the National Register of Historic Places. Therefore, redevelopment of 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 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 on-site 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 (published under separate cover) provides an 'at-a-glance' display of each building's condition, described by major systems and components. Appendix B contains schematic-level designs developed for the rehabilitation of the chapel, gymnasium, and the barracks.
DTIC
Hospitals

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*.

20040053375 Colorado State Univ., Fort Collins, CO, USA
Mesoscale Image Interpretation
Purdom, J.; Oliver, V.; Workshop on Satellite Meteorology. Part 2: Satellite Image Analysis and Interpretation; [1982]; 96 pp.; In English; See also 20040053372; Original contains color illustrations; Copyright; Avail: CASI; A05, Hardcopy

The papers in this section include: 1) 'Observations of Advection-Radiation Fog Formation from Enhanced IR Satellite Imagery'; 2) 'The Role of Inward Mixing in the Dissipation of Fog and Stratus'; 3) 'The Use of Enhanced Visible Imagery for Predicting the Time of Fog Dissipation'; 4) 'The Use of Geostationary Satellite Imagery for Observing and Forecasting Movement of New England Sea Fog'; 5) 'Cloud-Location Corrections Near the Horizon of an SMS Image'; 6) 'Picture of the Month: Meso-Highs and Satellite Imagery'; 7) 'Some Uses of High-Resolution GOES Imagery in the Mesoscale Forecasting of Convection and Its Behavior'; 8) 'The Development and Evolution of Deep Convection'; 9) 'Combining Satellite and Conventional Data for Very Short Range Forecasting Purposes'; 10) 'The Importance of Thunderstorm Outflow Boundaries in the Development of Deep Convection'; 11) 'Thunderstorm Trigger Mechanisms over the Southeast USA'; 12) 'Examples of a Wide Variety of Thunderstorm Propagation Mechanisms'; 13) 'Satellite and Surface Observations of Strong Wind Zones Accompanying Thunderstorms'; 14) 'Mesoscale Convective Complexes'.
CASI
Mesoscale Phenomena; Satellite Imagery; Image Analysis

20040053467 Texas A&M Univ., College Station, TX, USA
Special Experiment Data Sets
Scoggins, J.; Workshop on Satellite Meteorology. Part 1: Satellite and Their Data; [1982]; 66 pp.; In English; See also 20040053463; Original contains black and white illustrations; Copyright; Avail: CASI; A04, Hardcopy

The titles in this section include: 1) '1982 AVE/VAS Ground Truth Field Experiment Description and Operations Plan'; 2) 'Operations Plan 1981 CCOPE: Cooperative Convective Precipitation Experiment'; 3) 'CCOPE Begins Spring 1981'; 4) 'Aircraft Sensor Quality in SESAME 1979: Results of Tower Fly-Bys and Aircraft Intercomparison'; 5) 'NASA's Participation in the AVE-SESAME '79 Program'.
CASI
Remote Sensing; Research Aircraft; Meteorological Satellites

20040055313 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Remote Sensing of Icy Galilean Moon Surface and Atmospheric Composition Using Low Energy (1 eV-4 keV) Neutral Atom Imaging
Collier, M. R.; Sittler, E.; Chornay, D.; Cooper, J. F.; Coplan, M.; Johnson, R. E.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 17; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

We describe a low energy neutral atom imager suitable for composition measurements Europa and other icy Galilean moons in the Jovian magnetosphere. This instrument employs conversion surface technology and is sensitive to either neutrals converted to negative ions, neutrals converted to positive ions and the positive ions themselves depending on the power supply. On a mission such as the Jupiter Icy Moons Orbiter (JIMO), two back-to-back sensors would be flown with separate power supplies fitted to the neutral atom and iodneutral atom sides. This will allow both remote imaging of 1 eV < E < 4 keV neutrals from icy moon surfaces and atmospheres, and in situ measurements of ions at similar energies in the moon ionospheres and Jovian magnetospheric plasma. The instrument provides composition measurements of the neutrals and ions that enter the spectrometer with a mass resolution dependent on the time-of-flight subsystem and capable of resolving molecules. The lower energy neutrals, up to tens of eV, arise from atoms and molecules sputtered off the moon surfaces and out of the moon atmospheres by impacts of more energetic (keV to MeV) ions from the magnetosphere. Direct Simulation Monte Carlo (DSMC) models are used to convert measured neutral abundances to compositional distributions of primary and trace species in the sputtered surfaces and atmospheres. The escaping neutrals can also be detected as ions after photo- or plasma-ionization and pickup. Higher energy, keV neutrals come from charge exchange of magnetospheric ions in the moon atmospheres and provide information on atmospheric structure. At the jovicentric orbits of the icy moons the presence of toroidal gas clouds, as detected at Europa's orbit, provide M e r opportunities to analyze both the composition of neutrals and ions originating from the moon surfaces, and the characteristics of magnetospheric ions interacting with neutral cloud material. Charge exchange of low energy ions near the moons, and directional distributions of the resultant neutrals, allow indirect global mapping of magnetic field structures around the moons. Temporal variation of the magnetic structures can be linked to induced magnetic fields associated with subsurface oceans.
Derived from text
Remote Sensing; Atmospheric Composition; Neutral Atoms; Imaging Techniques; Computerized Simulation; Magnetic Field Configurations; Ice; Moon

20040055373 NASA Ames Research Center, Moffett Field, CA, USA, California State Univ., Monterey, CA, USA
Remotely Sensing Larval Population Dynamics of Rice Field Anophelines
Beck, Louisa R.; Dister, Sheri W.; Wood, Byron L.; Washino, Robert K.; November 26, 1997; 26 pp.; In English
Contract(s)/Grant(s): 199-97-62; Copyright; Avail: CASI; A03, Hardcopy

The primary objective of both studies was to determine if RS and GIS techniques could be used to distinguish between high and low larval-producing rice fields in California. Results of the first study suggested that early-season green-up and proximity to livestock pastures were positively correlated with high larval abundance. Based on the early-season spectral differences between high and low larval-producing fields, it appeared that canopy development and tillering influenced mosquito habitat quality. At that time, rice fields consisted of a mixture of plants and water, a combination that allowed An. freeborni females to lay eggs in partial sunlight, protected from both predators and wind. This established a population earlier in the season than in other, 'less-green' fields where tillering and plant emergence was too minimal for ovipositioning. The study also indicated the importance of the distance that a mosquito would have to fly in order to take a bloodmeal prior to ovipositing. These associations were fully explored in an expanded study two years later. The second study confirmed the positive relationship between early season canopy development and larval abundance, and also demonstrated the relationship between abundance and distance-to-pasture. The association between greenness (as measured using NDVI), distance-to-

pasture, and abundance is illustrated. The second study also indicated the siginificance of the landscape context of rice fields for larval production. Fields that included opportunities for feeding and resting within the flight range of the mosquito had higher abundances than did fields that were in a homogeneous rice area.
Derived from text
Remote Sensing; Geographic Information Systems; Insects; Larvae; Rice

20040055939 INTERA, Inc., Austin, TX
Surfactant-Enhanced Aquifer Remediation (SEAR) Implementation Manual
Londergan, John; Yeh, Laura; Apr. 2003; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421456; NFEC-TR-2219-ENV; No Copyright; Avail: CASI; A04, Hardcopy

The objective of this implementation manual is to familiarize remedial project managers and engineers and scientists affiliated with environmental remediation projects on the major tasks and planning parameters involved with implementing an in-situ surfactant flood or surfactant- enhanced aquifer remediation (SEAR) project to remove dense non-aqueous phase liquids (DNAPLs). A companion technical manual has been produced on SEAR design focusing on removal of DNAPLs. It is hoped that in combination, the guiding principles presented in these two manuals will assist users in understanding basic design and implementation issues for attaining remedial objectives and in following risk management methodologies and approaches for avoiding misapplication of surfactant flooding for DNAPL removal. cost effective surfactant flooding performance demands recognition of the chemical flooding process, system specifications, and design and operational limitations, in order to secure the appropriate level of services and performance for the site.
DTIC
Aquifers; Surfactants

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*.

20040055597 University of Southern California, Marina del Rey, CA
Power Aware Distributed Systems
Schott, Brian; Srivastava, Mani; Riley, Ronald; Elgorriaga, Igor; Jan. 2004; 234 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-C-0154; DARPA ORDER-J874; Proj-J874
Report No.(s): AD-A421468; AFRL-IF-RS-TR-2004-7; No Copyright; Avail: CASI; A11, Hardcopy

The goal of PADS was to study power aware management techniques for wireless unattended ground sensor applications to extend their operational lifetime and overall capabilities in this battery-constrained environment. The analysis included embedded systems architectures, signal processing algorithms, simulation and planning tools, and collaborative networking protocols.
DTIC
Electric Batteries; Electric Power Transmission

45
ENVIRONMENT POLLUTION

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

20040051133 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Sensitivity Study of the Residue Method for the Detection of Aerosols from Space-Borne Sensors
deGraaf, M.; 2002; ISSN 0169-1651; 17 pp.; In English
Report No.(s): KNMI-WR-2002-03; Copyright; Avail: Other Sources

In this study the residue method for the detection of absorbing aerosols from space-borne sensors has been investigated. It uses the spectral variations of the backscattered radiances in the near ultraviolet produced by the interaction between aerosols and molecular scattering to separate aerosol absorption from scattering effects. The departure of the observed spectral

contrast from that of a molecular atmosphere is computed. Its dependence on aerosol and environment variables has been investigated with several simulated aerosol laden atmospheres using a radiative transfer model. The residue increases with increasing optical thickness and aerosol layer altitude as expected. This study confirms the capability of the residue method for the detection of elevated absorbing aerosols by space-borne sensors. It can be used as an indicator for aerosol type distinction.
Author
Aerosols; Detection; Optical Thickness; Spectra

20040053448 NASA Ames Research Center, Moffett Field, CA, USA
Soot and Sulfuric Acid Aerosol from Aircraft: Is There Enough to Cause Detrimental Environmental Effects?
Pueschel, Rudolph F.; Strawa, A. W.; Ferry, G. V.; Howard, S. D.; Verma, S.; [2004]; 1 pp.; In English; Fifth International Aerosol Conference, 12-18 Sep. 1998, Edinburgh, Scotland, UK
Contract(s)/Grant(s): 538-08-12-14; No Copyright; Avail: Other Sources; Abstract Only

Aerosol from aircraft can affect the environment in three ways: First, soot aerosol has been implicated to cause long-term ozone depletion at mid-latitudes in the lower stratosphere at a rate of -5% per decade. This effect is in addition and unrelated to the polar ozone holes which are strongly influenced by heterogeneous chemistry on polar stratospheric clouds. Second, the most obvious effect of jet aircraft is the formation of visible contrails in the upper troposphere. The Salt Lake City region experienced an 8% increase in cirrus cloud cover over a 15-year period which covariates with an increase in regional commercial air traffic. If soot particles act as freezing nuclei to cause contrail formation-heterogeneously, they would be linked to a secondary effect to cloud modification that very likely is climatologically important. Third, a buildup of soot aerosol could reduce the single scatter albedo of stratospheric aerosol from 0.993+0.004 to 0.98, a critical value that has been postulated to separate stratospheric cooling from warming.
Derived from text
Sulfuric Acid; Soot; Aerosols; Environment Effects; Ozone Depletion

20040053639 National Inst. of Standards and Technology, Gaithersburg, MD, USA, Army Research Office, Research Triangle Park, NC, USA
Standard Reference Photometer for the Assay of Ozone in Calibration Atmospheres
Bass, A. M.; Paur, R. J.; Norris, J. E.; Buckley, T. J.; Feb. 2003; 28 pp.; In English
Report No.(s): PB2004-104090; NISTIR-6963; No Copyright; Avail: CASI; A03, Hardcopy

A photometric instrument for the assay of ozone from 0 ppbv to 1000 ppbv in calibration atmospheres has been designed, constructed, and evaluated. The absorption cross-section of ozone at 254 nm (Hg line) is the major component of uncertainty of the instrument. A number of workers have determined this cross-section to be about 1.147 x 10-17 cm2/molecule (or equivalently 308.32 atm-1 cm-1, base e), with a standard uncertainty of 1. 0%. To a lesser extent, the uncertainty of the instrument also depends on the uncertainty of the temperature, pressure, and transmittance measurements on the ozone sample. Based upon ozone calibration needs of the U.S. EPA, the design specifications called for an instrument with a standard uncertainty of 2 ppbv in the range of 1 ppbv to 100 ppbv and 2% in the range of 100 ppbv to 1000 ppbv.
NTIS
Photometers; Ozone; Air Pollution

20040053641 Lima and Associates, Phoenix, AZ, USA
PM(sub 10) Research for Developing Educational Tools and Outreach Programs
Lima, P. M.; Bohannan, R. H.; Arthur, C. D.; Oct. 2003; 296 pp.; In English
Report No.(s): PB2004-104092; No Copyright; Avail: CASI; A13, Hardcopy

More than 3 million persons reside in Maricopa County, Arizona, one of the fastest growing urban areas in the country. The urbanized portion of the county has been designated a nonattainment area for PM10, by the U.S. Environmental Protection Agency for levels of particulate matter that exceed the National Ambient Air Quality Standards. In response, Maricopa County has enacted Rule 310 that contains measures to mitigate the generation of fugitive dust. Construction activities estimated to generate nearly 40 percent of airborne particulates in the area. The Arizona Department of Transportation contracted with Lima & Associates and Cathy D. Arthur to develop an educational outreach program with the purpose of training construction industry personnel on the importance of controlling fugitive dust and the methods of so doing. This report summarizes the background leading up to the enactment of Rule 310 and the subsequent development of the outreach program. Elements of the program are described, and an implementation plan is provided. This report is accompanied by appendices that contain

prototype elements of the training program that have been developed. These prototypes are intended to illustrate the results of the research only, and are not current training instruments.
NTIS
Particulates; Air Pollution; Environment Protection

20040053665 National Inst. of Standards and Technology, Gaithersburg, MD
Air and Pollutant Transport from Attached Garages to Residential Living Spaces
Emmerich, S. J.; Gorfain, J. E.; Huang, M.; Howard-Reed, C.; Dec. 2003; 34 pp.; In English
Report No.(s): PB2004-104486; NISTIR-7072; No Copyright; Avail: CASI; A03, Hardcopy

NIST is conducting a study on the indoor air quality (IAQ) impacts and engineering solutions related to the transport of pollutants from attached garages to residential living spaces. Natural or equipment-induced pressure differences across air leakage paths in house-garage (HG) interfaces can result in the transport of the contaminants generated in garages into adjacent living spaces. This paper summarizes a literature review on the transport of pollutants from garages to residential living spaces and describes a field study to estimate the range of airtightness of attached garages and of HG interfaces in a sample of U. S. homes. In order to address one gap in understanding these issues, the airtightness of garages and HG interfaces was measured in five residences using fan pressurization. While the small sample of houses limits generalization of the results, a range of house ages, styles, and sizes was included. For all homes tested, the garage was found to be at least twice as leaky as the house, based on air changes per hour at 50 Pa.
NTIS
Air Quality; Indoor Air Pollution

20040055473 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Noise Levels in the Operating Room
Kuzmich, Geoffrey A.; Phillips, Mikel; Rojas, Lisandra; Oct. 2001; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421246; No Copyright; Avail: CASI; A04, Hardcopy

Monitoring during anesthesia improves patient outcome by increasing the anesthesia provider's awareness of actual and potential problems. Lack of vigilance has been reported to be responsible for up to 30% of major problems occurring during anesthesia. Excessive noise in the environment is a factor that may decrease provider vigilance, and the Anesthesia Patient Safety Foundation has recently identified noise in the operating room (OR) as a major area of concern. In this study the level of noise in one OR was measured and correlations between noise levels and anesthesia providers ability to hear critical patient monitors are described. The four-week study took place in an orthopedic OR of a 90-bed military hospital in the midwest. Noise was measured continuously from the initial set up of the room to the completion of the last procedure of the day. Episodes in which the audible pulse oximeter monitor tone (set at 50% volume) was difficult to hear or could not be heard at all due to the high levels of noise were documented. Noise levels ranged from a minimum of 46.8db(A) to a maximum of 95.0db(A). Average levels of noise (Leq) ranged from 60.1 to 69.4db(A). Baseline monitor tones and alarms ranged from 55-75db(A). NIOSH standards recommend the decibel level not exceed 85db(A) for an eight-hour work period or 91db(A) for more than two hours. Basic levels of noise measured in the OR did not exceed NIOSH standards. Determinations regarding the ability of noise levels to cause difficulty in hearing monitor tones and alarms were inconclusive. The role noise may play on decreasing anesthetist vigilance is still undetermined. Further study that focuses on actual noise levels and anesthetist task performance is needed.
DTIC
Ambience; Anesthesia; Noise (Sound); Noise Intensity

46
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*.

20040051098 Communications Research Lab., Tokyo, Japan
Real-Time Geomagnetic Data Acquisition from Siberia Region and Its Application-PURAES project
Kunitake, Manabu; Nagatsuma, Tsutomu; Kamei, Toyoshisa; Ishibashi, Hiromitsu; Kikuchi, Takashi; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting

Systems and Information Services, Volume 49, No. 4; December 2002, pp. 87-97; In English; See also 20040051097; Copyright; Avail: Other Sources

Monitoring and nowcasting of geomagnetic disturbance is necessary for conducting space weather forecast. As the energy from the magnetosphere flows into the ionosphere mainly concentrates on the polar region, it is important to watch the polar region. Developing geomagnetic observation points in the polar region and acquiring data in near real-time way are essentially effective for nowcasting and forecasting. Siberia is a missing region concerning near real-time data acquisition. PURAES Project (Project for Upgrading Russian AE Stations) has been conducted to upgrade magnetometer and set near real-time data transmission instrument in observatories in Siberia. In summer 2002, near real-time data acquisition from four observatories have been accomplished. AE index is the index which represents the geomagnetic activities in the polar region. Near real-time data acquisition contributes to that the AE index becomes better in its quality and quicker in its calculated output. Moreover, near real-time data is useful space weather forecasting application.

Author

Real Time Operation; Geomagnetism; Siberia; Data Acquisition

20040051102 Communications Research Lab., Tokyo, Japan

Quasi-Real Time Geomagnetic Data Transfer from Near Northern Magnetic Pole Region

Nagatsuma, Tsutomu; Obara, Takahiro; Ishibashi, Hiromitsu; Hayashi, Kanji; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 99-106; In English; See also 20040051097; Copyright; Avail: Other Sources

It is well known that the magnetic field variations in the near geomagnetic-pole region can be used as an index of magnetospheric convection driven by solar wind-magnetosphere coupling (PC index). Northern PC index (PCN) is derived from Qaanaaq (formally, Thule). Unfortunately, PCN is not produced in near-real time. To monitor the current condition of magnetospheric convection, it is necessary to collect geomagnetic field data in the near-geomagnetic pole region and to produce PCN-like index from those data. We have developed the system for collecting magnetic field data from Eureka, which is located in the northern near-pole region and transferring the data from Eureka to CRL in near real-time. Our system was installed at Eureka and has been operated since summer of 1999. Before producing PCN-like index from Eureka, we have compared geomagnetic field variations at Eureka and those at Qaanaaq. From the results of our data analysis, we have confirmed that PCN-like index can be derived from Eureka except for the period of low solar zenith angle (SZA < 70 deg).

Author

Real Time Operation; Geomagnetism; Magnetic Poles; Data Acquisition

20040051103 Communications Research Lab., Tokyo, Japan

Development of Instrument for the Resonance Scattering Emission of Oxygen Ion (O II:83.4nm): Toward the Imagery of Magnetosphere

Yamazaki, Atsushi; Yoshikawa, Ichiro; Takizawa, Yoshiyuki; Miyake, Wataru; Nakamura, Masato; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 107-120; In English; See also 20040051097; Copyright; Avail: Other Sources

According to previous theories a large number of oxygen ions are not able to escape from the ionosphere to the magnetosphere due to its heavy mass and loss process in the upper atmosphere. Recent satellite observations, however, reveal that oxygen ions of the ionospheric origin exist in the magnetosphere, and that the outflow flux from the polar ionosphere is comparable to that of hydrogen ions, which have its light mass, during the high solar activity and the high geomagnetic activity. The distribution of oxygen ions provides the interpretation of the plasma transfer during the high activity, and gives us the effective information for monitoring the space weather. The remote-sensing method is useful for the measurement of the distribution of oxygen ions all over the magnetosphere. We advance development of new optics for the resonance scattering emission of oxygen ions.

Author

Oxygen Ions; Resonance Scattering; Remote Sensing; Earth Magnetosphere

20040051110 Communications Research Lab., Tokyo, Japan

Real Time Data Reception of ACE and IMAGE Satellites

Sagawa, Eiichi; Watanabe, Shigeaki; Ohtaka, Kazuhiro; Shimazu, Hironori; Zwickl, Ronald D.; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting

Systems and Information Services, Volume 49, No. 4; December 2002, pp. 55-67; In English; See also 20040051097; Copyright; Avail: Other Sources

A ground station system for receiving and processing satellite telemetry data in real time was built for the ACE real-time solar wind monitor (RTSW) data in 1997. CRL has contributed to the global ACE tracking network by operating the facilities since the start of the RTSW project. A networked real-time data system hosted by NOAA/SEC was set up for exchanging the ACE real-time data, and it has been achieving a very high coverage. In 2000, data reception was extended to that of the IMAGE satellite. This addition incorporated a new antenna-management system for tracking multiple satellites. At CRL we use real-time satellite data for space weather forecasting. As a result of the success with the real-time data from ACE and IMAGE, real-time distribution of satellite data has become an important part of any satellite program dedicated to space science.

Author

Satellite Observation; Advanced Composition Explorer; Image Satellite; Ground Stations; Real Time Operation; Space Weather

20040051111 Communications Research Lab., Tokyo, Japan

Prediction of the Dst Index from Solar Wind Parameters by a Neural Network Method

Watanabe, Shigeaki; Ohtaka, Kazuhiro; Sagawa, Eiichi; Shimazu, Hironori; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 69-85; In English; See also 20040051097; Copyright; Avail: Other Sources

Using the Elman-type neural network technique, operational models are constructed that predict the Dst index two hours in advance. The input data consist of real-time solar wind velocity, density and magnetic field data obtained by the Advanced Composition Explorer (ACE) spacecraft since May 1998 (http://www2.crl.go.jp/uk/uk223/service/nnw/index.html). During the period from February to October 1998, eleven storms occurred with minimum Dst values below -80nT. For ten of these storms the differences between the predicted minimum Dst and the minimum Dst calculated from ground-based magnetometer data were less than 23%. For the remaining one storm (beginning on 19 October 1998) the difference was 48%. The discrepancy is likely to stem from a imperfect correlation between the solar wind parameters near ACE and those near the earth. While the IMF Bz remains to be the most important parameter, other parameters do have their effects. For instance, Dst appears to be enhanced when the azimuthal direction of IMF is toward the sun. A trapezoid-shaped increase in the solar wind density enhances the main phase Dst by almost 10% compared with the case of no density increase. Velocity effects appear to be stronger than the density effects. Our operational models have, in principle, no limitations in applicability with respect to storm intensity.

Author

Solar Wind Velocity; Geomagnetism; Space Weather; Magnetic Storms

20040051112 Communications Research Lab., Tokyo, Japan

Derivation of TEC and Estimation of Instrumental Biases from GEONET in Japan

Ma, Guanyi; Maruyama, Takashi; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Service, Volume 49, No. 4; December 2002, pp. 121-133; In English; See also 20040051097; Copyright; Avail: Other Sources

This paper presents a method to derive the ionospheric total electron content (TEC) and to estimate the biases of GPS satellites and dual frequency receivers using the GPS earth observation network (GEONET) in Japan. Based on the consideration that the TEC is uniform in a small area, the method divides the ionosphere over Japan into 32 meshes. The size of each mesh is 2 deg by 2 deg in latitude and longitude, respectively. By assuming that the TEC is identical at any point within a given mesh and the biases do not vary within a day, the method arranges unknown TECs and biases with dual GPS data from about 209 receivers in a day unit into a set of equations. Then the TECs and the biases of satellites and receivers were determined by using the least squares fitting technique. The performance of the method is examined by applying it to geomagnetically quiet days in various seasons, and then comparing the GPS-derived TEC with ionospheric critical frequencies (foF2). It is found that the biases of GPS satellites and most receivers are very stable. The diurnal and seasonal variation in TEC and foF2 shows a high degree of conformity. The method using highly dense receiver network like GEONET is not always applicable in other areas. Thus the paper also proposes a simpler and faster method to estimate a single receiver's bias by using the satellite biases determined from GEONET. The accuracy of the simple method is examined by comparing the receiver biases determined by the two methods. Larger deviation from GEONET derived bias tends to be found in the receivers at lower (<30 N) latitudes due to the effects of equatorial anomaly.

Author

Ionospheric Electron Density; Japan; Global Positioning System; Instrument Errors

20040052845 California Inst. of Tech., Pasadena, CA, USA
Granular Material Flows with Interstitial Fluid Effects
Hunt, Melany L.; Brennen, Christopher E.; [2004]; 7 pp.; In English
Contract(s)/Grant(s): NAG3-2358; No Copyright; Avail: CASI; A02, Hardcopy

The research focused on experimental measurements of the rheological properties of liquid-solid and granular flows. In these flows, the viscous effects of the interstitial fluid, the inertia of the fluid and particles, and the collisional interactions of the particles may all contribute to the flow mechanics. These multiphase flows include industrial problems such as coal slurry pipelines, hydraulic fracturing processes, fluidized beds, mining and milling operation, abrasive water jet machining, and polishing and surface erosion technologies. In addition, there are a wide range of geophysical flows such as debris flows, landslides and sediment transport. In extraterrestrial applications, the study of transport of particulate materials is fundamental to the mining and processing of lunar and Martian soils and the transport of atmospheric dust (National Research Council 2000). The recent images from Mars Global Surveyor spacecraft dramatically depict the complex sand and dust flows on Mars, including dune formation and dust avalanches on the slip-face of dune surfaces. These Aeolian features involve a complex interaction of the prevailing winds and deposition or erosion of the sediment layer; these features make a good test bed for the verification of global circulation models of the Martian atmosphere.
Author
Granular Materials; Fluid Mechanics; Interstitials; Viscous Flow; Rheology; Multiphase Flow

20040055325 Idaho Univ., Moscow, ID, USA
What is (and Isn't) Wrong with Both the Tension and Shear Failure Models for the Formation of Lineae on Europa
Kattenhorn, S. A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 38-39; In English; See also 20040055312
Contract(s)/Grant(s): NAG5-11495; NCC5-577; No Copyright; Avail: CASI; A01, Hardcopy

An unresolved problem in the interpretation of lineae on Europa is whether they formed as tension- or shear-fractures. Voyager image analyses led to hypotheses that Europan lineaments are tension cracks induced by tidal deformation of the ice crust. This interpretation continued with Galileo image analyses, with lineae being classified as crust- penetrating tension cracks. Tension fracturing has also been an implicit assumption of nonsynchronous rotation (NSR) studies. However, recent hypotheses invoke shear failure to explain lineae development. If a shear failure mechanism is correct, it will be necessary to re-evaluate any models for the evolution of Europa's crust that are based on tensile failure models, such as NSR estimates. For this reason, it is imperative that the mechanism by which fractures are initiated on Europa be unambiguously unraveled. A logical starting point is an evaluation of the pros and cons of each failure model, highlighting the lines of evidence that are needed to fully justify either model.
Derived from text
Cracks; Deformation; Evaluation; Failure; Structural Properties (Geology); Tides

20040055348 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne, Germany
Melting Probe Tests in Thermal Vacuum
Biele, J.; Ulamec, S.; Parpart, A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 9-10; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

One of the most fascinating aspects of the Europa relevant science is the putative sub-glacial ocean. To probe this Ocean in situ, only melting probes seem to be feasible. The principle of the technology has successfully been proven e.g. in Antarctica. However, a principle difference (at least in the initial penetration) is the low pressure on Europa leading to sublimation rather than melting of the ice layer. Our measurements confirms an extended theory that includes this effect and demonstrates the feasibility of the method. We how how the transition of sublimation to melting can take place after the 'borehole' behind the probe has closed and sufficient pressure has been built up to sustain liquid water.
Derived from text
Glaciers; Ice; Oceans; Vacuum Melting

20040055360 Eotvos Lorand Univ., Budapest, Hungary
Implication on Possible Submarin Biosignatures at Chaotic Terrains
Kereszturi, A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 40-41; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Observations and theories suggest Europa is interesting object for astobiology. For future radar and cryobotic missions

we have to know the best locations for analysis. Here we summarize aspects of some processes and structures in the icecrust interesting for astrobiology. We suggest the best locations are great chaotic terrains with signs of internal activity which may hold information on the submarin geothermal centers too.
Derived from text
Ice; Exobiology; Earth Crust

20040055367 Minnesota Univ., Minneapolis, MN, USA
Deformation of Ice
Kohlstedt, D. L.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 42; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Ice, like other materials, deforms by brittle, ductile, or a combination of brittle and ductile processes. The dominant mechanism of deformation is determined by the conditions to which the mass of ice is subjected. At low temperatures and high differential stresses, deformation occurs predominantly by brittle processes, while at high temperatures and low stresses, ductile process govern flow behavior. As pressure increases with increasing depth, brittle deformation gives way to ductile flow. The transition occurs roughly at a depth at which the lithostatic pressure reaches the level of the differential stress. In my talk, I will first review aspects of brittle deformation, emphasizing mechanisms of crack nucleation and propagation. I will then focus on ductile deformation or creep of ice, concentrating on recent progress arising from laboratory experiments that provide new insights into mechanisms of plastic flow. Field observations on flow of glaciers and ice sheets provide a direct test of the applicability of laboratory results to large-scale flow of ice. In addition, I will address the role of water on the rheological properties of ice.
Derived from text
Deformation; Ice; Brittleness; Glaciers; Ductility

20040055456 Defense Threat Reduction Agency, Dulles, VA
Excitation and Attention of Regional Waves, and Magnitude Dependance of PN/ LG Ratios in Eastern Eurasia
Xie, Jiakang; Jan. 1998; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DSWA01-98-1-0006; DSWA01-98-1-0009
Report No.(s): AD-A421226; No Copyright; Avail: CASI; A03, Hardcopy

In the past one and half years I have been processing large amount of regional/teleseismic data from IRIS, CDSN, GBA, Kyrghizstan and Kazakhstan network stations in eastern Eurasia. Fourier spectra of Pn, Lg and Pg waves were computed for many events/paths to study characteristics of seismic sources and path attenuations. Estimations of source spectral parameters and path attenuation were difficult for all wave types. I have used various methods to tackle the difficulties, including the standard two-station method for Q measurement, the reversed two-station method of Chun et al. (1987) for Q measurement, the empirical Green's function method for measuring source rise times, and the simultaneous Bayesian inversion method for sourcepath spectral parameters by Xie (1993, 1998, 1999). It is well known that seismic source parameters, such as magnitude, seismic moment and corner frequency tend to scale with one another. Xie and Patton (1999) obtained details of these scalings for each wave types (Pn and Lg), and source types (underground nuclear explosions and earthquakes) in central Asia. These scalings, and an spectral overshoot in explosion excited Pn and Lg waves, make the Pn/Lg spectral ratios from explosions differ from those from earthquakes in a frequency-dependent manner. For a given event size, there is a frequence band in which the Pn/Lg spectral ratios from both source types differ the most, resulting in an optimal frequency band for the ratios to be used for a discrimination purpose. This optimal frequency band is dependent on the corner frequencies derived using Pn and Lg. For events with smaller magnitudes or seismic moments, the Pn and Lg corner frequencies become higher, causing the optimal frequency band to shift higher. Until recently, the analyses of explosions in central Asia were conducted only for a limited magnitude range (about 5.0 to 6.0).
DTIC
Asia; Europe; Explosions; Green's Functions; Seismic Waves; Wave Excitation

20040055507 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
The Epidemiology of Malaria in Belize, 1989-1999
Hakre, Shilpa; Feb. 2003; 285 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421290; No Copyright; Avail: CASI; A13, Hardcopy

Retrospective analyses were conducted to describe the epidemiology of malaria in Belize over a 10-year period and to determine if environmental factors influenced the incidence of malaria at macro- and micro-scales. The purpose was to

contribute to the current body of knowledge regarding malaria transmission in Belize, which may aid in region- specific malaria control efforts. Malaria data were obtained from the National Malaria Control Program's National Malaria Database. Malaria rates were calculated using the 1991 population census of Belize (Central Statistics Office). Other data were obtained from the National Meteorological Service (Belize), National Center for Environmental Prediction (NCEP), National Weather Service (U.S.A.), Global Land One-Kilometer Base Elevation (GLOBE), National Geophysical Data Center, Land Information Centre (LIC, Belize), village and vector surveys, Ministry of Health (MOH), SPOT and Landsat multi-spectral images. Most of the data from these sources were collected for purposes other than the specific aims of the studies in this dissertation. Over a 10-year period, malaria incidence rates varied temporally and spatially; southern and central areas of Belize had consistently higher rates of malaria than northern areas. Toledo District had the highest Plasmodium vivax incidence; whereas, Stann Creek District had the highest P. falciparum incidence. Malaria incidence was highest during 1993 through 1996. Plasmodium falciparum incidence was highest in the transitional months preceding the wet season in Stann Creek. Vector surveys conducted in villages in the districts of Cayo, Stann Creek, and Toledo indicated that Anopheles darlingi was most common and abundant in Stann Creek District whereas, An. albimanus was most common and abundant in the other two districts.
DTIC
Belize; Epidemiology; Parasitic Diseases

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20040051097 Communications Research Lab., Tokyo, Japan
Journal of the Communications Research Lab, Volume 49, No. 4
Igarashi, Kiyoshi, Editor; Tomita, Fumihiko, Editor; Yoshimoto, Shigetoshi, Editor; Kikuchi, Takashi, Editor; Miyake, Wataru, Editor; December 2002; ISSN 0914-9260; 181 pp.; In English; See also 20040051098 - 20040051114; Copyright; Avail: Other Sources

The following reports were selected for the NA&SD database: Research on a System for Monitoring, Analyzing, and Forecasting of the Space Environment; Optical and Radio Solar Observation for Space Weather; L5 Mission and observation of Interplanetary CME; Solar Wind Plasma Instrument for the L5 mission; A Forecast Tool using Java Script for Predicting Arrival Time of Interplanetary Disturbances to the Earth; Real time data reception of ACE and IMAGE Satellites; Prediction of the Dst Index from Solar Wind Parameters by a Neural Network Method; Real-Time Geomagnetic Data Acquisition from Siberia Region and Its Application-PURAES project; Quasi-Real Time Geomagnetic Data Transfer from Near Northern Magnetic Pole Region; Development of Instrument for the Resonance Scattering Emission of Oxygen lOn(0 II :83.4nm) -Toward the Imagery of Magnetosphere; Derivation of TEC and Estimation of Instrumental Biases from GEONET in Japan; Ionospheric Observation and Observation Information Processing System; Space Environment Information Service System; Development of Telephone Service System; Space Weather Forecast in the Future Manned Space Era; Correcting Instable Signal in Near-Field Antenna Gain Measurement; and Radar Cross Section Reduction Sheet.
Derived from text
Space Weather; Weather Forecasting

20040051175 Colorado Univ., Boulder, CO, USA
Simple Models of the Spatial Distribution of Cloud Radiative Properties for Remote Sensing Studies
[2004]; 9 pp.; In English
Contract(s)/Grant(s): NAG5-11294; No Copyright; Avail: CASI; A02, Hardcopy

This project aimed to assess the degree to which estimates of three-dimensional cloud structure can be inferred from a time series of profiles obtained at a point. The work was motivated by the desire to understand the extent to which high-frequency profiles of the atmosphere (e.g. ARM data streams) can be used to assess the magnitude of non-plane parallel transfer of radiation in thc atmosphere. We accomplished this by performing an observing system simulation using a large-eddy simulation and a Monte Carlo radiative transfer model. We define the 3D effect as the part of the radiative transfer that isn't captured by one-dimensional radiative transfer calculations. We assess the magnitude of the 3D effect in small cumulus clouds by using a fine-scale cloud model to simulate many hours of cloudiness over a continental site. We then use a Monte Carlo radiative transfer model to compute the broadband shortwave fluxes at the surface twice, once using the

complete three-dimensional radiative transfer F(sup 3D), and once using the ICA F (sup ICA); the difference between them is the 3D effect given.
Derived from text
Cumulus Clouds; Remote Sensing; Spatial Distribution; Cloud Physics; Three Dimensional Models; Radiative Transfer; Atmospheric Models

20040051214 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Influence of Clouds on the Solar Radiation Budget
Deneke, Hartwig Manfred; 2002; ISSN 0169-1651; 132 pp.; In English
Report No.(s): KNMI-WR-2002-09; Copyright; Avail: Other Sources

This thesis investigates the accuracy of a current radiative transfer scheme and a single-column model for representing the influence of clouds on the solar radiation budget. An extensive set of pyranometer measurements and satellite observations collected throughout the Netherlands is used for this purpose. First, an overview of the relevant parts of the theory of atmospheric radiative transfer is given and a literature study of the instrumental uncertainties of the dataset is presented. Special attention is paid to the thermal offset of pyranometers, which has recently been identified as the origin of a significant systematic underestimate of measured solar irradiances. A mechanism is proposed whereby the thermal offset can lead to additional calibration errors not accounted for in previous estimates of the pyranometer uncertainty. In combination with the direct effects of the thermal offset, a large range of systematic pyranometer errors has to be expected, which significantly exceeds the range specified by the World Meteorological Organization for these type of instruments. A correct modeling of clear-sky atmospheric radiative transfer is an essential prerequisite for a correct treatment of cloudy atmospheres in radiative transfer models. To evaluate its accuracy, six years of global surface irradiance records obtained throughout the Netherlands during cloud-free situations are compared to model output of five different radiative transfer schemes, providing 6,132 individual cases.
Author (revised)
Clouds (Meteorology); Energy Budgets; Solar Radiation; Radiative Transfer

20040053372 Colorado State Univ., Fort Collins, CO, USA
Workshop on Satellite Meteorology, Part 2, Satellite Image Analysis and Interpretation
[1982]; 603 pp.; In English; Workshop on Satellite Mteorology, 19-23 Jul. 1982, Fort Collins, CO, USA; See also 20040053373 - 20040053379; Copyright; Avail: CASI; A99, Hardcopy

The Workshop on Satellite Meteorology is co-sponsored by the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University and the American Meteorological Society's Committee on Meteorological Aspects of Aerospace Systems. The workshop covers uses of satellite data in atmospheric science. It provides state-of-the-art information to those in Universities, research groups, and other users. One area of primary focus is to provide source material to university personnel for developing and augmenting courses in satellite meteorology and the atmospheric sciences. The items in the program include information on meteorological satellites and data sources, uses of satellite imagery for all scales of weather analysis and forecasting, uses of sounding data and other radiance information and research opportunities on interactive systems. Each session is presented by a group of experts in the field and includes an open discussion of the state-of-the-art and promising areas for future development. This pre-print volume is one of three parts on the workshop. The three parts are: PART I. Satellites and Their Data; PART II. Satellite Image Analysis and Interpretation; PART III. Satellite Soundings and Their Uses.
Author
Meteorological Satellites; Satellite Observation; Satellite Imagery; Image Analysis

20040053373 Colorado State Univ., Fort Collins, CO, USA
Precipitation Estimation
Kidder, S.; Griffith, C.; Workshop on Satellite Meteorology. Part 2: Satellite Image Analysis and Interpretation; [1982]; 157 pp.; In English; See also 20040053372; Original contains black and white illustrations; Copyright; Avail: CASI; A08, Hardcopy

The papers in this section include: 1) 'Rain Estimation from Geosynchronous Satellite Imagery - Visible and Infrared Studies'; 2) 'An Application of a Geostationary Satellite Rain Estimation Technique to an Extratropical Area'; 3) 'A Technique for Estimating Tropical Open-Ocean Rainfall from Satellite Observations'; 4) 'Satellite Rainfall Estimation by Cloud Indexing Methods for Desert Locust Survey and Control'; 5) 'The Sources of Error in Rain Amount Estimating Schemes from GOES

Visible and IR Satellite Data'; 6) A Scheme for Estimating Convective Rainfall from Satellite Imagery'; 7) 'Estimating Rainfall from Thunderstorms with Warm Tops in the Infrared Imagery'; 8) A Satellite Technique for Quantitatively Mapping Rainfall Rates over the Oceans'; 9) 'Seasonal Oceanic Precipitation Frequencies from Nimbus 5 Microwave Data'; 10) 'A Statistical Technique for Determining Rainfall over Land Employing Nimbus 6 ESMR Measurements'; 11) 'The Estimation of Rain from Satellite-Borne Microwave Radiometers'.
CASI
Precipitation (Meteorology); Estimating

20040053374 National Environmental Satellite Service, Washington, DC, USA
Basic Image Interpretation
Oliver, V.; Workshop on Satellite Meteorology. Part 2: Satellite Image Analysis and Interpretation; [1982]; 137 pp.; In English; See also 20040053372; Original contains black and white illustrations; Copyright; Avail: CASI; A07, Hardcopy

The papers in this section include: 1) 'Cloud Patterns and the Upper Air Wind Field'; 2) 'A Near-Stationary Gulf of Alaska Low - It's Effect on Weather in the Pacific Northwest'; 3) 'First Glances Can Be Misleading in Locating Vorticity Centers'; 4) 'The February 23-24 Dust Storm as Viewed from GOES-1'; 5) 'An Oceanic Cyclogenesis - It's Cloud Pattern Interpretation'; 6) 'Methods for Tropical Cyclone Intensity Analysis and Forecasting Using Satellite Data'.
CASI
Image Analysis; Satellite Imagery; Meteorological Satellites; Storms (Meteorology)

20040053376 NASA Marshall Space Flight Center, Huntsville, AL, USA
Synoptic and Mesoscale Cloud Tracking
Wilson, G.; Workshop on Satellite Meteorology. Part 2: Satellite Image Analysis and Interpretation; [1982]; 81 pp.; In English; See also 20040053372; Original contains black and white illustrations; Copyright; Avail: CASI; A05, Hardcopy

The papers in this section include: 1)'Wind Derivation from Geostationary Satellites'; 2) 'The Operational Processing of Wind Estimates from Cloud Motions: Past, Present, and Future'; 3) 'Intercomparision of SMS Wind Sets: A Study Using Rapid Scan Imagery'; 4) 'Mesoscale Wind Fields for a Severe Storm Situation Determined from SMS Cloud Observations'; 5) 'Moisture Convergence Using Satellite-Derived Wind Fields: A Severe Local Storm Case Study'
CASI
Synchronous Satellites; Satellite Observation; Mesoscale Phenomena

20040053377 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Stereo Measurements from Satellites
Adler, R.; Workshop on Satellite Meteorology. Part 2: Satellite Image Analysis and Interpretation; [1982]; 28 pp.; In English; See also 20040053372; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The papers in this presentation include: 1) 'Stereographic Observations from Geosynchronous Satellites: An Important New Tool for the Atmospheric Sciences'; 2) 'Thunderstorm Cloud Top Ascent Rates Determined from Stereoscopic Satellite Observations'; 3) 'Artificial Stereo Presentation of Meteorological Data Fields'.
CASI
Satellite Observation; Meteorological Satellites; Stereoscopy

20040053378 Chicago Univ., Chicago, IL, USA
Severe Storm Analysis
Fujita, T. T.; Workshop on Satellite Meteorology. Part 2: Satellite Image Analysis and Interpretation; [1982]; 34 pp.; In English; See also 20040053372; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The papers in this section include: 1) 'Close-up View of 20 March 1976 Tornadoes: Sinking Cloud Tops to Suction Vortices'; 2) 'Mesoscale Damage Patterns of Hurricane Frederic in Relation to Enhanced SMS Imagery'; 3) 'Mesoscale Aspects of Convective Storms'.
Author
Tornadoes; Hurricanes; Mesoscale Phenomena

20040053379 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Infrared Data for Storm Analysis

Adler, R.; Workshop on Satellite Meteorology. Part 2: Satellite Image Analysis and Interpretation; [1982]; 64 pp.; In English; See also 20040053372; Original contains black and white illustrations; Copyright; Avail: CASI; A04, Hardcopy

The papers in this section include: 1) 'Thunderstorm Top Structure Observed by Aircraft Overflights with an Infrared Radiometer'; 2) 'Thunderstorm Intensity as Determined from Satellite Data'; 3) 'Relation of Satellite-Based Thunderstorm Intensity to Radar-Estimated Rainfall'; 4) 'A Simple Physical Basis for Relating Geosynchronous Satellite Infrared Observations to Thunderstorm Rainfall'; 5) 'Satellite-Observed Cloud-Top Height Changes in Tornadic Thunderstorms'; 6) 'Predicting Tropical Cyclone Intensity Using Satellite-Measured Equivalent Blackbody Temperatures of Cloud Tops'.

Author

Storms (Meteorology); Infrared Instruments

20040053463 Colorado State Univ., Fort Collins, CO, USA

Workshop on Satellite Meteorology, Part 1, Satellite and Their Data

[1982]; 210 pp.; In English; Workshop on Satellite Meteorology, 19-23 Jul. 1982, Fort Collins, CO, USA; See also 20040053464 - 20040053467; Copyright; Avail: CASI; A10, Hardcopy

The Workshop on Satellite Meteorology is co-sponsored by the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University and the American Meteorlogical Society's Committee on Meteorological Aspects of Aerospace Systems. The workshop covers uses of satellite data in atmospheric science. It provides state-of-the-art information to those in Universities, research groups, and other users. One area of primary focus is to provide source material to university personnel for developing and augmenting courses in satellite meteorology and the atmospheric sciences. The items in the program include information on meteorological satellites and data sources, uses of satellite imagery for all scales of weather analysis and forecasting, uses of sounding data and other radiance information and research opportunities on interactive systems. Each session is presented by a group of experts in the field and includes an open discussion of the state-of-the-art and promising areas for future development. This pre-print volume is one of three parts on the workshop. The three parts are: PART I. Satellites and Their Data; PART II. Satellite Image Analysis and Interpretation; PART III. Satellite Soundings and Their Uses.

Author

Meteorological Satellites; Satellite Observation

20040053465 National Environmental Satellite Service, Washington, DC, USA

Where To Get, and How To Get Data

Hoppe, E.; Workshop on Satellite Meteorology. Part 1: Satellite and Their Data; [1982]; 42 pp.; In English; See also 20040053463; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The titles in this section include: 1) 'Meteorological Satellite Systems'; 2) 'Environmental Satellite Data Products and Services'; 3) 'Satellite Data Handling'; 4) 'Information on Satellite Data and Products Archived in the USA'.

CASI

Meteorological Satellites; Data Processing

20040053498 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Lidar for Meteorologists 101

[2004]; In English; 84th AMS Annual Meeting, 11-15 Jan. 2004, Seattle, WA, USA; See also 20040053499 - 20040053503; No Copyright; Avail: CASI; C01, CD-ROM

The following records were processed for inclusion into the NA&SD database:Basic Lidar Principles and Techniques; Applications I: Radiative Forcing and Climate; Boundary Layer and Pollution; Scattering of laser light:more than just smoke and mirrors; Applications II: Water Vapor and Atmospheric Dynamics; Regional and Global Data Available Now And In The Future.

Derived from text

Optical Radar; Meteorology

20040053500 Maryland Univ. Baltimore County, Catonsville, MD, USA

Applications I: Radiative Forcing and Climate; Boundary Layer and Pollution

Hoff, Ray M.; Lidar for Meteorologists 101; [2004]; 31 pp.; In English; See also 20040053498; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: Simplified radiative transfer. Climate effects: Volcanoes. Cirrus Clouds. Regional Hazes. Boundary layer profiling: Urban sources of pollution. Plume monitoring. Boundary layer growth and dynamics. Boundary layer winds. Atmospheric chemistry (ozone, NO(x), SO2) Radiation and climate applications.
Derived from text
Boundary Layers; Cirrus Clouds; Climate; Radiative Transfer; Optical Radar

20040053664 National Weather Service, Honolulu, HI, USA
2002 Tropical Cyclones: Central North Pacific
Nash, A.; Bingaman, B.; Fournier, J.; Loos, T.; Rosendal, H.; Feb. 2004; 38 pp.; In English
Report No.(s): PB2004-104116; NOAA/NWSTM-PR-50; No Copyright; Avail: CASI; A03, Hardcopy

Total tropical activity for the season was near normal, with five named systems occurring within the area of responsibility of the Central Pacific Hurricane Center (CPHC). Three tropical cyclones (Alika, Ele, Huko) developed within the central Pacific, with two additional systems (Fausto, Lowell) moving into the area from the eastern Pacific. Ele and Huko went on to cross the Dateline into the western Pacific, where they became typhoons. The season was denoted by two relatively short but distinct 'bursts' of activity. The first being toward the end of August when, for a 12 hour period, there were three active tropical cyclones in the central Pacific. The other 'burst' occurred during the latter half of October. Outside of these times, no tropical cyclone activity was observed.
NTIS
Cyclones; Typhoons; Pacific Ocean

20040055324 Geological Survey, Denver, CO, USA
The Surface Composition of Europa: Mixed Water, Hydronium, and Hydrogen Peroxide Ice
Clark, R. N.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 16; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Interpretations of the composition of the surface Europa have been controversial, with different identifications resulting in correspondingly different implications for the origin and evolution of the satellite. The surface of Europa has an unusual water spectrum that has previously been interpreted resulting from sulfate and carbonate salt minerals. However, the spectra of such minerals at the temperatures of Europa's surface have features which preclude their presence. This has led some investigators to postulate an unspecified hydrated mineral as the cause, and the term non-icy is now generally used to describe the Europa material. Europak non-icy spectrum has also been interpreted as a sulfuric acid hydrate. Sulfuric acid hydrate spectral features are not unique to sulfuric acid, because other acids show similar features. These features are interpreted here as being due to hydronium, H30, the ice structure. Thus, Europa's non-icy material interpreted as being due to hydronium. Hydronium ice may be caused by ionization defects in regular ice due to bombardment by magnetospheric particles, implantation of protons in the ice surface, or endogenic processes indicating an acidic ocean, or all three. Hydrogen peroxide also has been identified on Europa, and hydrogen peroxide-acid mixtures provide close matches to Europa's non-icy material. This too may be caused by ionization defects from the particle bombardment, or may indicate an ocean of acid and hydrogen peroxide.
Derived from text
Hydrogen Peroxide; Ice; Composition (Property); Hydronium Ions; Surface Layers; Ionization

20040055392 California Univ., San Diego, CA, USA
Land Surface Temperature Measurements from EOS MODIS Data
Wan, Zheng-Ming; February 29, 2004; 40 pp.; In English
Contract(s)/Grant(s): NAS5-31370; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes the accomplishments made by the MODIS LST (Land-Surface Temperature) group at University of California, Santa Barbara, under NASA Contract. Version 1 of the MODIS Land-Surface Temperature Algorithm Theoretical Basis Document (ATBD) was reviewed in June 1994, version 2 reviewed in November 1994, version 3.1 in August 1996, and version 3.3 updated in April 1999. Based on the ATBD, two LST algorithms were developed, one is the generalized split-window algorithm and another is the physics-based day/night LST algorithm. These two LST algorithms were implemented into the production generation executive code (PGE 16) for the daily standard MODIS LST products at level-2 (MODII-L2) and level-3 (MODIIA1 at 1 km resolution and MODIIB1 at 5km resolution). PGE codes for 8-day 1 km LST product (MODIIA2) and the daily, 8-day and monthly LST products at 0.05 degree latitude/longitude climate model grids (CMG) were also delivered. Four to six field campaigns were conducted each year since 2000 to validate the daily LST

products generated by PGE16 and the calibration accuracies of the MODIS TIR bands used for the LST/emissivity retrieval from versions 2-4 of Terra MODIS data and versions 3-4 of Aqua MODIS data. Validation results from temperature-based and radiance-based methods indicate that the MODIS LST accuracy is better than 1 C in most clear-sky cases in the range from -10 to 58 C. One of the major lessons learn from multi- year temporal analysis of the consistent V4 daily Terra MODIS LST products in 2000-2003 over some selected target areas including lakes, snow/ice fields, and semi-arid sites is that there are variable numbers of cloud-contaminated LSTs in the MODIS LST products depending on surface elevation, land cover types, and atmospheric conditions. A cloud-screen scheme with constraints on spatial and temporal variations in LSTs was developed to remove cloud-contaminated LSTs. The 5km LST product was indirectly validated through comparisons to the 1 km LST product. Twenty three papers related to the LST research work were published in journals over the last decade.
Author
Algorithms; Climate Models; Contamination; Land Surface Temperature; Latitude; Meteorology; Spatial Distribution; Temperature Measurement

20040055503 General Hospital (121st) APO, New York, NY
Describing Access and Forecasting Demand for Family Practice Services in the 121st General Hospital
Ueoka, Alan K.; Nov. 15, 2003; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421286; HCA-35-03; No Copyright; Avail: CASI; A04, Hardcopy

Determining appropriate levels of staffing and appointment availability depends on the population served and their utilization. This project predicted the number of required providers based on the population at risk, its utilization patterns from Fiscal Years 2001 and 2002, and availability of Army Family Practice providers. The data included all visits from active duty to U.S. civilians, who are seen at the 121st General Hospital. Interestingly, active duty enrollees averaged three visits per year compared to the Department of the Army average of 7.2 in 2002. All utilization analysis was put into a model for predicting the level of capacity and services required, and for calculation of future provider requirements. The current model indicates 21,450 Family Practice visits per year and a shortfall of seven military providers or four civilian FTEs. Future increases in the population due to the Land Partnership Plan predict 33,833 visits and a shortfall of thirteen military or eight civilian FTEs.
DTIC
Forecasting; Hospitals; Medical Services; Personnel

20040055558 Army Cold Regions Research and Engineering Lab., Hanover, NH
Probability Distributions for the Refractive Index Structure Parameter and the Inner Scale of Turbulence and Their Implications for Flux Averaging
Andrea, Edgar L.; Fairall, Christopher W.; Persson, P. O.; Guest, Peter S.; Dec. 2003; 56 pp.; In English
Report No.(s): AD-A421359; ERDC/CRREL-TR-03-24; No Copyright; Avail: CASI; A04, Hardcopy

Defining the averaging time required for measuring meaningful turbulence statistics is a central problem in boundary-layer meteorology. Path-averaging scintillation instruments are presumed to confer some time-averaging benefits when the objective is to measure surface fluxes, but that hypothesis has not been tested definitively. This study uses scintillometer measurements of the inner scale of turbulence l(sub 0) and the refractive index structure parameter (C(sup, sub n)) collected during SHEBA (the experiment to study the Surface Heat Budget of the Arctic Ocean) to investigate this question of required averaging time. The first conclusion is that the beta probability distribution is useful for representing; C(sup 2, sub n) and l(sub 0) measurements. Consequently, beta distributions are used to set confidence limits on C(sup 2, sub n) and l(sub 0) values obtained over various averaging periods. When the C(sup 2, sub n) and l(sub 0) time series are stationary, a short- term average of C(sup 2, sub n) or l (sub 0) can be as accurate as a long-term average. But, as with point measurements, when time series of path- averaged C(sup 2, sub n) or l (sub 0) values are nonstationary, turbulent surface fluxes inferred from these C(sup 2, sub n) and l (sub 0) values can be variable and uncertain-problems that path- averaging was presumed to mitigate. Since nonstationarty turns out to be a limiting condition, the last topic is quantifying the nonstationarty with a published nonstationarty ratio and also by simply counting zero-crossings in the time series.
DTIC
Meteorology; Probability Distribution Functions; Refractivity; Turbulence

20040055583 Army Cold Regions Research and Engineering Lab., Hanover, NH
A Preliminary Investigation of Diffusion of Volatile Atmospheric Acids in Snow
Cragin, James H.; Leggett, Daniel C.; Nov. 2003; 15 pp.; In English
Report No.(s): AD-A421422; ERDC/CRREL-TR-03-22; No Copyright; Avail: CASI; A03, Hardcopy

A preliminary cold room experiment was conducted to determine the diffusion rate of several reactive atmospheric chemical contaminants in snow at -70 degrees C. These species included formaldehyde, p-nitrotoluene (PNT), HNO3, and HCI. Because of detection or contamination problems we could not quantify diffusion rate for formaldehyde, PNT, or HNO3. However, the diffusivity of HCI in snow (p = 0.38 g/cu cm) was found to be >7.7 x 10(exp -4) sq cm/s. This is about two orders of magnitude greater than hitherto expected and suggests that HCI may be rapidly redistributed or lost from seasonal snowpacks. Thus, one should be cautious in interpreting temporal records of HCI and other volatile species in seasonal or polar snowpacks, until their integrity is better established.
DTIC
Air Pollution; Contamination; Diffusion; Snow; Volatility

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20040053476 NASA Ames Research Center, Moffett Field, CA, USA
Sulfur Cycling Mediates Calcium Carbonate Geochemistry in Modern Marine Stromatolites
Visscher, P. T.; Hoeft, S. E.; Bebout, B. M.; Reid, R. P.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): RTOP 839-88-20; No Copyright; Avail: Other Sources; Abstract Only

Modem marine stromatolites forming in Highborne Cay, Exumas (Bahamas), contain microbial mats dominated by Schizothrix. Although saturating concentrations of Ca2+ and CO32- exist, microbes mediate CaCO3 precipitation. Cyanobacterial photosynthesis in these stromatolites aids calcium carbonate precipitation by removal of HS+ through CO2 use. Photorespiration and exopolymer production predominantly by oxygenic phototrophs fuel heterotrophic activity: aerobic respiration (approximately 60 umol/sq cm.h) and sulfate reduction (SR; 1.2 umol SO42-/sq cm.h) are the dominant C-consuming processes. Aerobic microbial respiration and the combination of SR and H2S oxidation both facilitate CaCO3 dissolution through H+ production. Aerobic respiration consumes much more C on an hourly basis, but duel fluctuating O2 and H2 depth profiles indicate that overall, SR consumes only slightly less (0.2-0.5) of the primary production. Moreover, due to low O2 concentrations when SR rates are peaking, reoxidation of the H2S formed is incomplete: both thiosulfate and polythionates are formed. The process of complete H2S oxidation yields H+. However, due to a low O2 concentration late in the day and relatively high O2 concentrations early in the following morning, a two-stage oxidation takes place: first, polythionates are formed from H2S, creating alkalinity which coincides with CaCO3 precipitation; secondly, oxidation of polythionates to sulfate yields acidity, resulting in dissolution, etc. Vertical profiles confirmed that the pH peaked late in the afternoon (greater than 8.8) and had the lowest values (less than 7.4) early in the morning. Thus, the effect of this S-cycling through alkalinity production, followed by acidification during H2S oxidation, results in a six times stronger fluctuation in acidity than photosynthesis plus aerobic respiration accomplish. This implies that anaerobic processes play a pivotal role in stromatolite formation.
Author
Sulfur; Calcium Carbonates; Geochemistry; Marine Environments; Microorganisms

20040055315 Colorado Univ., Boulder, CO, USA
Creating a Georeferenced Digital Image Library of Europa
Crawford, Z. A.; Pappalardo, R. T.; Collins, G. C.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 22; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Geographic Information Systems (GIS) software has been used extensively in Earth-based quantitative mapping as the means for tying computational models to field and satellite observations of the surface. However, it has not yet become the standard method of mapping and manipulating geographic data in extraterrestrial settings. Currently, mapping is commonly done on a frame-by-frame basis in applications unaware of georefrencing, making large-scale generalizations and data-sharing between research groups difficult. In the hopes of reducing duplicated efforts, enhancing collaboration between researchers, and facilitating quantitative geological analyses, we are creating a digital library of the Galileo SSI images of Europa which are processed uniformly, and consistently georeferenced so as to be ready for use in several popular GIS software packages.
Derived from text
Applications Programs (Computers); Geographic Information Systems; Quantitative Analysis; Europa

20040055316 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA

Highly Hydrated Sulfate Salts as Spectral Analogs to Disrupted Terrains on Europa

Dalton, J. B.; Jamieson, C. S.; Quinn, R. C.; Prieto-Ballesteros, O.; Kargel, J.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 23-24; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Asymmetric and distorted near-infrared absorption features indicate the presence of hydrated materials on the surface of Europa. A number of species have been proposed as the material which plays host to the waters of hydration. The most promising class of these may well be the ones which retain high numbers of water molecules. Earlier work has shown discrepancies between near-infrared spectra of disrupted terrains on Europa gathered by the Galileo NIMS instrument and the spectral behavior of hydrated salts of low hydration states. Other work indicates that these discrepancies are reduced at higher levels of hydration. Here we report additional laboratory measurements which strengthen the case for highly hydrated materials on Europa.

Derived from text

Galileo Spacecraft; Hydration; Asymmetry; Sulfates; Salts

20040055317 Centre National de la Recherche Scientifique, Saint Martin d'Heres, France

The Rheology of Ice at Low Stresses; Application to the Behavior of Ice in the Europan Shell

Duval, P.; Montagnat, M.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 25-26; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The existence of an ocean in Europa is attributed to tidal heating. The thickness of the ice shell is poorly constrained. Surface features are in agreement with the occurrence of thermally induced solid-state convection within the lowest part of the ice shell. The ice shell would be therefore composed of a thick brittle conductive layer overlying a convective sublayer. Tidal heating would be located in the bottom of the convective layer. These results are obviously largely dependent on the viscosity of the ice. Tidal stresses are estimated of the order of 0.04 MPa with a strain rate of about 10-10 s-1 whereas convective stresses would be substantially lower. These mechanical conditions are found in polar ice sheets for which the lower bound for strain rates is about 10-13 s-1 near the surface of the East Antarctic ice sheet. The rheological behavior of ice at low stresses is subjected to extensive studies to improve ice sheet flow models. In situ and laboratory measurements are needed for a better knowledge of the ice flow law at these low strain rates and for the construction of polycrystals models used to simulate the mechanical behavior of isotropic and anisotropic ices. A review of recent results on the behavior of pure ice is given here with emphasis placed on the physical deformation mechanisms which control the deformation of ice at low stresses. Particular attention is paid to the variation of the viscosity with stress, temperature and grain size in the deformation conditions of the Europan ice shell.

Derived from text

Ice; Mechanical Properties; Anisotropy; Isotropy; Temperature Effects; Rheology

20040055321 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Long Period Variations in Tidal and Librational Forcing of Europa

Bills, Bruce G.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 11-12; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The gravitational field of Jupiter exerts a profound influence on the energy balance, thermal evolution, and stress regime of Europa. It widely appreciated that dissipation associated with the spheroidal tidal deformation is a major source of heat. Another possibly important source of dissipation is the toroidal deformation field associated with forced librations. Both tidal and librational deformations depend on the distance and direction Jupiter, as seen from Europa. These quantities vary with time as a result of the finite values of orbital eccentricity and spin pole obliquity, though the obliquity effects have been ignored in most previous studies. Variations in eccentricity and obliquity of the Galilean satellites occur on a very wide range of time scales, as angular momentum is exchanged among the orbital and rotational components of the coupled system. The orbital periods are only a few days in length, and the secular changes in orbital period associated with tidal and librational dissipation have characteristic time scales of 10-9 years or longer. On intermediate time scales, the satellites perturb each other, and the Sun and Saturn make additional contributions. The present values of satellite orbital inclinations and obliquities are not particularly representative their respective longer term variations. As a result, the tidal stress and dissipation regimes at present may not provide adequate explanation of the sources of surface features seen on the satellites.

Derived from text

Galilean Satellites; Angular Momentum; Eccentricity; Tides; Librational Motion; Europa

20040055347 Arizona State Univ., Tempe, AZ, USA

Brine Pockets in the Icy Shell on Europa: Distribution, Chemistry, and Habitability

Zolotov, M. Yu; Shock, E. L.; Barr, A. C.; Pappalardo, R. T.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 100-101; In English; See also 20040055312

Contract(s)/Grant(s): NAG5-7696; NCC2-1340; No Copyright; Avail: CASI; A01, Hardcopy

On Earth, sea ice is rich in brine, salt, and gas inclusions that form through capturing of seawater during ice formation. Cooling of the ice over time leads to sequential freezing of captured sea-water, precipitation of salts, exsolution of gases, and formation of brine channels and pockets. Distribution and composition of brines in sea ice depend on the rate of ice formation, vertical temperature gradient, and the age of the ice. With aging, the abundance of brine pockets decreases through downward migration. De- spite low temperatures and elevated salinities, brines in sea ice provide a habitat for photosynthetic and chemosynthetic organisms. On Europa, brine pockets and channels could exist in the icy shell that may be from a few km to a few tens of km thick and is probably underlain by a water ocean. If the icy shell is relatively thick, convection could develop, affecting the temperature pattern in the ice. To predict the distribution and chemistry of brine pockets in the icy shell we have combined numerical models of the temperature distribution within a convecting shell, a model for oceanic chemistry, and a model for freezing of Europan oceanic water. Possible effects of brine and gas inclusions on ice rheology and tectonics are discussed.

Derived from text

Brines; Sea Ice; Temperature Distribution; Marine Chemistry; Habitability; Reaction Kinetics

20040055357 Texas Univ., Austin, TX, USA

Earth's Ice Sheets and Ice Shelves as an Analog for Europa's Icy Shell

Blankenship, D. D.; Morse, D. L.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 13-14; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Earth's ice sheets and ice shelves could be viewed as poor analogs for understanding physical states and the processes governing these states within Europa s icy shell because their formation is dominated by atmospheric processes. However below the top few tens of meters, the atmosphere ceases to dominate their physical state so they become increasingly relevant as analogs for Europa Our intent is to examine the thermal, structural and compositional states of Earth s ice sheets and ice shelves from the perspective of their governing processes, then to relate these processes to those hypothesized for Europa. Our ultimate goal is to elucidate possible observable physical states within Europa s icy shell based on these analogous processes.

Derived from text

Ice; Temperature Distribution; Analogs

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*.

20040051126 Defence Science and Technology Organisation, Edinburgh, Australia

Behavioural Situation Awareness Measures and the Use of Decision Support Tools in Exercise Prowling Pegasus

Kardos, Monique; November 2003; 73 pp.; In English

Report No.(s): DSTO-TR-1521; DODA-AR-012-963; Copyright; Avail: Other Sources

Exercise Prowling Pegasus was held during May 19th to the 22nd, 2001, at DSTO Edinburgh. The aim of the exercise was to support ARH doctrine and ITP development, and the development of joint Land Air Systems concepts. A human factors behavioural observation approach was taken in order to assess the behavioural indicators of situation awareness (SA) and the effect of SA enhancing tools on the performance of military participants. Results on the levels of behaviour, the outcomes of wargames, and the relations of the two are discussed. Future work aims to clarify the relationship between behavioural observations and wargame outcomes.

Author

Physical Exercise; Human Factors Engineering

20040052835 Centers for Disease Control and Prevention, Atlanta, GA, USA

Characterization of a Novel Coronavirus Associated with Severe Acute Respiratory Syndrome

Rota, Paul A.; Oberste, M. Steven; Monroe, Stephan S.; Nix, W. Allan; Campagnoli, Ray; Ucenogle, Joseph P.; Penaranda, Silvia; Bankamp, Bettina; Maher, Kaija; Chen, Min-hsin, et al.; Sciencexpress; May 1, 2003; 10 pp.; In English; Copyright; Avail: Other Sources

In March 2003, a novel coronavirus (SARS-CoV) was discovered in association with cases of severe acute respiratory syndrome (SARS). The sequence of the complete genome of SARS-CoV was determined, and the initial characterization of the viral genome is presented in this report. The genome of SARS-CoV is 29,727 nucleotides in length, has 11 open reading frames, and the genome organization is similar to that of other coronaviruses. Phylogenetic analyses and sequence comparisons showed that SARS-CoV is not closely related to any of the previously characterized coronaviruses.

Derived from text

Viruses; Respiratory Diseases; Signs and Symptoms; Genome; Nucleotides

20040052864 NASA Marshall Space Flight Center, Huntsville, AL, USA

Indigenous and Contaminant Microbes in Ultradeep Mines

Onstott, T. C.; Moser, D. P.; Pfiffner, S. M.; Fredrickson, J. F.; Brockman, F. J.; Phelps, T. J.; White, D. C.; Peacock, A.; Balkwill, D.; Hoover, R.; Krumholz, L. R.; Borscik, M.; Kieft, T. L.; Wilson, R.; June 13, 2003; 3 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Rock, air and service water samples were collected for microbial analyses from 3.2 kilometers depth in a working Au mine in the Witwatersrand basin, South Africa. The approx. 1 meter wide mined zone was comprised of a carbonaceous, quartz, sulfide, uraninite and Au bearing layer, called the Carbon Leader, sandwiched by quartzite and conglomerates. The microbial community in the service water was dominated by mesophilic aerobic and anaerobic, alpha, beta and gamma-Proteobacteria with a total biomass concentration approx. l0(exp 4) cells/ ml, whereas, that of the mine air was dominated by members of the Chlorobi and Bacteroidetes groups and a fungal component. The microorganisms in the Carbon Leader were predominantly mesophilic, aerobic heterotrophic, nitrate reducing and methylotrophic, beta and gamma - Proteobacteria that were more closely related to service water microorganisms rather than air microbes. Rhodamine WT dye and fluorescent microspheres employed as contaminant tracers, however, indicated that service water contamination of most of the rock samples was less that 0.01% during acquisition. The microbial contaminants most likely originated from the service water, infiltrated the low permeability rock through and accumulated within mining-induced fractures where they survived for several days prior to being mined. Combined PLFA and terminal restriction fragment length profile (T-RFLP) analyses suggest that the maximum concentration of indigenous microorganisms in the Carbon Leader was less than lo(exp 2) cells/ g. PLFA, S-35 autoradiography and enrichments suggest that the adjacent quartzite was less contaminated and contained -10(exp 3) cells/gram of a thermophilic, sulfate reducing bacteria, SRB, some of who are delta Proteobacteria. Pore water and rock geochemical analyses suggest that these SRB's may have been sustained by sulfate diffusing from the adjacent U-rich, Carbon Leader where it was formed by radiolysis of sulfide.

Author

Accumulations; Bacteria; Contaminants; Depth; Microorganisms; Microparticles; Thermophiles; Mines (Excavations)

20040053268 NASA Ames Research Center, Moffett Field, CA, USA

Osteoblast Differentiation Decreases Hypergravity-Stimulated Release of PGE(sub 2)

Searby, Nancy D.; Steele, Charles R.; Globus, Ruth K.; November 04, 2002; 1 pp.; In English; American Society of Gravitational and Space Biology Meeting, 7-10 Nov. 2002, USA

Contract(s)/Grant(s): NAGW-4625; 99-HEDS-02; No Copyright; Avail: Other Sources; Abstract Only

We determined if progressive differentiation of osteoblasts influences their sensitivity to gravitational loading. Osteoblasts were cultured for 4 days (confluent monolayer), 6 days (prenodules), 9 days (nodules) and 19 days (mineralized nodules), then centrifuged at 10 times gravity (g) or 50-g for 3 hours using the NASA Ames 1-ft. Diameter Centrifuge. Stationary controls were placed in an adjacent incubator. Following centrifugation, conditioned media were collected and analyzed for PGE, by ELISA. Microtubules were fluorescently labeled and analyzed by confocal microscopy to determine microtubule network morphology and height. Centrifugation at 10-g reduced microtubule network height by 15% on d4 and 10% on d6, with variable changes in more mature cultures. No major changes in microtubule morphology were observed. PGE(sub 2) release by d4 cultures increased in a dose-dependent fashion (3-fold at 10-g and 6-fold at 50-g relative to controls). D6 cultures produced a 5-fold increase for both 10-g and 50-g. PGE(sub 2) increased only 1.5-fold by d9, and by d19, PGE(sub 2) was not delectable in either the control or hypergravity-stimulated cells. Thus, as osteoblasts differentiate in culture, responsiveness

of the microtubule cytoskeleton and the PGE(sub 2) pathway to hypergravity declines.
Author
Osteoblasts; High Gravity Environments; Dosage; Centrifuging

20040053288 NASA Ames Research Center, Moffett Field, CA, USA
Are Samples Obtained after Return to Earth Reflective of Spaceflight or Increased Gravity?
Wade, C. R.; Holton, E.; Baer, L.; Moran, M.; [2001]; 1 pp.; In English
Contract(s)/Grant(s): 121-10-30; 121-10-40; 121-10-50; 121-40-10; No Copyright; Avail: Other Sources; Abstract Only

Upon return to Earth, following space flight, living systems are immediately exposed to an increase in gravity of 1G. It has been difficult to differentiate between changes that are residuals of the acclimation to space flight from those resulting from acute exposure to an increase in =gravity upon re-entry. We compared previously reported changes observed in male Sprague-Dawley rats upon return to Earth to those induced by centrifugation, because both paradigms result in an increase of 1G. With both treatments there was a reduction in body mass, due to reduced food intake and increased urine output. The decrease in food intake was initially greater with centrifugation. The magnitudes of the changes in food intake and urine output were similar in both treatments. However, the slightly greater initial loss in body mass with centrifugation was due to a decrease in water intake not seen after space flight. The absence of pronounced differences between these treatments suggest the responses observed after landing are not residuals of adaptation to the space flight environment, but the result of adaptation to an increase in the level of gravity.
Author
Acclimatization; Adaptation; Exposure; Gravitation; Reentry

20040053300 NASA Ames Research Center, Moffett Field, CA, USA, Florida Agricultural and Mechanical Univ., Tallahassee, FL, USA, San Jose State Univ., CA, USA
Use of Novel Light Sources and Melatonin Delivery Systems in the Maintenance of Temporal Organization of Physiological and Behavioral Circadian Rhythms
Winget, C. M.; Singh, M. S.; Syrkin, N. C.; Holley, D. C.; May 29, 1998; 1 pp.; In English; International Aerospace Medical Aerospace Symposium, 8-10 Sep. 1998, Singapore, China
Contract(s)/Grant(s): NCC2-779; NCC2-843; RTOP 106-50-06; RTOP 334-10-01; No Copyright; Avail: Other Sources; Abstract Only

The synchronization of physiological and behavioral rhythms are controlled by an endogenous biological clock. It is generally accepted that environmental lighting is the strongest entrainer of this clock. The pineal gland is an important physiological transducer of environmental lighting via systemic melatonin secretion. We have used a novel light source using light emitting diode (LED) technology to entrain circadian rhythms in rats, and propose a novel percutaneous exogenous melatonin delivery system to entrain rat rhythms. We used 5 groups of Sprague-Dawley rats (175-350 g; N = 8/group) and showed normal entrainment of gross locomotor activity, feeding, and drinking circadian rhythms at light intensities varying from 80 lux to 0.1 lux (22.4 to 0.03 sq cm). To improve the delivery of melatonin across the skin stratum corneum it was formulated in a suitable vehicle in a transdermal drug delivery system. Various saturated and unsaturated fatty acids were used E, akin penetration enhancers. Our best vehicle formulation was achieved with a combination-of ethano1:water (60:40) along with 5% oleic acid as the enhancer. This formulation mixture was studied using Franz diffusion cell (0.636 sq cm diffusional area) and 1 cu cm dorsal skin isolated from Sprague Dawley rats. Our results showed that oleic acid in combination with the water ethanol mixture improved the flux of melatonin by more than 18 fold. The lag time for melatonin permeation was 2-3 hrs and the peak concentrations were achieved in 8-10 hrs. Our approaches in the future will involve the use of our transdermal melatonin delivery system and under the influence of LED light and microgravity.
Author (revised)
Circadian Rhythms; Entrainment; Synchronism; Rhythm (Biology); Pineal Gland; Light Sources

20040053348 Case Western Reserve Univ., Cleveland, OH, USA
Metabolic Adaptation to Muscle Ischemia
Cabrera, Marco E.; Coon, Jennifer E.; Kalhan, Satish C.; Radhakrishnan, Krishnan; Saidel, Gerald M.; Stanley, William C.; [2000]; 2 pp.; In English; NHLBI Workshop, 11 Nov. 2000, New Orleans, LA, USA
Contract(s)/Grant(s): NCC3-782; No Copyright; Avail: Other Sources; Abstract Only

Although all tissues in the body can adapt to varying physiological/pathological conditions, muscle is the most adaptable. To understand the significance of cellular events and their role in controlling metabolic adaptations in complex physiological

systems, it is necessary to link cellular and system levels by means of mechanistic computational models. The main objective of this work is to improve understanding of the regulation of energy metabolism during skeletal/cardiac muscle ischemia by combining in vivo experiments and quantitative models of metabolism. Our main focus is to investigate factors affecting lactate metabolism (e.g., NADH/NAD) and the inter-regulation between carbohydrate and fatty acid metabolism during a reduction in regional blood flow. A mechanistic mathematical model of energy metabolism has been developed to link cellular metabolic processes and their control mechanisms to tissue (skeletal muscle) and organ (heart) physiological responses. We applied this model to simulate the relationship between tissue oxygenation, redox state, and lactate metabolism in skeletal muscle. The model was validated using human data from published occlusion studies. Currently, we are investigating the difference in the responses to sudden vs. gradual onset ischemia in swine by combining in vivo experimental studies with computational models of myocardial energy metabolism during normal and ischemic conditions.
Author
Ischemia; Musculoskeletal System; Adaptation; Mathematical Models; Lactates; Carbohydrate Metabolism

20040055442 University of South Florida, Tampa, FL
Cell Growth and Survival in Ovarian Epithelial Cancer Core A
Nicosia, Santo V.; Aug. 2003; 80 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0670
Report No.(s): AD-A420867; No Copyright; Avail: CASI; A05, Hardcopy

Since receipt of first year funding (September 2002), the Administration Core has provided scientific leadership as well as administrative and financial oversight for all components of this project. The Core continues to evaluate the progress of, and stimulate interaction among, investigators, and has provided oversight on issues of a regulatory nature, including IRB, Animal Care, Radiation Safety, and Human Subject Protection. Monthly meetings of project investigators (PIs) have been held on various issues, including administration, budget, and current research reports. In addition, weekly research meetings have taken place within individual laboratories. A cadre of 24 outstanding speakers has been invited to deliver cutting-edge lectures on scientific and methodological topics dealing with ovarian cancer or related issues. While ad hoc meetings with members of the Internal Steering Committee have taken place so far, the first joint meeting of the Program Project's Internal Steering Committee and the External Scientific Advisory Board has been finalized for November 13-14, 2003. A multidisciplinary graduate course on the Pathobiology of Human Cancer has been developed with the interactive participation of all PIs. Finally, the PIs have submitted 2 grant proposals on Akt2 Oncogenesis (Jin Q. Cheng-NIH) and Telomerase- Apoptosis in Ovarian Cancer (Patricia Kruk-DoD), 8 manuscripts, and 11 presentations at national meetings. Appendixes provide the schedule of the November 13-14 meeting entitled 'Cell Growth and Survival in Ovarian Epithelial Cancer;' a letter to Patricia Evans, DoD Contracting/Grants Officer, requesting the reassignment of Dr. Cheng to PI and Dr. Nicosia to co-PI due to the departure of Dr. Coppola, former PI; and the curriculum vitae of Dr. Santo V. Nicosia, MD (57 pp.) and Dr. John Mark Lancaster (10 pp.), an expert in ovarian cancer genetics and genomics, who was recently recruited to the Gynecologic Oncology Program at the Moffitt Cancer Center7
DTIC
Cancer; Cell Division; Epithelium; Medical Science; Ovaries; Research Management; Survival

20040055443 British Columbia Univ., Vancouver, British Columbia
Statistical Methods for Analysis of NF Clinical Data
Joe, Harry; Aug. 2003; 64 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0546
Report No.(s): AD-A420869; No Copyright; Avail: CASI; A04, Hardcopy

This project describes research in statistical methods that would be useful for statistical modeling and analysis of clinical data from neurofibromatosis 1 (NF1) and neurofibromatosis 2 (NF2) subjects. The statistical methods are classified into the following areas: (a) estimation of familial correlation for different types of data, and (b) assessment of multi-hit mutation models for incidence of tumors. Some of the statistical methods to be developed are either new or partly new and require further research for computer software implementation. Clinical data exist in many formats, including binary, categorical, count, and continuous information. Furthermore, a common 'real life' problem is censored data (where the beginning or end point is not known for all cases but some intermediate data exist). One goal of the project is to produce a software package for familial data analysis for different types of data, such as binary, count, and censored survival data. To date, seven manuscripts have been accepted for publication, and one other has been submitted. Presentations were made at the 2000-2002 meetings of the American Society of Human Genetics and are planned for the 2003 meeting. In addition, this year five presentations were made at the NNFF International Consortium for the Molecular Biology of NF1 and NF2, at the Fourth

International Conference on Vestibular Schwannoma and Other CPA Lesions, Cambridge UK, and at the 10th European Neurofibromatosis Meeting, Turku, Finland. The report contains the following preprints: Genotype-phenotype correlation for cataracts in NF2; Familial analysis of binary traits; and Analysis of neurofibromatosis lesions by body segment. Also included are the outline for Yinshan Zhao's thesis, excerpt from a summary section on estimation methods from Zhao's thesis, and 6 abstracts published or accepted in 2003.
DTIC
Clinical Medicine; Diseases; Genetics; Neoplasms; Statistical Analysis

20040055444 Massachusetts General Hospital, Boston, MA
A Novel High Resolution Positron Emission Tomography System for Measurement of Bone Metabolism
Correia, John A.; Sep. 2003; 66 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-8511
Report No.(s): AD-A420885; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of the work reported here is to develop high-resolution PET instrumentation for imaging the long bones. To-date a single plane prototype and a single plane second-generation instrumentation have been completed and evaluated. A generalized multi-planar detector element has also been designed and evaluated experimentally and a volumetric instrument has been designed through simulation studies. Radiopharmaceuticals for bone growth rate imaging have been developed for use in a demonstration study of imaging in a monkey osteoporosis model. Preliminary animal studies showing feasibility have been carried out.
DTIC
Bones; High Resolution; Metabolism; Positrons; Tomography

20040055445 Boston Univ., Boston, MA
Development of a Novel Vaccine With Fusions of Dendritic and Ovarian Cancer Cells From Patients
Gong, Jianlin; Aug. 2002; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0572
Report No.(s): AD-A421000; No Copyright; Avail: CASI; A03, Hardcopy

In the present study, ovarian carcinoma cells (OVCA) derived from 15 patients were successfully fused with autologous DC in 10 cases and allogeneic DC in 7 cases (both autologous and allogeneic fusion cells were formed in 4 cases). The created heterokaryons expressed tumor-associated antigens, such as CA-125, MUC1 and/or HER2/neu, and DC-derived co-stimulatory and adhesion molecules. The fusion cells were functional in stimulating the proliferation of autologous T cells. in addition, CD4(+) and CD8(+) T cells derived from patients with ovarian cancer were stimulated by fusion cells to secret high level of IFN-r as demonstrated by intracellular staining in 8 patients. Significantly, T cells primed by fusion cells produced MHC class I-dependent lysis of autologous ovarian tumor cells. Furthermore, MUC1- specific CTL were generated from a HLA-A2 patient with ovarian carcinoma positive for MUC1 as demonstrated by MHC class I/MUC1 peptide tetrameric analysis. These findings indicate that fusions of human ovarian cancer cells with autologous or allogeneic DC activate both CD4(+) and CD8(+) T cells and are associated with potent and antigen-specific antitumor responses against autologous ovarian cancer cells.
DTIC
Cancer; Cells (Biology); Lymphocytes; Ovaries; Patients; Vaccines

20040055446 New York Univ., New York, NY
New System for Protein Based Nanotechnology
Kallenbach, Neville R.; Sep. 30, 2003; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-I-0125
Report No.(s): AD-A421057; No Copyright; Avail: CASI; A01, Hardcopy

A method for constructing nanoscale complexes from peptides is reported, which uses branched coiled coils to create figures with specified geometry and structure. These structures can be used as vertices for programmed assembly of novel arrays, lattices and materials; the arms in our constructs are formed from alpha helical coiled coils with two or more strands. Demonstration of the design principle has been achieved. Connection of vertices to generate higher order structures is being explored, using a system for linking units that retains specific interactions between the arms.
DTIC
Nanotechnology; Peptides; Proteins

20040055448 California Univ., Davis, CA
Protein Interaction with the N-Terminus of the Androgen Receptor
Gumerlock, Paul H.; Mar. 2002; 55 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8565
Report No.(s): AD-A421196; No Copyright; Avail: CASI; A04, Hardcopy

This project, which began with the goal of identifying proteins that bind to the human androgen receptor (hAR) differentially based on the length of the CAG repeat sequence, has been instrumental in revealing new biological findings of the role of the androgen receptor in prostate cancer progression to androgen-independence. Three significant findings were these: 1) Failure to identify any binding proteins for the Gln repeat region of the human androgen receptor. Our conclusion was that the continued search for such binding proteins is not warranted at this time, however further study of ARA24 is warranted. 2) The role of the RB pathway growth arrest in the androgen response in prostate cancer. The occurrence of cell death following the growth arrest, may provide a biology that can be exploited for prostate cancer patient therapy. 3) Bag1L binds to hAR is induced by gain-of-function p53 mutants, and contributes to androgen-independent growth of prostate cancer cells. We believe these findings make important and extremely valuable contributions toward understanding the role of the androgen receptor in hormone-refractory prostate cancer. These multiple findings provide clearer foundations on which to build and propose new projects for study of this important aspect of human prostate cancer.
DTIC
Cancer; Hormones; Males; Prostate Gland; Proteins; Receptors (Physiology)

20040055449 North Carolina Univ., Greensboro, NC
Genetic and Molecular Characterization of Drosophila Brakeless: A Novel Modifier of Merlin Phenotypes
LaJeunesse, Dennis; Jul. 2003; 22 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0718
Report No.(s): AD-A421198; No Copyright; Avail: CASI; A03, Hardcopy

During the 2nd year, we have continued the work on the circuit defined by genetic interactions, we have observed among scribbler, Merlin and Cyclin E. During this year, we have shown that: 1) the two scribbler isoforms (SbbA and SbbB) are not completely equivalent in their requirements for the regulation of proliferation; 2) scribbler regulates Cyclin E expression at the transcriptional level and 3) Merlin functions upstream of scribbler. In addition to this, we have identified a human homologue to scribbler (Hsbb) which remarkably shares a similar genomic organization to Drosophila scribble and we have also performed a genetic screen to identify genes involved in proper Merlin localization within epithelial cells.
DTIC
Drosophila; Genes; Genetics; Proteins

20040055450 Texas Univ., San Antonio, TX
Y Chromosome Aberrations in Prostate Cancer
Naylor, Susan L.; Sep. 2003; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9469
Report No.(s): AD-A421200; No Copyright; Avail: CASI; A03, Hardcopy

We hypothesize that chromosomal loss of the Y chromosome in prostate cancer is a specific tumorigenic event. Transfer of the Y chromosome by microcell mediated chromosome transfer into PC-3 cells resulted in suppression of tumor growth. However, these PC-3 hybrids containing the Y chromosome did grow in soft agar indicating a lack of correlation between in vitro and in vivo tumor growth. We have isolated clones with fragments of the Y chromosome and found suppression of tumorigenesis correlates with either the short arm of the Y or two small regions on the q arm. The data from the functional assay will be correlated with data form deletions in patient material. We have isolated a complete genomic microarray specific for the Y chromosome. These BAC (bacterial artificial chromosomes) will be used to perform array CGH (Comparative genomic hybridization) of prostate tumor samples. Successful identification of a gene on the Y chromosome will provide a marker that may aid in the diagnosis and prediction of prognosis of prostate cancer.
DTIC
Aberration; Cancer; Chromosomes; Genes; In Vitro Methods and Tests; In Vivo Methods and Tests; Prostate Gland

20040055451 Michigan Univ., Ann Arbor, MI
Biological Difference Between Prostate Cancer Cells that Metastasize to Bone Versus Soft Tissue Sites
Pienta, Kenneth J.; Dec. 2003; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0098
Report No.(s): AD-A421201; No Copyright; Avail: CASI; A02, Hardcopy

The most common site for prostate cancer metastases to develop are the bone where they cause significant morbidity as well as contribute to the mortality of the patient. The molecular differences between metastatic prostate cancer and localized prostate cancer are not well established. Before prognostic markers and rational therapies can be developed to target this lethal form of prostate cancer, the molecular alterations associated with it need to be unmasked. We have hypothesized that we can identify genetic and biologic changes that are important in prostate cancer metastasis to bone and determine their functional significance in prostate cancer bone metastasis. In this last period, we have: Task 1: We have investigated the binding of VCap prostate cancer cells (derived from a bone metastasis) and DUCaP cells (derived from a soft tissue metastasis) to bone. Task 2: We have developed a model to investigate metastatic patterns of prostate cancer cells in a preclinical in vivo model. Task 3: We have identified genes differentially expressed between bone and soft tissue metastases of the same patient.
DTIC
Bones; Cancer; Cells (Biology); Metastasis; Prostate Gland

20040055452 Naval Health Research Center, San Diego, CA
Development of a Field Sick Call Medical Module for the Marine Corps
Galarneau, Mike; Lowe, Doug; Konoske, Paula J.; Jan. 2002; 23 pp.; In English
Contract(s)/Grant(s): Proj-M0095
Report No.(s): AD-A421215; NHRC-02-23; No Copyright; Avail: CASI; A03, Hardcopy

Central to ensuring a fit and healthy force is the provision of a readily available and effectively executed sick call capability. Currently, Marine Corps sick call capability is included in the Battalion Aid Station (BAS) Authorized Medical Allowance Lists. The objective of this study was to support the creation of a stand-alone sick call capability. This paper describes the development of the sick call supply module using an objective, systematic methodology that identifies the clinical requirements for each individual supply, thereby providing the highest level of clinical support with the fewest resources. To identify sick call supplies, Naval Health Research Center (NHRC) first reviewed the Joint Readiness Clinical Advisory Board patient conditions (PCs) to determine those PCs covering disease and nonbattle injury (DNBI). Next, the rate that these DNBI PCs occur was determined using underlying casualty rate probabilities in the NHRC patient-generating model FORECAS. Third, a patient stream was fed into the NHRC Estimating Supplies Program to determine the supplies necessary to treat sick call patients. A total of 29 equipment and 143 consumable items were identified for the sick call module. An examination of these 172 items showed that 17 new medical items were added to the Marine Corps supply inventory, representing an enhancement to the administration of field sick call. Furthermore, the supplies in the sick call module are no longer co-mingled with the combat casualty care portion of the BAS. This stand- alone capability provides units greater flexibility in matching their medical supply support to their mission profiles and objectives.
DTIC
Medical Services; Military Operations; Personnel; Sicknesses

20040055453 Naval Health Research Center, San Diego, CA
Monitoring Anthrax Vaccine Safety in US Military Service Members on Active Duty: Surveillance of Hospitalizations in Temporal Association with Immunization 1998
Sato, Paul A.; Reed, Robert J.; Smith, Tyler C.; Wang, Linda; Jan. 2000; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421216; NHRC-00-29; No Copyright; Avail: CASI; A03, Hardcopy

We studied military medical hospitalizations for possible temporal associations with anthrax immunization in U. S. military personnel on active duty in 1998. Anthrax immunization, demographic, and hospitalization data were linked and analyzed using Cox proportional hazards modeling for hospitalization within 42 days of an anthrax vaccine dose. Discharge diagnoses were aggregated into 14 International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) diagnostic categories. Approximately 11% of active-duty personnel received one or more doses of anthrax vaccine during 1998; those anthrax immunized were more likely to be younger and male. Lower hospitalization rates were observed in the anthrax- immunized, across doses and diagnostic categories. Adjusted risk ratios for hospitalization by diagnostic category suggests that anthrax- immunized active-duty service members were at equal or lesser risk of hospitalization than the nonimmunized.
DTIC
Immunology; Infectious Diseases; Personnel; Safety; Surveillance; Vaccines

20040055457 Academy of Health Sciences (Army), Fort Sam Houston, TX

Space Available Beneficiaries and TRICARE Prime: Identification of Factors that Influence Enrollment

Diaz, Marciano A.; Dec. 4, 2003; 65 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421227; HCA-32-03; No Copyright; Avail: CASI; A04, Hardcopy

Despite efforts to encourage beneficiaries of the National Naval Medical Center's (NNMC) to enroll with TRICARE Prime, over 21,000 beneficiaries received their care on space- available basis. Care provision on a space-available basis can result in undesirable outcomes for the organization and for the individual beneficiary, many of which may be moderated by enrollment with TRICARE. A questionnaire was developed and administered to 850 randomly selected eligible beneficiaries in order to gain an understanding of the factors that affect a beneficiary s decision to enroll in TRICARE Prime. Beneficiaries reported different reasons for not enrolling in Prime and for disenrolling. Descriptive analysis also revealed that half of the respondents do not intend to enroll with Prime. Multinomial logistic regression analysis indicates that females and beneficiaries with sponsor rank classification of officer are twice as likely to report that they do not intend to enroll with Prime compared with those that are unsure about their decision (ψ = 2.068, p < .05; ψ = 2.073, p < . 10). These findings have important implications for marketing efforts and planning at the organizational level.

DTIC

Medical Services

20040055458 Academy of Health Sciences (Army), Fort Sam Houston, TX

Case Study: Review of Operating Room Utilization at Naval Hospital Jacksonville

Hamilton, LaShelle R.; Jun. 2003; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421228; HCA-32-03; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of the study was to determine if the operating suite at Naval Hospital Jacksonville (NHJAX) is being under utilized. The operating suite consists of six operating rooms (OR) that provide service for seven surgical services. The variables OR capacity, OR capacity utilized, allocated block time per service, allocated block time used per service, and the number of surgical cases referred outside NHJAX were analyzed. Data were collected over fiscal year 2002. Analysis showed that the OR suite is only utilizing 69.25% of available minutes for the year. Out of the seven surgical services only Ear, Nose, and Throat (ENT) consumes greater than 75% of allocated minutes. The result of this study showed that the OR is being under utilized and that the antiquated data collection system (which requires a great deal of manual data collection) employed n the OR suite needs to be replaced with a user-friendly modern system. Thereby, allowing for improved utilization of resources, including equipment, rooms, and staff.

DTIC

Hospitals; Medical Services; Surgery

20040055465 Greater San Antonio Hospital Council, TX

Effective Utilization Management in a Military Treatment Facility

Belisle, Daniel J.; Dec. 1999; 50 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421236; HCA-34-99; No Copyright; Avail: CASI; A03, Hardcopy

Healthcare systems and facilities across the country have used utilization management as a response to the pressures of declining revenue, increasingly competitive markets, and escalating operating expenses. The result of utilization management is a reduction of inpatient operations, as well as excess capacity. Wilford Hall Medical Center was studied, using primarily the Medical Expense Performance Reporting System (MEPRS) and Corporate Executive Information System (CEIS) data systems, to determine the magnitude of inpatient activity reduction. In addition, other factors such as Department of Defense referral policy changes and changes in the beneficiary population were examined to determine their role in the decline of inpatient activity.

DTIC

Medical Services; Patients

20040055466 Naval Health Research Center, San Diego, CA

A Descriptive Analysis of Medical Encounters Aboard 15 Navy Surface Ships Home-Ported in San Diego

Freeman, Karen M.; Trank, Tamara V.; Sherman, Sterling S.; Jan. 2002; 26 pp.; In English

Report No.(s): AD-A421238; NHRC-02-32; No Copyright; Avail: CASI; A03, Hardcopy

There has been no mechanism for comprehensively monitoring shipboard illnesses and injuries in over a decade. Electronic medical encounter records from the Shipboard Non- Tactical ADP Program (SNAP) Automated Medical System

(SAMS) installed aboard individual vessels are now available and were acquired for this descriptive study of sick-call visits aboard 15 San Diego, California, home-ported Navy ships. An extensive examination of ICD-9-CM diagnostic and demographic frequencies is presented. Of the 5,378 encounters examined, the most frequent major categorical complaints were respiratory (31%), injury and musculoskeletal (29%), dermatologic (9%), and infectious or parasitic illnesses (8%). Frequency of diagnosis was largely unrelated to gender, although men were more apt to be seen for sprains and strains and women for genitourinary conditions and reproductive services. Of 1,307 encounters that resulted in either modified/light duty or lost work, 60% were caused by upper respiratory infections (23%), intestinal disease (19%), and sprains/strains (18%). This is the first in- depth analysis of SAMS data obtained from a diverse sample of surface ships, and it demonstrates the substantial surveillance capability now available to continuously monitor shipboard health and readiness. Such surveillance, if monitored actively, should enhance our ability to intervene early, identify modifiable risks, assess prevention and control efforts, and improve the allocation of limited resources.
DTIC
Computer Techniques; Data Processing; Encounters; Navy

20040055468 Naval Health Research Center, San Diego, CA
Medical Planning for Operations Other Than War (OOTW): Determining Unique Patient Conditions Clinical Tasks and Supplies
Gauker, Eleanor D.; Konoske, Paula J.; Emens-Hesslink, Kristee; Jan. 2002; 57 pp.; In English
Report No.(s): AD-A421241; NHRC-02-11; No Copyright; Avail: CASI; A04, Hardcopy

Operations other than war (OOTW) and combat scenarios differ in doctrinal, cultural, political, personnel, and logistical aspects. Relying on the parameters of combat scenarios to plan medical requirements for OOTW missions might result in overstocking of some supplies and equipment while underestimating the requirements for others. The goal of this study was to identify those diseases and injuries that occur during OOTW but not during combat operations, and to link them to corresponding treatment tasks and supply requirements. The ultimate objective of this research effort was to add an OOTW component to the Estimating Supplies Program (ESP), thus enhancing its value as a planning tool. A literature search was conducted to find published disease and injury statistics representing a variety of OOTW scenarios, and this information was organized to form a database. Researchers compared the OOTW diagnoses with diseases and injuries that were already defined in the ESP model. The literature search produced 19 sources that included disease and injury information for OOTW. To organize these statistics, PCs used in ESP were identified either as trauma or nontrauma. The trauma PCs were divided into 18 categories, while the nontrauma PCs formed 20 categories. There were 15 OOTW diagnoses that did not match already-existing PCs, and all of them were nontraumatic. In addition, 22 new clinical tasks were introduced. In this report, the diagnoses were classified by type rather than by frequency to determine which diseases and injuries are unique to OOTW. Additional research is needed to quantify populations at risk and to calculate rates of occurrence for humanitarian assistance, disaster relief, and peacekeeping.
DTIC
Medical Services; Patients; Planning; Supplying; Warfare

20040055469 Ben Taub General Hospital, Houston, TX
Business Plan for the Creation of a National Center of Excellence for Alcohol Septal Ablation at Ben Taub General Hospital
Cole, Andrew T.; Apr. 23, 2003; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421242; AMDCS-34-03; No Copyright; Avail: CASI; A04, Hardcopy

This project provides a business plan for establishing an international center of excellence for alcohol septal ablation at Ben Taub General Hospital. Alcohol septal ablation is a new treatment for hypertrophic obstructive cardiomyopathy, which impacts approximately one in every five hundred individuals. The procedure involves the injection of ethanol alcohol into the left ventricle creating a controlled heart attack. This business plan provides a market analysis, volume forcast, staffing projections, and financial analysis. The five-year cumulative return on this project is approximately $5.4 million. Concluding analysis reveals the center of excellence can achieve profitability at the end of the first year of operations.
DTIC
Ablation; Alcohols; Commerce; Ethyl Alcohol; Hospitals

20040055470 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Perception of Personal Well-Being and Workers' Compensation Injuries in Federal Correctional Workers
Skvore, Casey; Jan. 2001; 138 pp.; In English
Report No.(s): AD-A421243; No Copyright; Avail: CASI; A07, Hardcopy

Federal correctional workers are tasked with protecting society from felons convicted of federal crimes and remanded to the custody of the Attorney General for incarceration. The physical and psychological demands placed upon these workers are great, and these workers have greater risk factors for occupational injury and disease than do other federal law enforcement officers. This dissertation examines rates of occupational injuries for approximately 30,000 federal correctional workers with regard to the security level of the prison worked in, the occupation of the correctional worker, gender, and associated number of days away from work after an occupational injury. Also analyzed is a Perception of Personal Well-Being (PWB)instrument, part of a widely circulated self-report measure of physical and emotional well- being administered to federal correctional workers on a nationwide basis. It was hypothesized that security level, and occupation, would be related to higher levels of occupational injury, lower levels of PWB, and that higher security levels would be associated with significantly lower levels of perception of personal well-being. Security level is significantly related to rates of occupational injury, in that federal correctional workers at Minimum security institutions had lower odds for the occurrence of occupational injuries than all other security levels except the AdMax security level. Security level was not a significant predictor for aggregate perception of well-being. Correctional officers had higher rates of occupational injuries than non-correctional officers. Security level was not a significant predictor of aggregate measures of PWB. Correctional officers had higher aggregate scores of PWB than non-correctional officers.
DTIC
Injuries; Medical Services; Personnel

20040055472 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Comparison of Iontophoretic Lidocaine to EMLA Cream for Pain Reduction Prior to Intravenous Fannulation in Adults
Spence, Kenneth L.; Oct. 2000; 77 pp.; In English
Report No.(s): AD-A421245; No Copyright; Avail: CASI; A05, Hardcopy
The insertion of intravenous (IV) catheters, required for most operative anesthesia, can be a source of pain and anxiety. Lidocaine, a local anesthetic, is frequently injected intradermally to decrease pain associated with IV cannulation in adults. Topically administered EMLA (Eutectic Mixture of Local Anesthetics) cream is frequently used, but it takes one hour for it to effectively anesthetize venipuncture sites, which limits its usefulness. A method gaining acceptance in healthcare is the iontophoresis (transdermal administration of ionizable drugs utilizing an electric current) of a polarized local anesthetic. Using iontophoresis, a local anesthetic such as lidocaine, a positively charged molecule, can be used to effectively anesthetize the skin to depths of up to 8mm without the use of needles, in as few as ten minutes. The purpose of this study was to compare the iontophoresis of lidocaine with epinephrine to EMLA cream for producing local anesthesia prior to intravenous cannulation. A descriptive study utilizing the experimental method with a cross over design was used. The procedures for the study consisted of the random application of EMLA cream (for 60 minutes) or the iontophoresis of 4% lidocaine HCl (40 mg/ml) with 1:50,000 epinephrine (20 mcg/ml) (40 milliamp minutes) to either the dorsal surface of the right or left hand. Results were that the iontophoresis of 4% Lidocaine HCl with Epinephrine 1:50,000 (20 micrograms/ millimeter (mcg/ml) reduced pain more effectively than EMLA cream associated with intravenous cannulation in adults (14 mm vs. 3 mm for the EMLA cream and Iontophoresis respectively). The majority of subjects preferred iontophoresis.
DTIC
Anesthetics; Human Beings; Intravenous Procedures; Pain

20040055474 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Patient Perception of Disclosure Performance of Informed Consent Elements in the Preanesthesia Interview
Hartgerink, Bradley J.; Dec. 1997; 74 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421247; No Copyright; Avail: CASI; A04, Hardcopy
Adequate disclosure during the informed consent process ensures equalization of the practitioner/patient relationship and patient decision-making rights. The purpose of this study was to provide a descriptive analysis of the extent to which patients report that the elements of informed consent (nature of the proposed anesthesia, benefits of the proposed anesthesia, material risks of the proposed anesthesia, and alternative anesthetic modalities) were discussed in the preanesthesia interview. A survey composed of 21 questions pertaining to demography and informed consent elements was devised and administered to 53 patients immediately following their preanesthesia interview. The nature, benefits, and risks of the proposed anesthetic were discussed more than average or in detail more than 90%, 81%, and 90% respectively. However, alternative anesthetic modalities were not or only somewhat discussed 30% of the time. This study found that during the preanesthesia interview, the type, benefits, and risks of the anesthetic were well discussed with the patient, but that patients do not perceive that anesthetic choices were being offered. A low statistical inverse correlation of -0.217 was found between the total score for the

informed consent elements and the highest educational level attained. This suggests that the higher the patient educational level, the more inadequate was the perceived level of anesthetic disclosure by the anesthesia provider. A low statistical correlation of 0.370 was found between those identified by the patient as the provider and the actual provider. This indicates that patients are not clear on whether their provider is a nurse anesthetist or an anesthesiologist.
DTIC
Anesthesia; Decision Making; Patients

20040055475 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Pericardium-6 Acupressure for the Prevention of Postoperative Nausea and Vomiting
Woods, Robert M.; Oct. 1999; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421248; No Copyright; Avail: CASI; A04, Hardcopy

Postoperative nausea and vomiting (PONV) are common problems after general anesthesia. Pharmacological advances have reduced the incidence of PONV however; nausea and vomiting remain the most common postoperative complications of anesthesia. Persistent nausea and vomiting may result in dehydration, electrolyte imbalance, and delayed discharge. Traditional western medicine has been unable to definitively explain why this phenomenon continues to occur. Acupressure at the pericardium-six meridian has been studied in various patient populations and found to be without side effects, however its effectiveness has not been shown. The purpose of this study was to set up a pilot study to retest the claim that acupressure at the pericardium-six meridian can reduce PONV. Ten patients undergoing laparotomy, laparoscopic, or general surgery for gynecological procedures were studied. Acupressure's effectiveness was compared to sham acupressure of the control group. Patients, anesthesia providers, and data collectors were blinded to the control and study groups. Non- invasive acupressure wristbands were applied to both wrists prior to surgery and worn for 24 hours after. Post anesthesia care unit personnel recorded data while the patient was in the hospital. The patient's recorded and quantified nausea and vomiting at home using a visual analogue scale. An anesthesia provider called the patient after surgery to collect data. All data were analyzed using SPSS 8. 0. No statistical significance was found in nausea and vomiting scores between the two groups.
DTIC
Anesthesia; Nausea; Prevention; Vomiting

20040055477 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Solid Phase Microextraction (SPME) as a Method to Defect the Presence of Escherichia Coli in Waster by Headspace Sampling and Gas Chromatography/Mass Spectrometry Analysis
Hall, Tara L.; Jan. 2002; 58 pp.; In English
Report No.(s): AD-A421251; No Copyright; Avail: CASI; A04, Hardcopy

A method was developed for detecting the metabolite indole produced by Escherichia coli in the headspace above a sample in Luria bertani broth. This method used solid phase microextraction (SPME) and gas chromatography/mass spectrometry to perform extraction and analysis. Five commercially available SPME fibers were investigated to determine the optimal fiber and extraction conditions. Polyacrylate (PA) and polydimethylsiloxane- divinylbenzene fiber coatings gave a statistically indistinguishable and best response compared to the other three types examined. The PA fiber coating was selected for further study. The lower level of detection was determined to be 1 colony forming unit (cfu) in 100 milliliters (mL) of water incubated for twelve hours at 37 degrees Celsius. Themethod detection level was determined to be 101-1000 cfu in 100 mL of water, although 11-100 cfu were detected 90.9% of the time. Forty water samples split, filtered and analyzed with SPME and membrane filtration were shown to be in agreement 57.1% more often than would be expected by chance (Kappa = 0.571, P<0.001). The results of this study showed significant promise in the use of SPME for detection of volatile metabolites of bacterial water contaminants. However, under the conditions optimized in this study, the method is neither sensitive nor fast enough to be considered superior over existing methods.
DTIC
Defects; Escherichia; Gas Chromatography; Mass Spectroscopy; Sampling; Solid Phases

20040055478 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
The Correlation Between End-Tidal Carbon Dioxide Measured by Capnoxygen (Trade Mark) Mask and Nasal Cannula
Fitzpatrick, Leo J.; Oct. 2000; 70 pp.; In English
Report No.(s): AD-A421253; No Copyright; Avail: CASI; A04, Hardcopy

The use of capnography during general anesthesia has become a standard of care for all anesthesia providers and is

considered an essential monitoring devise. The relationship of end-tidal carbon dioxide (ETCO2) to arterial carbon dioxide in intubated patients has been well established by Saunders, and colleagues (1994). Attention has focused on capnography in sedated, nonintubated patients where ETCO2 was not monitored and patients had associated comorbidities. Studies also have documented a correlation between the accuracy of ETCO2 to arterial carbon dioxide during spontaneous ventilation using a carbon dioxide (CO2) sampling device through a prong in an oxygen (O2) nasal cannula. In this study, a single-use medium concentration O2 face mask designed to deliver oxygen while monitoring ETCO2 in spontaneously breathing patients was used. The accuracy of the measured ETCO2 was compared to a standard nasal cannula sampling port in 13 normal healthy volunteers. There was a positive correlation between the ETCO2 of both devices with and without the addition of oxygen. Mean ETCO2 measurements with the mask decreased in proportion to increasing oxygen flows, while mean ETCO2 with the nasal cannula remained consistent. Sixty one percent of volunteers stated the mask was more comfortable to wear during their testing experience, and half stated they would prefer to wear the mask over the cannula for a procedure lasting more than one hour.
DTIC
Anesthesia; Cannulae; Carbon Dioxide; Masks; Tides

20040055479 Northwestern Univ., Evanston, IL
Ex Vivo Expanded (EVE) Megakaryocytes (MK) for Supportive Care of Patients With Breast Cancer Hematologic Malignancies: A Phase I/II Clinical Study
Cohen, Isaac; Dec. 2003; 62 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-8327
Report No.(s): AD-A421254; No Copyright; Avail: CASI; A04, Hardcopy

The main goal of this project is to culture blood stem cells in the presence of human hematopoletic growth factors to produce autologous megakaryocytes (MK) to be transfused into patients as a supplement to the conventional stem cell autograft. The purpose of the clinical trial is to determine whether the transfused MK will generate platelets in vivo in great enough numbers to reduce or eliminate the need for repeated platelet transfusions following high-dose chemotherapy and autologous stem cell transplant. We determined in pre-clinical experiments that a cocktail of the growth factors thrombopoietin, IL-3 and Flt3-L and high seeding cell density were necessary to optimize the ex vivo expansion of MK. We successfully transplanted three patients. Cell expansion was optimal after six days, no negative reactions were observed, and the patients recovered normal platelet levels fast with normal platelet function. This study shows that using an ex vivo expanded product is feasible, and the successful outcome in our three transplanted patients augurs well for future use of this concept. Additionally, we have added a novel survival factor, PLP-E to the arsenal of growth factors used for ex vivo myeloid expansion and have elucidate the molecular mechanism of proplatelet formation.
DTIC
Cancer; Hematology; Mammary Glands; Patients

20040055480 Virginia Univ., Charlottesville, VA
Aromatase Overexpression and Breast Cancer Development
Yue, Wei; Aug. 2003; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0445
Report No.(s): AD-A421255; No Copyright; Avail: CASI; A03, Hardcopy

Estrogen can be metabolized to hydroxylated catechol estrogen, a genotoxic metabolite of estrogen, which causes DNA damage and tumors in animal models. In situ synthesis of estrogen in the breast through arornatase results in high tissue estrogen concentrations. We hypothesized that overexpression of aromatase in breast tissue increases tissue estradiol concentrations and consequent genotoxic metabolites, and eventually causes breast cancer. To test our gypothesis, we stably expressed aromatase cDNA in MCF-10A cells, a benign breast epithelial cell line. During this funding period, we initially characterized the stable line, MCF-10Aarom using tritiated water release assay and products isolation by thin layer chromatography. We demonstrated that MCF-10Aarom cells expressed functional aromatase. We then conducted in vitro study for transformation using soft agar growth assay and in vivo tumorigenesis in nude mice. Our pilot studies allowed us to set up standards (growth time and colony size) for the soft agar assay. There is no palpable tumor formed in nude mice in which MCF-l0Aarom cells were inoculated. We also treated the MCF-l0Aarom cells in the culture with androstenedione, estradiol, and aromatase inhibitor letrozole. The samples were sent to Dr. Cavalieri for metabolites measurement.
DTIC
Cancer; Estrogens; Mammary Glands

20040055481 Duke Univ., Durham, NC

Neuronal Degeneration in the Cingulate Gyrus: NMDA Antagonists and Anticholinesterases

Wilson, Wilkie A.; Oct. 2003; 124 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9541

Report No.(s): AD-A421256; No Copyright; Avail: CASI; A06, Hardcopy

The primary objective of these studies was to determine the neurotoxic risks of combining acetyloholinesterase inhibitors (AChEIs) with N-methyl-D- aspartate (NMDA) receptor antagonists. There is evidence that although NMDA receptor antagonists are considered neuroprotective against excess glutamate release during acute conditions, these same agents may also induce neurodegeneration in brain areas associated with attention and motivation; This neurodegeneration is exacerbated by muscarinic cholinergic agonists. Military personnel and civilians may be exposed to a wide array of cholinesterase inhibitors by pesticide exposure, chemical weapons deployment or prophylactic treatment. Exposure to these agents may elevate brain levels of acetyloholine (ACh), leading to increased muscarinic cholinergic stimulation. Individuals may be at risk of neuronal degeneration if they are co-exposed to a NMDA receptor antagonist, for example, cough suppressants, anticonvulsants, ethanol or the Alzheimer Disease agent, memantine. We approached this problem by using patch-clamp electrophysiology, behavioral assessment and histopathology to examine the effects NMDA receptor antagonists in animals co- exposed to AChET agents. We found that the AChET, PB is neuroprotective in some animals co-exposed to NMDA antagonists, but is lethal in others.

DTIC

Cholinesterase; Degeneration; Inhibitors; Neurophysiology; Pharmacology

20040055482 Pennsylvania Univ., Philadelphia, PA

Development of a Computer Decision Support System for Women With BRCA1 of BRCA2 Mutations

Armstrong, Kartina; Aug. 2003; 102 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-98-1-8234

Report No.(s): AD-A421257; No Copyright; Avail: CASI; A06, Hardcopy

The objectives of this study, 'Development of a computer Decision Support System for Women with BRCA1 or BRCA2 Mutations' was to create a decision support system that provided individualized information about the expected benefits of alternative cancer risk reduction strategies for women with either a BRCA1 or BRCA2 mutation. The project was comprised of three phases: 1) development of the education booklet, 2) development of the Decision Support System (DSS), and 3) randomized controlled trial of the DSS. The primary outcome of the trial was decision satisfaction. Secondary outcomes included knowledge of the effects of alternative management options on cancer risk, anxiety and depression, and behavior and behavioral intentions. Women who were in the Decision Support System arm reported higher satisfaction with their decisions than did women in the control arm (mean Decision Satisfaction Score 31.2 vs. 26.2, p=O.O4). In addition, higher decision satisfaction at follow up was associated with cancer anxiety at baseline and having had breast cancer or a prophylactic mastectomy prior to enrollment. The results of this trial are currently being submitted for publication. In addition, we are currently developing a methodological review highlighting the ouestions raised by this trial and similar trials.

DTIC

Cancer; Computer Techniques; Decision Support Systems; Females; Genes; Mammary Glands; Mutations

20040055483 University of South Florida, Tampa, FL

Advanced Cancer Detection Center

Krischer, Jeffrey P.; Oct. 2003; 104 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8659

Report No.(s): AD-A421259; No Copyright; Avail: CASI; A06, Hardcopy

The goals of the Advanced Cancer Detection Center include the discovery of molecular and genetic markers of cancer risk, the identification of individuals at high risk for cancer through screening and the testing of methods to prevent cancer. The projects included in this report are: * Markers of Transformation in Airways Epithelial Cells from a Cohort of Obstructed Smokers and Former Smokers (PT: Tockman) * Development of the Moffitt Cancer Network (PT: Krischer) * The Tampa Bay Ovarian Cancer Study (PT: Sutphen) Each of these projects is presented as a complete study in the attached materials.

DTIC

Cancer

20040055484 Columbia Univ., New York, NY
Program Project on the Pathogenesis and Treatment of Parkinson's Disease
Przedborski, Serge E.; Dec. 2003; 69 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0002
Report No.(s): AD-A421260; No Copyright; Avail: CASI; A04, Hardcopy

MPTP (l-methyl-4-phenyl-,2, 3, 6- tetrahydropyridine is the tool of choice for investigations into the cascade of events that lead to arkinson's Disease (PD). Herein, we investigated the role of inflammation in PD using the MPTP mouse model of PD. We found that APTP causes a robust microglial activation which is accompanied by the up- regulation of inducible nitric oxide synthase (INOS) and fcell surface markers such as macrophage activating complex-I (MAC- i) as well as the production of cytotoxic molecules such as eactive oxygen species (ROS) nitric oxide (NO) and a host of proinflammatory cytokines like interleukin-1$, cyclooxygenase- 2 and he prostaglandin PG%. We also noted that NADPH oxidase, a multimeric enzyme that is a major source of the superoxide radical, is p-regulated in ventral midbrains of MPTh-treated mice and in tissues from PD brains. Although both the COX-2 enzyme and PGE2 ere also up-regulated in MPTP-treated mouse ventral midbrains, only COX-2 was up-regulated in PD brains. Minocycline, a etracycline antibiotic that has anti- inflammatory action independent of its antimicrobial action, attenuated most of the microglial-elated events caused by MPTP. Thus, inflammation may push the progressive nature of PD through microglial activation and may be ideal point for therapeutic intervention in PD.
DTIC
Diseases; Pathogenesis

20040055485 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Evaluating Breast Self-Examinations in a Military Beneficiary Population
Pablo, Kolet R.; May 1999; 75 pp.; In English
Report No.(s): AD-A421261; No Copyright; Avail: CASI; A04, Hardcopy

Despite the recommendations of the American Cancer Society for all women 20 years and older to perform monthly breast self-examinations (BSE), studies have shown that only 30% of females perform BSE. With over two million female military beneficiaries, the importance of assuring BSE is an essential secondary preventive health care practice to ensure a healthy force and a healthy military family. This study was a nonexperimental, descriptive study using Ajzen and Fishbein s Theory of Reasoned Action as the theoretical framework to describe the characteristics associated with BSE performance. Using a non-random, voluntary, convenience sample of female military beneficiaries 20 years and older in a regional U.S. Army healthcare system located in the northeastern USA, 110 participants completed the 24-question Breast Self- Examination Questionnaire. Results revealed a high rate of BSE performance and intention to perform BSE. Motivators to perform BSE were early detection, healthy/right thing to do, and personal risk/family history. Most of the women felt that there were no barriers regarding BSE, but a few women noted forgetfulness and lack of time as a barrier. The most significant negative attitude of BSE was the unacceptability that BSE involves thinking about breast cancer. Ninety percent of the women agreed that their healthcare provider and the media recommend BSE performance, and they had the greatest motivation to comply with their healthcare provider's recommendation. The results of this study indicate the need for healthcare providers to recommend BSE to their patients and to explore those variables that influence BSE performance.
DTIC
Cancer; Mammary Glands; Physical Examinations; Populations

20040055486 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Experience of Military Nurse Practitioners During their First Year of Practice
Bosch, Julie M.; May 2000; 85 pp.; In English
Report No.(s): AD-A421262; No Copyright; Avail: CASI; A05, Hardcopy

The lived experience of military nurse practitioners during their first year of clinical experience was explored using a phenomenological approach. The purpose of the study was to explore and describe the experience of the military nurse practitioner during the first year of practice. Purposive sampling of 6 military advanced practice nurses (APNs) was used. Data was generated using open-ended core questions and in-depth face-to-face interviews. Data analysis incorporated the qualitative methods of Marshall and Rossman and Scannel-Desch. Seven theme categories and fifteen theme clusters emerged from the data collected. The theme categories were: nurse practitioner role issues, it s more than they bargained for, control issues, stress and challenges, preceptor stories, patients and practice, and looking toward the future. The data was related to Van Manen s four existential themes. This study is significant to military nursing because very few studies focused on the experience of military nurse practitioners. In addition, transitions have been identified as one of the key concepts central to

the discipline of nursing.Recommendations for further study include examining the specific role of the Family Nurse Practitioner, studying the NP role from a physician's perspective, and including Navy NPs in future studies.
DTIC
Medical Personnel; Personnel

20040055487 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Health Beliefs of Active Duty Army Women: Barriers to Well Woman Examinations
Herberger, Kathleen M.; May 2000; 92 pp.; In English
Report No.(s): AD-A421263; No Copyright; Avail: CASI; A05, Hardcopy

The diagnosis of breast or cervical cancer will be given to over two million women in the USA during the 1990s. Recommendations for clinical breast examination and Papanicolaou (Pap) smear as a preventive health examination are advocated by the American Academy of Family Physicians (AAFP), the American Cancer Society (ACS) and the American College of Obstetricians and Gynecologists (ACOG). Army Regulation outlines annual examination requirements for active duty Army women. The Barriers construct of the Health Belief Model (HBM) was used as the conceptual framework to guide this study. A descriptive study design was used to identify compliance, perceived barriers, and intent to seek well woman examinations. Questionnaires were distributed to 65 active duty Army women using a convenience sample from Army units located in the northeast USA. A Barriers Scale devised by Melynk was modified and four subscales were assessed: provider/consumer relationship, site related, fear, and inconvenience. The combined subscales were also evaluated. A Likert Scale was used to assess barriers to seeking well woman examinations and ratings on the Likert scale were none, slight, moderate, and great regarding barriers. While all women did not report having a clinical breast examination and Pap smear in the past 12 months, 71 and 77% respectively complied. The modified Barriers Scale revealed that only the provider/consumer relationship subscale was a barrier to seeking well woman care, and this was particularly noted by items regarding continuity of care and the ability to pick a good provider. Other constructs of the HBM need to be studied to determine if they affect compliance.
DTIC
Health; Personnel; Physical Examinations

20040055488 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Hostility and Anger in Women with Suspected Coronary Artery Disease: The Women's Ischemia Syndrome Evaluation (WISE) Study
Kao, Carolyn P.; Jan. 2003; 70 pp.; In English
Report No.(s): AD-A421264; No Copyright; Avail: CASI; A04, Hardcopy

This study reports analyses from the Women s Ischemia Syndrome Evaluation (WISE) Study to determine whether women with angiographic coronary artery disease (CAD) have elevated hostility and anger (e.g., in comparison to women without angiographic CAD). Logistic regression analysis revealed that of the anger and hostility measures, only Anger Out was a significant independent predictor of angiographic presence of CAD, with an OR of 1.08 (CI: 1.00-1.16) after controlling for significant risk factors. Hostility and anger scores were strongly related to baseline symptoms, with women who reported > 10 symptoms in their symptom history having significantly higher scores on all six measures of anger and hostility than women who reported <10 symptoms. These findings suggest that the outward expression of anger and hostility may be a CAD risk factor for women with suspected disease, and that higher levels of anger and hostility traits characterize highly symptomatic women.
DTIC
Arteries; Coronary Circulation; Females; Heart; Heart Diseases; Ischemia; Signs and Symptoms

20040055489 Army Southeastern Regional Medical Command, Fort Gordon, GA
An Assessment of the Southeast Regional Medical Command as a Strategy Focused Organization
Swofford, Mark D.; Jul. 27, 2003; 110 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421265; AMDCS-4B-03; No Copyright; Avail: CASI; A06, Hardcopy

In 2001 the USA Army Medical Department (AMEDD) adopted the Balanced Scorecard (BSC) as the central component of its strategic management system. Subordinate regional medical commands were directed to develop supporting scorecards (Peake, 2001). The SERMC accomplished this task in late 2001 and has since worked to incorporate the scorecard into their daily business. The purpose of this study was to perform an analysis of SERMC s efforts to use the BSC to become a Strategy-Focused Organization (SFO). A survey based on the five principles of a SFO (Kaplan & Norton, 2001) was used to

gather feedback from employees throughout the region. It was hypothesized that various demographic groups within the region are underserved by current BSC implementation efforts. An analysis of 749 responses supported this hypothesis, revealing significant differences ($p < .05$) in six demographic categories (Organization of Assignment, Rank, Duty Status, Professional Discipline, Organizational Level, and Tenure). A significant relationship ($p < .001$) was also found between a respondent s knowledge of the BSC and their belief that their organization was strategically focused. These results were used to make recommendations to refine and improve current BSC implementation practices within the SERMC.
DTIC
Medical Science; Personnel Management

20040055490 Brooke Army Medical Center, Fort Sam Houston, TX
MEDBASE: Strategic Planning and Implementation of an Army Medical Department Software Application
Kim, Forest S.; Jul. 17, 2003; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421269; AMDCS-3-03; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this research is to provide recommendations for the strategy and implementation of MEDBASE an Army Medical Department (AMEDD) software application. MEDBASE began as an Army physician assistant s pet project used to ease medical readiness reporting for field medical units. The program has quickly grown into a multi-functional medical database with applications for both medical treatment facilities as well as field medical units operating in garrison or in theater. Though the application possesses a great deal of potential, program implementation has been rocky. To assist program management with problems with implementation and planning, a strategic plan was created along with the following products: SWOT (strengths, weaknesses, opportunities, and threats) analysis, vision statement, strategy map, and balanced scorecard. Securing a spot in the AMEDD s overall information system architecture was identified as the most critical issue that the team must address within the next 12-18 months. In addition, the paper suggests the use of a showcase clinic as a proof of concept in order to more effectively develop, test and market the application.
DTIC
Computer Programs; Computer Techniques; Management Planning

20040055491 Army Medical Center, Fort Gordon, GA
Dwight D. Eisenhower Army Medical Center (DDEAMC) Staff Preferences: Electronic Journals versus Print Journals
Love, William R.; Apr. 2003; 80 pp.; In English
Report No.(s): AD-A421272; AMDCS-4A-03; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this research was to evaluate Dwight D. Eisenhower Army Medical Center (DDEAMC) staff preferences with regards to print and electronic journals. Based on a review of the literature concerning the electronic journal revolution occurring in the academic/scientific arena, it was hypothesized that a person s age, computer skill level and job position may influence a person s journal preference. A random sample of $n = 235$ staff/students was obtained from the DDEAMC population using a self-administered survey concerning journal format preference. Phi correlation and Chi square tests were used to test the independent variables age, computer skills, and job position with the dependent variable, journal preference. The test yielded statistically significant results supporting all three hypotheses. The results of this research may be utilized by the Health Sciences Library to assist in the development of a strategic plan to facilitate a migration from print journals to electronic journals in the near future. In doing so, the Health Sciences Library will ensure the best possible support to its customers which will ultimately have a positive impact on patient care.
DTIC
Medical Services; Tasks

20040055492 Brooke Army Medical Center, Fort Sam Houston, TX
The Rising Cost of Civilian Trauma Care at Brooke Army Medical Center: Strategies and Solutions
Rheney, Chris; Jun. 2003; 52 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421273; AMDCS-3-03; No Copyright; Avail: CASI; A04, Hardcopy

This study examines the crisis involving the rising cost of providing trauma care to civilians at Brooke Army Medical Center. The paper specifically addresses the partnership and policy strategies BAMC has employed in an attempt to mitigate the increasing costs and still justify the existence of the trauma program. BAMC has pursued partnership agreements with University Health System as a means of compensation for unreimbursed trauma care provided to Bexar County residents. Four proposed agreements are quantitatively and qualitatively evaluated as viable methods of compensation. Although all four proposals indicate significant cost savings, the negative qualitative effects of entering into the agreements preclude

implementation. This study then looks at the historical success of BAMC s influence on the policy development process and examines current and proposed efforts to sustain the trauma program and find funding. Finally, both partnerships and policy development are evaluated in terms of recommendations for future strategy supporting the BAMC trauma program.
DTIC
Costs; Medical Services

20040055493 Womack Army Medical Center, Fort Bragg, NC
A Case Study of Womack Army Medical Center's Initiative to Compete With the Civilian Sector for Obstetric Patient Market Share
Shields, Jeffrey D.; Apr. 2003; 55 pp.; In English
Report No.(s): AD-A421275; AMDCS-02-03; No Copyright; Avail: CASI; A04, Hardcopy

The National Defense Authorization Act for fiscal year 2002 eliminated the requirement for a TRICARE Standard patient to obtain a nonavailability statement to receive maternity care outside the military treatment facility (MTF). In effect, then, this law gives maternity patients the right to choose to receive their obstetrical care anywhere they choose, whether it be from a military or a civilian healthcare provider. The TRICARE Management Activity will pay the claims if the patient chooses a civilian provider, and the workload will be lost to the MTF. A private consulting firm studied the potential impact, and found that up to 50% of future OB patients might abandon Womack Army Medical Center (WAMC) (KPMG Consulting Site Visit Report, 2002). In order to counteract the enormous impact this would have on the MTF, WAMC initiated a project to upgrade and enhance its OB services so that it could directly compete with civilian providers to retain these patients. Currently the OB initiative is underway with a price tag of over $4 million. Major product lines or services that WAMC is improving include the addition of ultrasound machines, and ensuring continuity of care with a single provider throughout the patient s pregnancy.
DTIC
Health; Medical Services; Patients; Pregnancy

20040055494 Rochester Univ., NY
Development and Application of Single Chain Antibodies for PD Therapy
Federoff, Howard J.; Dec. 2003; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0009
Report No.(s): AD-A421276; No Copyright; Avail: CASI; A02, Hardcopy

In PD the insult to the dopamine (DA) neuron is posited to involve oxidative injury mediated by mitochondrial respiratory abnormalities and through participation of oxidative adducts made onto DA and presynaptic target proteins such as a-synuclein. The misfolding of a-synuclein engendered by oxidative adduct formation is hypothesized to be a critical participating process in Lewy Body formation and dopamine neuron compromise and death. Our central hypothesis purports that protein aggregates forming within dopaminergic neurons are seeded and require misfolded a-synuclein and that these aggregates are cytotoxic thereby contributing directly to neuron death. Thus targeting a-synuclein protein misfolding will enable the development of effective therapy. The main goal of this application is to identify and characterize humanized single chain antibodies (scFvs) that recognize structural epitopes on a-synuclein misfolding. Thus far, we have expressed and purified wildtype and a-synuclein; generated altered conformers of these proteins; screened for and identified synuclein-specific scFvs. Finally, we have begun the characterization of these synuclein-specific scFvs.
DTIC
Antibodies; Diseases; Dopamine; Therapy

20040055495 Systems Assessment and Research, Inc., Lanham, MD
The Prospective Army Coronary Calcium (PAAC) Study
Taylor, Allen J.; Sep. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-98-C-8048
Report No.(s): AD-A421277; No Copyright; Avail: CASI; A02, Hardcopy

Electron beam computed tomography (EBCT) is a noninvasive x-ray test like a CAT scan that detects calcium in the arteries of the heart. When calcium deposits are present, they indicate that some build-up of arterial blockages has begun in the arteries. The available evidence on EBCT shows that patients with calcium deposits are more likely to develop heart problems, such as heart attacks. There is controversy, however, because it is not clear whether EBCT is more accurate than traditional risk factor measurements for predicting who is most likely to develop heart disease. Some of the controversy has arisen because EBCT is expensive (about $500 per test). The test is also very sensitive, possibly too sensitive, meaning that

many patients will have arterial abnormalities, but only some will ultimately experience problems with heart disease. Because of its promise and uncertainties, the Army needs to understand whether EBCT is a better way to screen our personnel than our current methods. This study, which will enroll 2000 active duty Army personnel (men and women) between the ages of 40 and 45, will answer 3 important questions about the utility of EBCT as a screening test in our active-duty troops: 1. How common is coronary calcium in aged 40 to 45 year old active duty Army personnel? How does the expense and accuracy of an EBCT screening program compare to our current program of risk factor measurements? 2. Does finding coronary calcium on an EBCT provide patients with better information to help guide them to healthier and happier lifestyles compared to our current measurements, like cholesterol? Are patients more motivated to eat right and exercise, for example, when they know they have early arterial blockages? 3. Can we predict who will develop heart disease in the future better using an EBCT scan or a cholesterol measurement? Better predictions about heart disease risk will allow us to more accurately prescribe risk-reducing

DTIC

Calcium; Cardiovascular System; Computer Aided Tomography; Heart; Heart Diseases; Personnel

20040055496 Stanford Univ., Stanford, CA

Energy-and Intensity-Modulated Electron Beam for Breast Cancer Treatment

Boyer, Arthur L.; Oct. 2003; 349 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8156

Report No.(s): AD-A421278; No Copyright; Avail: CASI; A15, Hardcopy

In order to deliver MERT plans efficiently, we have designed and manufactured a prototype EMLC based on the results of Monte Carlo simulations and a Varian 25 x 25 Cm to the 2 electron applicator. The performance of the EMLC was experimentally evaluated and the results were compared with those of Monte Carlo simulations and a PMLC. We have also developed a complete system of Monte Carlo-based inverse treatment planning system for MERT plans. The system incorporates the Monte Carlo simulated electron pencil beams into the inverse planning process. Additionally, we have characterized the EMLC using a multiple-source beam model for fast Monte Carlo simulation, incorporated the EMLC into the EGS/BEAM simulations as an MLC component module, and created MERT plans for breast cancers. We have also studied the effect of beam delivery on optimized modulated electron radiation therapy plans in the final dose calculation. Furthermore, we have developed aperture-based MERT techniques for fast delivery of MERT plans. We believe that MERT provides a viable alternative modality to conventional Opposed tangential fields approach and photon IMRT.

DTIC

Cancer; Electron Beams; Mammary Glands; Monte Carlo Method

20040055497 Duke Univ., Durham, NC

Gene Regulation by Retinoid Receptors in Human Mammary Epithelial Cells

Seewaldt, Victoria L.; Oct. 2003; 116 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8351

Report No.(s): AD-A421279; No Copyright; Avail: CASI; A06, Hardcopy

Based on Preliminary Data, we hypothesized that loss of retinoic acid receptor function might promote dysregulated growth and loss of epithelial polarity. We now report that retinoids and the retinoic acid receptor-beta are important regulators of proliferation and polarity normal mammary epithelial cells through modulation of 1) the CREB- binding protein, CBP and 2) laminin 5 expression. As proposed in Objective lA, and described in the BODY of this report, we have been successful in identifying a retinoid-regulated gene, the CREB-binding protein, CBP whose function is important in mammary epithelial cell growth regulation and polarity. CBP is a known critical regulator of retinoid-signaling, however, the role of CBP in regulating growth and epithelial cell polarity has been previously unknown. As proposed in Objective 1B, we have suppressed CBP function in mammary epithelial cells and demonstrated that suppression of CBP function results in loss of growth regulation and polarity. We also provide evidence that CBP functions in a positive feed-back loop with retinoids and the retinoic acid receptor-beta 2. In the final year of this grant we have shown that CBP regulates polarity and growth through modulation of laminin-5 expression. These findings provide important insight into how retinoid and retinoic acid receptors may act to regulate normal mammary epithelial cell growth and polarity. These findings also can be rapidly translatated to provide 1) biomarkers for breast cancer risk and 2) response to chemoprevention.

DTIC

Cancer; Epithelium; Gene Expression; Mammary Glands; Receptors (Physiology)

20040055498 Walter Reed Army Medical Center, Washington, DC

Implementation and Evaluation of a Web-Based Automated Mental Health Intake System

Chun, Ryo S.; Dec. 2002; 26 pp.; In English

Contract(s)/Grant(s): MIPR-1DCB7W1056

Report No.(s): AD-A421280; No Copyright; Avail: CASI; A03, Hardcopy

The Child and Adolescent Psychiatry Service (CAPS) at the Walter Reed Army Medical Center (WRAMC) provides in-clinic consultation and telepsychiatry services for the North Atlantic Regional Medical Command. To facilitate the enrollment of new patients, the Department of Telemedicine and CAPS developed a secure Web-based Automated Mental Health Intake System (WAMHIS) to replace the traditional paper-based intake system. Parents/guardians were able to complete intake forms online days before the initial appointment in their home or at work allowing providers to access and review the completed forms well in advance of the appointment to prepare for the interview.

DTIC

Intake Systems; Internets; Medical Services; Mental Health; Telemedicine

20040055499 Madigan Army Medical Center, Takoma, WA

Electronic Behavioral Health 'Health-E'

Gahm, Gregory A.; Dec. 2002; 14 pp.; In English

Contract(s)/Grant(s): MIPR-IDCB8K1070

Report No.(s): AD-A421281; No Copyright; Avail: CASI; A03, Hardcopy

How much is access to care improved when patients are offered an internet delivered Behavioral Health Clinic? Can quality be measurably improved at the same time? Does this service cost less, particularly once it has been developed? How much can behavioral health care, enabled to reach across the home and work environment extend access to care and improve treatment quality? These are all questions this project will address. Access to health care, to include behavioral health care, is a challenge faced by all military medical treatment facilities (MTFs). Patient demand and our Tricare contracts guarantee access to care. Meeting this demand is the challenge faced by our system. For behavioral health, unlike other types of health care, patients (other than active duty) do not have to seek their care first at the MTF. Patients regardless of geographic location are free to choose the provider and healthcare system they feel best meets their needs. Convincing these patients to want to choose our system is the challenge we face and a goal of our organization. The 'Health-E Clinic' web enabled behavioral health clinic provides patients access to behavioral health services 24 hours a day, 7 days a week. This e-clinic modifies clinical business processes to offer services on-line. Integration with clinical pathways is inherent in this design as patients interfacing with this system are led through decision pathways consistent with established MHS and local practice guidelines. Continuity of care is ensured with providers now able to provide follow-up care regardless of patient geographic location. The clinic design provides for maximal integration of daily practice in garrison with that on deployment.

DTIC

Clinical Medicine; Health; Medical Services

20040055500 Army Medical Dept. Activity Panama APO, Miami, FL

A Study of the Relative Value Unit as a Practice Management Tool for Provider Productivity

St. Andrews, John; Apr. 11, 2003; 31 pp.; In English

Report No.(s): AD-A421282; AMDCS-40-3; No Copyright; Avail: CASI; A03, Hardcopy

The Military Health System (MHS) currently uses work relative value units (RVU) to measure productivity of its providers. This nationally standardized scale is used by Medicare and many other third party payers and is a common source for work RVUs. The work RVU is intended to reflect the time to perform a service, technical skill and mental effort of a provider. This productivity measure is included in the Defense Health Program s (DHP) performance plan between the Deputy Secretary of Defense and the Assistant Secretary of Defense, Health Affairs (ASD(HA)) along with the Army, Navy and Air Force Assistant Secretaries for Manpower and Reserve Affairs. It is one of many measures that articulate the expectations for the performance of DHP. This study was intended to explain how the RVU is calculated, and how it is used as a tool for evaluating provider productivity. The MHS calculates provider productivity per day by individual medical treatment facility (MTF). This study calculated productivity by individual provider for the entire Heidelberg Medical Activity (MEDDAC). This process uncovered data quality issues and allowed providers to evaluate their own performance. Additionally, this study revealed that though this measure is reliable, its validity is very dependent on coding accuracy and availability accuracy. It also revealed that a true benchmark of productivity should not be established until the administration processes are in place and streamlined to lessen the burden on the providers.

DTIC

Medical Science; Medical Services; Military Operations; Planning; Productivity

20040055501 Landstuhl Regional Medical Center, Landstuhl
LRMC Remote Nerve Fiber Laser Analysis and Teleophthalmology Project
Hess, Todd D.; Allen, Christopher S.; Dec. 2002; 15 pp.; In English
Contract(s)/Grant(s): MIPR-1DCB8D1065
Report No.(s): AD-A421284; No Copyright; Avail: CASI; A03, Hardcopy

Major Christopher S. Allen, Lieutenant Colonel Todd D. Hess, Major Jim H. Burden, Lieutenant Colonel Richard H. Birdsong, Department of Ophthalmology, Landstuhl Regional Medical Center, Germany Objective: To test the efficacy and efficiency of transmitting digital nerve fiber layer analysis (Gdx) results via e-mail for teleconsultation.
DTIC
Diagnosis; Fiber Lasers; Lasers; Medical Services; Nerves; Ophthalmology

20040055504 MacCallum (Peter) Cancer Inst., Melbourne
Molecular Epidemiology of Ovarian Cancer
Bowtell, David; Sep. 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0729
Report No.(s): AD-A421287; No Copyright; Avail: CASI; A03, Hardcopy

The aim of this Program is to study the association between epidemiologic risk factors, low-risk genes, and histologic and novel molecular subtypes of ovarian cancer. In December 2002, we received final approval from the Human Subject Research Review Board (HSRRB) to start recruitment at 13 of the proposed study sites. We have established a network of research nurses across the country and recruitment is now progressing well at 12 different sites. Recruitment of cases for the study began in January 2003 and control recruitment began in May 2003 and we have since recruited a total of 283 - women with ovarian cancer and 155 control women. The recruitment, sample and data collection and processing systems are working well and we are continuously monitoring our performance against our targets as outlined in the reports from Core Components A (epidemiology) and B (Biospecimens). In relation to this we also have established systems to manage data and samples from all of the different sites.
DTIC
Cancer; Epidemiology; Ovaries

20040055505 Walter Reed Army Medical Center, Washington, DC
Augmentation of Acute Stroke Management Via Telemedicine
Choi, John Y.; Urban, Edward; Dec. 2002; 13 pp.; In English
Contract(s)/Grant(s): MIPR-IDCB851059
Report No.(s): AD-A421288; No Copyright; Avail: CASI; A03, Hardcopy

Stroke is the leading cause of disability and the third leading cause of death in the USA. Urgent stroke management is constrained by a narrow, 3 hour therapeutic window for treatment with intravenous recombinant tissue plasminogen activator (IV rt-PA), the 'brain saving' drug. Using IV rt-PA requires rapid diagnosis and an organized approach to acute stroke care. Emergency room (ER) healthcare providers inexperienced with using IV rt-PA have been reluctant to initiate this treatment, due to known brain bleeding side effects. Misdiagnosing a non-cerebrovascular condition as a stroke is a subsequent concern. Past studies indicated that many ER physicians do not accurately interpret brain computed tomography studies (CTs). Sufficient interpretation of brain CTs is crucial to ruling out brain hemorrhage and cerebral infarctions not amenable to thrombolytic therapy. Telemedicine technology can provide immediate, remote stroke assessment and treatment by experts. Rural areas in the USA and the US military medical system would benefit from remote expert telemedicine consultants. The ability to better triage patients will not only improve stroke care but will also reduce cost by this drug benefit. The cost of treating stroke in the USA was $40.9 billion in 1997.
DTIC
Augmentation; Brain; Cerebrum; Diagnosis; Medical Services; Military Operations; Telemedicine

20040055506 Walter Reed Army Medical Center, Washington, DC
Using Telemedicine and Wireless Technology to Improve Diabetic Outcomes in Poorly Controlled Patients
Vigersky, Robert A.; Dec. 2002; 18 pp.; In English
Contract(s)/Grant(s): MIPR-1DCB7T1055
Report No.(s): AD-A421289; No Copyright; Avail: CASI; A03, Hardcopy

Diabetes mellitus is a condition that lends itself to the use of telemedicine and technology because its management relies

heavily on the collection, sharing, and interpretation of blood glucose data by the patient and healthcare provider. We studied whether or not we could improve the blood sugars of poorly controlled diabetics (A1 C> 8.0%) by giving them one of three technologies to communicate their blood sugar results from home to their provider. Poorly controlled type 1 and 2 diabetic patients were prospectively randomized to 'routine care' (n=67) or 'technology' (n=104). Patients in the latter group were further randomized to one of three technologies - modem (n=37) , WebTV (n=22), internet accessible computer (n=45) - which connected their glucose meter to their provider via a secure password-protected web site maintained by Healths entry. Patients in the WebTV and computer groups could review their own data on the web site, whereas those using the modem could not. 'Routine care' patients were seen by their provider as needed but no less than every 3 months and treated according to clinical practice guidelines. The patients in the 'technology' group were similarly seen but were also instructed to download their blood glucose values weekly by the assigned technology. The HealthSentry software accepts downloads from any brand of glucose meter which it then analyzes and displays in tabular and graphic formats. Treatment recommendations were then made based on the data. Data for the first 92 patients have been analyzed (45 'routine care' and 47 'technology'). Since there were no difference among the 3 'technology' groups, their results have been grouped together. Furthermore, patients were equally matched in each group with respect to demographics and pre-study glycemic control.
DTIC
Clinical Medicine; Computer Programs; Internets; Metabolic Diseases; Patients; Telemedicine

20040055508 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Epidural Analgesia in the Postoperative Period
Mathsen, Curtis E.; Smith, Robert C.; Oct. 2001; 73 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421291; No Copyright; Avail: CASI; A04, Hardcopy

Postoperative pain is an unwanted side effect of surgery, and is associated with many postoperative complications. This descriptive study was conducted to determine which surgical patients experienced the most analgesia with the fewest side effects when receiving epidural analgesia in the postoperative period. A retrospective chart audit of 200 surgical patients who received epidural medications for pain management was conducted. The sample was obtained from a 90-bed hospital. A description of the patients age, gender, type of surgery, type of epidural medication, side effects, incidence of breakthrough pain, and treatments were recorded and cross-tabulated. The following surgical categories emerged: abdominal, orthopedic, thoracic, and lower extremity/vascular. Breakthrough pain was reported in 27% of the cases. Lower extremity/vascular surgery patients had the lowest incidence of side effects. Thoracic surgery patients had the highest incidence of breakthrough pain, and abdominal surgery had the highest incidence of nausea/vomiting, pruritis, and respiratory depression. Morphine and bupivacaine provided the best analgesia, but had the highest incidence of side effects.
DTIC
Analgesia; Anesthetics; Morphine; Nausea

20040055509 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Induction and Characterization of Immune Responses in Small Animals Using a Venezuelan Equine Encephalitis Virus (VEE) Replicon System, Expressing Human Immunodeficiency Virus Type 1 (HIV-1) Envelope Genes
DeVol, Jennifer M.; Jan. 2003; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421292; No Copyright; Avail: CASI; A05, Hardcopy

Human immunodeficiency virus type 1 (HIV-1) is the lentivirus responsible for the Acquired Immunodeficiency Syndrome (AIDS) pandemic. Currently, no approved vaccine exists to combat this global human health threat. One approach is to develop a vaccine that induces neutralizing antibodies. To date, the most promising platforms used for induction of neutralizing antibodies against HIV-1 is the Venezuelan equine encephalitis virus (VEE) replicon system. The studies detailed herein have characterized certain aspects of the immune responses induced by the in vivo VEE expression system. Following HIV-1 Env-encoding replicon preparation and immunization of mice, the analysis of those immune responses were carried out using enzyme immunoassays (EIAs) and virus neutralization assays. The data revealed significant anti-HIV- 1 Env antibody induction, with intra-clade and to a lesser extent inter-clade neutralizing antibody reactivity. The data obtained from these studies will contribute to the goal of inducing broadly cross-reactive neutralizing antibodies and aid in the development of an effective vaccine for HIV-1.
DTIC
Animals; Antibodies; Encephalitis; Genes; Human Immunodeficiency Virus; Immunity; Physiological Responses; Signs and Symptoms; Viruses

20040055512 Catholic Univ. of America, Washington, DC

Tactile Mapping of Breast Palpation for Diagnosis, Documentation and Training

Srikanchana, Rujirutana A.; Sep. 2003; 33 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0195

Report No.(s): AD-A421296; No Copyright; Avail: CASI; A03, Hardcopy

Effective computational tools are developed for improved detection, diagnosis, and monitoring of breast cancer. A tactile mapping device (TMD) is tested for the early detection of breast cancer through more objective and quantitative breast palpation. Following the detection of breast cancer, diagnosis of the breast is the next step. We introduce a hybrid source decomposition algorithm, which allows for a computational characterization of tumor microvascular heterogeneity in both spatial and temporal domains. The goal is to reveal temporal-spatial patterns for the visualization and quantification of tumor-induced angiogenesis and response to therapy using dynamic contrast- enhanced magnetic resonance imaging (DCE-MRI). An image-based change detection approach is proposed to assess tumor's response to therapy. Based on promising experimental results, we anticipate that functional imaging based computational characterization of tumor heterogeneity and response will be useful in a wide variety of medical imaging studies.

DTIC

Cancer; Diagnosis; Education; Mammary Glands

20040055513 Pittsburgh Univ., Pittsburgh, PA

Remote Patient Management in a Mammographic Screening Environment in Underserved Areas

Gur, David; Sep. 2003; 43 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0410

Report No.(s): AD-A421297; No Copyright; Avail: CASI; A03, Hardcopy

Early detection of breast cancer is of significant interest to our society. Mammographic screening is gradually moving toward a 'distributed acquisition -centralized review' approach. Unfortunately, a relatively high recall rate using this approach increases patient anxiety as well as the cost and complexity of the diagnostic process. The purpose of this project is to evaluate in a multi-phase project the possible impact of a unique telemammography system that utilizes common carriers with wavelet-based data compression for image transmission on the recall rate in remote locations where physicians are not available during mammographic procedures. The initial phase of the project encompasses the design, assembly, and technical testing of a multi-site telemammography system that enables the digitization, transmission, and display of wavelet compressed images as well as associated text documents of a case in less than 15 minutes. The impact of such a system with and without the incorporation of CAD results will be evaluated during a step- by-step assessment in a multi-site study.

DTIC

Cancer; Diagnosis; Mammary Glands; Patients

20040055514 Uniformed Services Univ. of the Health Sciences, Bethesda, MD

The Effectiveness of the Human Patient Simulator in Teaching Anesthesia Pharmacology to First Year Nurse Anesthesia Students

Hall, Annie L.; Dec. 2002; 83 pp.; In English

Report No.(s): AD-A421299; No Copyright; Avail: CASI; A05, Hardcopy

Traditionally, the principles and practices of anesthesia have been taught using seminars and lectures to supplement clinical training. There is no substitute for case- based experience; however, recent innovations in computer technology provide high fidelity, realistic simulators, which are being used in many anesthesia programs. Research using simulation technology analyzes its use as an evaluation tool in the assessment of competence and human performance; however, there is a need to better define the role for simulation- based programs in professional nurse anesthesia education. The purpose of this study was to evaluate the effectiveness of integrating the anesthesia patient simulator with the traditional lecture in nurse anesthesia education. The study measured the potential benefits of knowledge assimilation and retention using the human patient simulator (HPS) in an anesthesia pharmacology course compared to the traditional classroom approach. The sample group for this study consisted of GSN nurse anesthesia students enrolled at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. Outcome measures included the completion of a twenty item pre-test to measure each student s baseline knowledge prior to participating in a 1.5- hour pharmacology teaching session. Knowledge retention was measured by the results of each student s 20-item post examination scores. Comparison data of the pre and post-examination scores within each teaching group was analyzed using a paired t-test. An independent t-test was used to statistically analyze the absolute difference in learning between using Likert type items, and additional open-ended items, exploring student

expectations, course strengths and weaknesses, and recommendations for future courses. Knowledge equivalence was shown in the two groups, with baseline pretest scores showing no statistic
DTIC
Anesthesia; Education; Patients; Pharmacology; Simulators; Students

20040055518 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Hostility and Anger Expression: Behavioral and Cardiovascular Responses to Mental Stress Among Cardiovascular Disease Patients
Tucker, Dana L.; Jan. 2002; 211 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421306; No Copyright; Avail: CASI; A10, Hardcopy

Hostility and anger expression have been postulated as contributing factors to cardiovascular disease and have been associated with cardiovascular reactivity and stress-induced myocardial ischemia. The present research investigates relationships between hostility, anger expression, and defensiveness and cardiovascular measures of reactivity and ischemia. The study is an analysis of previously collected data from the Triggers of Myocardial Ischemia Study, in which participants underwent mental stress tasks (math, anger recall speech, and Stroop Color-Word) with concurrent assessments of cardiovascular reactivity and ischemia as well as brief emotional state assessments in the laboratory. Outside of the laboratory, a subset of these participants (n= 59) completed a set of questionnaires including the Marlowe-Crowne Scale of Social Desirability and the Cook-Medley Hostility Scale. Results indicated that higher Cook-Medley Hostility scores were positively correlated with anger expression changes following the math task (r=.308, p< .05), and Composite Hostility predicted anger expression changes to the same task (r=.334, p<.05). The Composite Hostility component Hostile Affect was a significant predictor of anger expression changes during all three tasks. Although hostility measures did not appear to be consistently predictive factors in stress-induced cardiovascular reactivity, changes in anger expression predicted systolic and diastolic blood pressure changes during the anger recall task, and marginally predicted heart rate changes to anger recall. Higher Total Hostility was marginally related to presence of ischemia during Anger Recall and Stroop tasks, but anger expression changes were not related to presence of ischemia.
DTIC
Cardiovascular System; Heart Diseases; Heart Function; Patients; Physiological Responses; Stress (Psychology)

20040055523 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
The Experiences of U.S. Army Primary Care Providers Meeting Sexual Health Care Needs During Post-Vietnam Deployments
Matthew, Richard; Weskamp, Dominic T.; Jan. 2002; 62 pp.; In English
Report No.(s): AD-A421312; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this study was to explore the experiences of U.S. Army primary care providers meeting sexual health care needs during post-Vietnam deployments and associated ethical issues providing care in an atmosphere that forbids sexual contact. As the Army has sought to add the role of advanced practice nurses to deployments, they will potentially find themselves faced with providing sexual health care in the field. A phenomenological approach was used in this study for the purpose of understanding, interpreting, and describing provider experiences during deployment. Purposeful sampling was used and dialogical engagements were conducted with six U.S. Army primary care providers who had served in post-Vietnam deployments. The Parse method was adapted to synthesize 21 core concepts and four structures that enabled the researchers to describe the experiences of the providers. The four structures are: provider experiences, soldier experiences, command experiences, and ethical experiences. Recommendations for further areas of research include rates of STI and pregnancy, feminine hygiene needs in the field, suppression of sexuality in the field, and ethical decision making among military providers.
DTIC
Deployment; Health; Medical Services; Personnel; Sex; Vietnam

20040055526 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Structural and Functional Studies on the Fusion and Attachment Envelope Glycoproteins of Nipah Virus and Hendra Virus
Bossart, Katharine N.; Jan. 2003; 193 pp.; In English
Report No.(s): AD-A421315; No Copyright; Avail: CASI; A09, Hardcopy

Nipah virus (NiV) and Hendra (HeV) virus are emerging, biosafety level 4 paramyxoviruses responsible for fatal zoonotic

infections of humans from pigs and horses, respectively, and are the prototypic members of a new Paramyxovirinae genus called Henipavirus. These enveloped, negative-sense RNA viruses infect cells through a pH- independent membrane fusion event mediated through the actions of their attachment (G) and fusion (F) envelope glycoproteins, which are also the principal antigens to which neutralizing antibodies are directed. Understanding the biological and functional features of the viral glycoproteins will help define the characteristics and properties of these novel viruses, and may provide insights into membrane fusion mechanisms, the virus infection process, and towards the development of therapeutics. Here, recombinant vaccinia virus vectors were generated to express the NiV and HeV glycoproteins. Glycoprotein functions and their cellular tropism characteristics were examined with a quantitative assay for membrane fusion. NiV and HeV glycoprotein-mediated fusion could be blocked by virus-specific antisera or synthetic peptides corresponding to the C-terminal alpha- helical heptad repeats of NiV or HeV F. Both F and G glycoproteins were required for membrane fusion and a broad species and cellular tropism pattern was observed for both HeV and NiV. Further, protease treatment of receptive host cells abolished viral glycoprotein-mediated fusion activity, suggesting a cell-surface protein serves as a receptor for these viruses. In addition, interactions between the glycoproteins of the paramyxoviruses have not been well defined, but studies reported here show the NiV and HeV glycoproteins are capable of a highly efficient heterotypic functional activity amongst themselves, but not with other related paramyxoviruses.
DTIC
Proteins; Viruses

20040055527 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
The Molecular Epidemiology of Malaria in Western Kenya
Amon, Joseph J.; Sep. 2002; 110 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421316; No Copyright; Avail: CASI; A06, Hardcopy

Malaria epidemiology reflects a complex web of inter-related factors: host, parasite, vector and environment. The nature, duration and severity of malaria infection depend upon these fixed and changing factors, and are complicated by varying levels of acquired immunity in individuals. The present research used molecular biology tools to examine three distinct topics related to malaria epidemiology: 1) the distribution of TNF-alpha;, IFN-gamma;, IL-6, TGF-Beta;, and IL-10 gene polymorphisms; 2) the rate and pattern of mixed Plasmodium species infections; and 3) Plasmodium falciparum growth dynamics. The first two research topics were examined in a cohort of 248 males recruited from three highly endemic villages in western Kenya where severe malaria anemia is common. The third topic was investigated among 22 volunteers during the post-challenge phase of a malaria vaccine trial sponsored by Walter Reed Army Institute of Research. Individuals in the Kenya cohort were found to have a marked bias toward genotypes associated with low expression of IFN- gamma; and IL-6, cytokines that, at high plasma levels, have been previously implicated in anemia and poor malaria outcomes. By contrast, the frequency of the TNF-alpha; 238A allele, which has been associated with severe malarial anemia, was found to be similar to frequencies reported in a number of diverse populations. Over the course of three malaria transmission seasons, non-falciparum malaria was consistently seen in a minority (5-10%) of volunteers, most commonly as a dual infection with P. falciparum. In contrast to previous reports of long-term stable parasite density among individuals with mixed species infections, in 80% of cases, multi-species infections were detected when individuals had their highest rate of parasite density.
DTIC
Epidemiology; Kenya; Parasitic Diseases

20040055529 North Dakota State Univ., Fargo, ND
TGF(Beta)1 Regulation of Matrix Metalloproteinase- 9 in Human Prostate Cancer Metastasis
Sehgal, Inder; Jun. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0038
Report No.(s): AD-A421319; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this project is to identify and test portions of the 3 prime untranslated region of the Matrix Metalloproteinase-9 mRNA responsible for TGFBETA-induced increases in mRNA stability. This is to be accomplished by generating constructs of the 3'UTR and comparing them with the entire MMP-9 coding sequence in transfection experiments. This past year I obtained a modified SOW, in which part of our second task was changed to allow us to use our MMP-9 3'UTR deletion constructs in vitro invasion assays and then measure MMP-9 expression and inhibition of invasion as end points. Western blot analyses and zymography using one cell line suggest a portion of the 3 UTR, when overexpressed, can reduce TGFBETA-simulation of MMP-9. Northern blots were being conducted. A serious problem has arisen with this research project. I have recently obtained a faculty position elsewhere. Upon learning of my departure, NDSU has given me only restricted access to my office and laboratory. Notebook and all reagents pertinent to this project have been seized. As I write

this report, I am not able to communicate with the student who worked on this project, nor have I been allowed access to her data, notebook or reagents.
DTIC
Cancer; Metastasis; Prostate Gland

20040055530 Robotic Surgical Tech, Inc., New York, NY
Robotic Replacement for Surgical Scrub Technician
Treat, Michael R.; Feb. 2004; 66 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-C-0083
Report No.(s): AD-A421320; No Copyright; Avail: CASI; A04, Hardcopy

The concept of reduction in logistical footprint can be applied not only to fighting forces but also to mobile surgical facilities that are co-deployed. At the beginning of this contract, we had completed preliminary work in constructing a prototype robotic surgical device that can perform, on a very limited basis, the essential job functions of the surgical scrub technician in the operating room. This machine could potentially reduce the personnel needed in the surgical facility. The work done under this contract was to improve the capabilities of the machine so that it comes closer to being able to replace a human scrub technician. The two specific goals in the statement of work were 1) to improve the robot's vision capabilities so that it can correctly recognize twelve instruments with 98% accuracy and 2) to make the robot 98% reliable in retrieving the instruments that it has recognized. We were entirely successful in meeting the first goal, and came close to meeting the second goal. Combined with additional work that was done concurrently, the contract work has the result that the robot's development has progressed such that we are on track for clinical deployment in the year of 2005.
DTIC
Medical Personnel; Replacing; Robotics; Robots; Surgery

20040055532 Northwestern Univ., Evanston, IL
Molecular Biology of Breast Neoplasia
Jordan, Virgil C.; Sep. 2003; 164 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0386
Report No.(s): AD-A421323; No Copyright; Avail: CASI; A08, Hardcopy

The Northwestern University Robert H. Lurie Comprehensive Cancer Center is an NCI-funded comprehensive cancer center. One of the major accomplishments for the Cancer Center has been to establish a nationally recognized program in both laboratory and clinical based breast cancer research. The Cancer Center has received $14.2 million from the Avon Foundation and successfully competed for a SPORE in Breast Cancer from the National Cancer Institute. In September 2000 the Cancer Center received a four year award from the US Army for comprehensive training of graduate students and postdoctoral fellows conducting breast cancer relevant research entitled, 'The Molecular Biology of Breast Neoplasia' (DAMDl7-00- 0386). In year 2003, the Selection Committee reviewed applications and assisted in the selection of 4 graduate students and two postdoctoral fellows for appointment to the Training Program. Trainees and mentors actively participated in the weekly meetings of the Breast Cancer Journal Club, as well as training program course entitled, Advanced Topics in Breast Cancer. Year 2004 appointments have just been completed.
DTIC
Cancer; Education; Mammary Glands; Molecular Biology; Neoplasms

20040055533 Battelle Columbus Labs., OH
Technical Functional Testing of Multi-Chamber Autoinjectors (MA)
Hayes, Tim; Bullen, Larry; Sep. 2000; 126 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-D-0010
Report No.(s): AD-A421326; BATT-G472506B; No Copyright; Avail: CASI; A07, Hardcopy

The Multi-Chambered Autoinjector (MA) is a single autoinjector containing two medicaments stored in separate chambers. The MA devices provided for this study contain only a saline solution. The device is cylindrical in shape and is approximately 18 centimeters in length (cm). The diameter is approximately 2.5 cm. The MA has a removable, gray safety cap on one end and a smaller, green cap on the needle injection end that is permanently affixed. The MA device is stored in a flexible package with notches on both ends for opening. In- field operation of the MA device is accomplished by: (1) removing the device from the protective package, (2) removing the gray safety cap, (3) placing the green end against the thigh, and (4) pushing hard until the device activates. The 299 MA devices tested in this study had been carried by soldiers through

routine training exercises as part of the Initial Operational Test and Evaluation (IOTE) for the MA devices. Battelle conducted technical testing of the devices to determine functionality and physical condition. The laboratory testing was performed using standards established by current Good Laboratory Practices and according to MREF Protocol 176 for Study Number G472506B. The tests included measuring four parameters: Dispensed Volume Saline (DV); Firing Force (FF); Time of Delivery (TD); Needle Length (NL). In addition to the four measurements, the condition of the protective package and of the MA was examined and recorded.
DTIC
Health; Medical Science

20040055536 Cornell Univ., Ithaca, NY
Characterization of the Hen as a Model for Human Ovarian Cancer
Johnson, Patricia A.; Sep. 2002; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0560
Report No.(s): AD-A421332; No Copyright; Avail: CASI; A03, Hardcopy

Investigation of basic factors involved in malignant transformation of the ovary has been hampered by the lack of an appropriate animal model. The overall hypothesis of this project is that the hen is an excellent model for human ovarian epithelial cell cancer. We will take a three-pronged approach in this project. First, we will compare differences in spontaneous incidence between two strains of hens as they age and examine for pathological ovarian changes that may indicate site of origin of the tumors. We have not yet compared the incidence of tumors in the two strains of hens because we were not able to obtain 2-year old hens at the start of the experiment. We have begun to histologically analyze the ovarian surface epithelium (OSE) as well as ovary proper for pre-tumor lesions. Our second approach was to evaluate possible differences between the strains in response to reproductive manipulations highly correlated to incidence in women. Because we did not have access to 2-year old hens at the initiation of the experiment, we have not yet begun experiments to manipulate the incidence of adenocarcinoma. These experiments will be initiated in the coming year. Our third approach was to examine potential differences in cell signaling that may underlie the different incidence between the strains. We have made the most progress on this task with respect to validating and characterizing our culture system for OSE cells. We have determined that significant quantities of hen OSE cells can be obtained and can be cultured in two commercially available types of media (CM) or (MCDB) for at least 10 days. The cultured OSE cells are positive for cytokeratin and negative for vimentin. In combination with Hoechst staining, these results indicate that the cultures are not contaminated with fibroblasts.
DTIC
Cancer; Diagnosis; Ovaries

20040055543 Naval Medical Research Inst., Corpus Christi, TX
Analysis of the Winter Texan Impact on the Naval Hospital Corpus Christi Health Care System
Brewster, Steven G.; Jan. 2004; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421342; AMDCS-32-03; No Copyright; Avail: CASI; A03, Hardcopy

The Naval Hospital Corpus Christi Health Care System (NHCCHCS) provides care for an enrolled beneficiary population of approximately 23,000. Additionally, NHCCHS provides care for locally-residing beneficiaries who request care on a space available basis. Naval Hospital Corpus Christi Health Care System also experiences seasonal changes in the demand for health care services because of inflows and outflows of beneficiaries throughout the year. The group known as Winter Texans is one of many groups of individuals that alter demand for services on a seasonal basis, yet the exact number of these individuals remains unknown. This project provides an estimate of the number of Winter Texans and determines their impact on resource utilization. The issues identified in this project suggest that the impact on the NHCCHCS is substantial, to the degree that it could potentially completely overwhelm the resources of the NHCCHCS or any other facility that serves seasonal beneficiaries. Under the revised financing scheme of the TRICARE Next Generation Contracts, capitated funding to medical treatment facilities (MTFs) may worsen this impact. Creating a dual enrollment category for TRICARE beneficiaries could mitigate this impact and preserve MTF solvency.
DTIC
Health; Hospitals; Medical Services; Winter

20040055544 University of South Florida, Tampa, FL
AKT2 Oncogene and Phosphoinositide 3-Kinase in Human Breast Cancer
Cheng, Jin Q.; Sep. 2003; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0394
Report No.(s): AD-A421343; No Copyright; Avail: CASI; A03, Hardcopy

We have previously shown frequent alterations of AKT2 and PI3K in human primary breast carcinomas. Recently, we have demonstrated that activation and overexpression of AKT2 contribute to chemoresistance by phosphorylation of apoptosis signal-regulating kinase 1 (ASK1) and mammalian sterile 20- like kinase 1 (MST1) resulting in inhibition of apoptosis. We have also demonstrated that geranylgeranyltransferase I inhibitors (GGTIs) inhibit AKT and surviving pathways to overcome AKT- induced chemoresistance. In addition, no significant phenotype has been observed in MMTV-AKT2 transgenic mice. DTIC

Cancer; Mammary Glands; Oncogenes; Proteins; Tumors

20040055545 Brooke Army Medical Center, Fort Sam Houston, TX

Remote Echocardiography: Proof of Concept for Support of National Disasters, Combat and Humanitarian Mission

Boyd, Sheri Y.; Huffer, Linda L.; Bauch, Terry D.; Furgerson, James L.; Dec. 2002; 15 pp.; In English

Contract(s)/Grant(s): MIPR 1DCB8F1067

Report No.(s): AD-A421344; No Copyright; Avail: CASI; A03, Hardcopy

Echocardiography is an essential tool in the evaluation of patients with cardiac emergencies and chest trauma. The objective of our study was to establish the feasibility and diagnostic accuracy of a portable satellite transmission system in the assessment of cardiac emergencies for the real-time support of rnass casualty and humanitarian relief efforts. Twelve patients with cardiac structural disease identified by conventional in-hospital transthoracic echocardiography (TTE) were transported to a remote portable field hospital where TTE was performed with a hand-held echocardiographic device. Images were then relayed by a commercial VSAT satellite to a level 3 trauma center where they were interpreted in real-time by a cardiologist. Remote VSAT studies were recorded at the field hospital prior to satellite transmission and again upon download at the receiving facility. The remotely acquired studies before and after satellite transmission were compared to each other and subsequently compared with conventional hospital TTE for technical quality and diagnostic accuracy using a blinded single reader side-by-side comparison. Excellent agreement was found between the recorded field-site and satellite- transmitted images with an overall average of 95% concordance. When the field data acquired with the handlield device and satellite transmission was compared to the conventional in- hospital echocardiography, a high degree of agreement was demonstrated in overall technical quality (83%) and assessments of left ventricular ejection fraction (100%), pericardial efflision (100%), and left ventricular size (92%). This study demonstrates the feasibility and diagnostic accuracy of remote, real-time echocardiography using VSAT satellite transmission for mass casualty triage or humanitarian relief efforts.
DTIC

Combat; Disasters; Echocardiography; Remote Control

20040055546 Medical Coll. of Wisconsin, Milwaukee, WI

Use of a Transgenic Mouse Model With a Regulatable Estrogen Receptor Alpha (ER) to Study the Role of ER in Mammary Gland Development and Cancer

Sugg, Sonia L.; Sep. 2003; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0199

Report No.(s): AD-A421345; No Copyright; Avail: CASI; A02, Hardcopy

Estrogen (E2) is required for the development of breast cancer, but there are few animal models to study its mechanism of action in vivo. We hypothesize that the timing of estrogen receptor a (ERalpha) action is crucial in normal mammary gland development and tumorigenesis. Therefore, a transgenic mouse model with a regulatable ERalpha is being generated. In vitro, a mutant ERalpha (525L) has a severely attenuated response to endogenous estradiol (E2) but a wild- type (WT) response to diethyistibestrol (DES) . Gene targeting was used to insert 525L into the WT ER gene. Positive clones were injected into mouse blastocysts and chimeras were generated. There has been no germline transmission so far. Additional injections and further breeding is in progress. The resultant transgenic mouse will enable us to study how the timing of ER activation modulates normal mammary maturation and the development of mammary cancers.
DTIC

Cancer; Estrogens; Mammary Glands; Mice

20040055547 Baylor Coll. of Medicine, Houston, TX

Development of a Novel Ligand Binding Assay for Estrogen Receptor

Chung, Arthur C.; Apr. 2002; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9068

Report No.(s): AD-A421346; No Copyright; Avail: CASI; A02, Hardcopy

Nuclear receptors undergo conformational changes when they bind ligands. It should be possible to monitor these changes in vivo using energy transfer between fluorophores. The existence of inherently fluorescent proteins such as the variants of jellyfish green fluorescent protein (GFP) suggests that this problem may be approached by making fusions of these proteins to nuclear receptors. We set out to study this problem using the estrogen receptor (ER), a nuclear receptor known to undergo a conformational change upon ligand binding.
DTIC
Assaying; Cancer; Estrogens; Ligands; Mammary Glands

20040055549 Cold Spring Harbor Lab., New York, NY
A New Pathway of Chemotherapy Induced Apoptosis in a Prostate Cancer Cell Line
Lazebnik, Yuri A.; Lassus, Patrice; Opitz-Araya, Ximena; Jun. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0044
Report No.(s): AD-A421348; No Copyright; Avail: CASI; A02, Hardcopy
We have continued to systematically investigate several possibilities regarding the identity of caspase-P. Our systematic approach to chemotherapy-induced apoptosis helped us to advance the understanding of this process and to develop new tools to analyze mechanisms of cell death in tumor cells.
DTIC
Apoptosis; Cancer; Chemotherapy; Prostate Gland

20040055550 Sloan-Kettering Inst. for Cancer Research, New York, NY
Monitoring Therapeutic Response of Metastatic Breast Lesions Using Magnetic Resonance Imaging of Water Self-Diffusion Coefficients
Ballon, Douglas J.; Oct. 2003; 28 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0558
Report No.(s): AD-A421349; No Copyright; Avail: CASI; A03, Hardcopy
A new magnetic resonance imaging technique has been developed that is designed to detect and monitor metastatic breast lesions in bone marrow and other organs. Specifically, a diffusion sensitive echo planar magnetic resonance pulse sequence has been developed for both 1.5 Tesla and 3.0 Tesla whole-body imaging systems along with image processing techniques to facilitate whole-body screening for breast metastases. The acquisition sequence allows for multi- shot, multi-excitation imaging at multiple diffusion weighting values and is also compatible with phased array resonator use. Three-dimensional image reconstruction includes a paradigm for matching slabs of images obtained at multiple anatomical stations to yield a single field-of-view for rapid assessment of metastatic activity in subsequent clinical studies. Image display makes use of a pseudo-three- dimensional rotating presentation of maximum intensity projections through the three- dimensional dataset. In addition, the method is amenable to the measurement of coefficients of water-self diffusion on a voxel-by-voxel or region of interest basis anywhere in the body. This imaging technique requires no introduced contrast agents and can be completed in less than 20 minutes on conventional magnetic resonance scanners.
DTIC
Cancer; Diffusion Coefficient; Imaging Techniques; Lesions; Magnetic Resonance; Mammary Glands; Metastasis; Therapy; Water

20040055551 State Univ. of New York, Syracuse, NY
Modulation of T Cell Tolerance in a Murine Model for Immunotherapy of Prostatic Adenocarcinoma
Hurwitz, Authur A.; Sep. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0085
Report No.(s): AD-A421350; No Copyright; Avail: CASI; A02, Hardcopy
The goal of this project is to characterize T cell tolerance to prostate tumor antigens and identify the role of costimulatory receptors in overcoming this tolerance. Identification of these processes will assist in the development of novel therapeutic approaches for treating prostate cancer. We use the TRAMP model, a transgenic mouse line that develops primary prostatic tumors due to expression of the SV4O T antigen (Tag) under the transcriptional control of a prostate-specific promoter. In this summary, we report that adoptive transfer of naive Tag-specific T cells into TRAMP mice results in an initial proliferative expansion followed by a clonal deletion within 5 days. Vaccination of mice with dendritic cells pulsed with the cognate antigen results in expansion in the peripheral lymphoid compartments and subsequent trafficking to the prostate-draining lymph nodes (pDLN) . However, 11 days post-vaccine, Ag-specific T cells were no longer detectable in pDLN. In contrast, a large

percentage of Ag-specific T cells were still present in the prostatic tissue of vaccinated TRAMP mice, and persisted for at least 21 days. These data demonstrate that an Ag-pulsed DC vaccine may 'rescue' prostate-specific T cells from peripheral tolerance in tumor-bearing mice and promote their infiltration and survival in the prostate. On going studies are testing the role of CTLA-4 blockade and CD4+ T cell help to rescue this deletion.
DTIC
Cancer; Modulation; Prostate Gland; Rodents

20040055552 Colorado Univ., Boulder, CO
An Experimental System to Evaluate LOH in Prostate Cancer
Strauss, William M.; Jul. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9032
Report No.(s): AD-A421351; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this grant is to establish a new biological system for studying the progression of prostate cancer. We propose a technology we have previously developed to help define X-chromosome inactivation to increase our understanding of the molecular biology of prostrate cancer. Using a mouse model, our goal is to induce functional Loss of Heterozygosity (LOH) on a particular chromosome at various specified times during development or life span. Specifically, we plan to induce LOH only in mouse prostatic tissues. We are particularly interested in evaluating sites of allelic loss previously identified to be associated with prostate cancer (7q, 8p, 10p, 10q, 13q, 16q, 18q) in humans and understanding the effect of LOH on syntenic mouse chromosomes. We believe this approach has the potential to increase our knowledge of the acquisition and progression of prostate cancer. A systematic experimental approach for creating LOH can help define new prostate specific tumor suppressor genes. As human chromosome 8p is most frequently associated with prostate cancer (80% of primary and metastatic prostate cancers show this chromosomal variant, our mouse model system will initially focus on the development of those mouse chromosomes syntenic with human chromosome 8p. This technology would augment the positional cytogenetic approach to understanding the genetic complexity of prostate cancer.
DTIC
Cancer; Genes; Heterogeneity; Prostate Gland

20040055553 Thomas Jefferson Univ., Philadelphia, PA
Intermittent Ultrasound Imaging of Prostate Cancer
Halpern, Ethan J.; Aug. 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0061
Report No.(s): AD-A421352; No Copyright; Avail: CASI; A02, Hardcopy

This study proposed to evaluate contrast-enhanced ultrasound imaging with a microbubble contrast agent in 300 subjects over a period of 3 years in order to improve the detection of prostate cancer. Although the grant period began 8/1/ 2001, patient recruitment actually commenced on 10/1/2001. Between 10/15/2001 and 7/31/2003 a total of 240 subjects provided informed consent. Laboratory blood tests (PSA) and ultrasound evaluations were completed on all 240 subjects (including the ultrasound interpretation worksheet of the primary reviewer). An independent blinded reader has completed review of the first 100 subjects. Pathological review for the presence and grade of &ancer has been completed for all 240 subjects. CD31 staining for micro-vessel density has been performed on the first 40 subjects. All available data has been entered into a computer database using an Excel spreadsheet. A preliminary analysis of the data from the first 201 subjects was incorporated into two abstracts that have been accepted for presentation at the 2003 annual meeting of the Radiological Society of North America (see appendix) . Based upon the current rate of recruitment we expect to reach the target goal of 300 subjects by February 2004.
DTIC
Cancer; Imaging Techniques; Prostate Gland; Ultrasonics

20040055555 Georgetown Univ., Washington, DC
Gene Methylation in Prostate Cancer
Huang, Wen-Xin; Jan. 2004; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0058
Report No.(s): AD-A421354; No Copyright; Avail: CASI; A03, Hardcopy

NKX3.l is a homeoprotein with prostate-specific expression in adults. Loss of NKX3.l correlates with prostate cancer progression. Loss of heterozygosity affects NKX3.l in about 80% of prostate cancers. This project focuses on DNA

methylation of the NKX3.l gene promoter in prostate cancer cell lines and tissues. DNA was analyzed by methylation- specific PCR and sequencing of bisulfite-treated DNA. We also treated cultured cells with the methylation inhibitor 5- azacytidine and the histone deacetylase inhibitor, trichostatin A. There was no effect of 5-azacytidine or trichostatin A on NKX3.l expression in cultured cell. By bisulfite modified DNA sequencing, we identified some methylated or partial,methylated CpG islands in -1056 to 1172 of NKX3.l gene. Three CpG sites at -921, -903 and -47 were selectively methylated in different prostate cancer cell lines and were also methylated in some prostate cancer tissue. Methylation in tissue correlated inversely with NKX3.l protein expression. We also study the effect of Spl and Sp3 transcription factors on the expression of NKX3.l, our results showed Spl and Sp3 did not influence on the expression of NKX3. l.
DTIC
Cancer; Genes; Methylation; Prostate Gland

20040055556 Geneva Univ., Geneva
Skin Bioengineering: Noninvasive Transdermal Monitoring
Guy, Richard H.; Jan. 2004; 54 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0712
Report No.(s): AD-A421355; No Copyright; Avail: CASI; A04, Hardcopy

The long-term objective is to develop and optimize a novel, noninvasive iontophoretic approach for metabolic monitoring via the skin. The low-level current density drives both charged and highly polar (yet neutral) compounds across the skin at rates much greater than passive diffusion. As the skin offers a uniquely accessible body surface across which information can be extracted, we hypothesize that truly noninvasive and highly sensitive devices, which exploit uniquely paired flows of at least two substances, can be developed for iontophoretic monitoring applications. Proof-of- principle targets two analyses of significant interest; specifically, glucose, and lactate.
DTIC
Bioengineering; Metabolism; Skin (Anatomy)

20040055557 California Univ., Los Angeles, CA
Elucidation of a Novel Cell Death Mechanism in Prostate Epithelial Cells
Baum, Linda G.; Dec. 2003; 40 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0022
Report No.(s): AD-A421357; No Copyright; Avail: CASI; A03, Hardcopy

Tumor cell resistance to apoptosis is a major obstacle to effective therapy of prostate cancer. We have found that the androgen dependent prostate cancer cell line LNCaP is sensitive to apoptosis induced by galectin-1, an endogenous human lectin that is abundant in prostate stroma. In contrast, androgen independent LNCaP, DUl45, and PC3 cells are resistant to galectin-1 induced death and actually synthesize galectin-1 and export it to the cell surface. Galectin-1 binds to saccharide ligands on suscepibel LNCaP cells to trigger cell death. Susceptibility to galectin-1 appears to depend on the presence of a specific class of cell surface glycans, the 0-linked glycans on glycoproteins; in contrast, N-glycans are not recuired for galectin-1 induced LNcaP cell death. Resistance to galectin-1 induced death correlates with markedly decreased expression of a specific glycosyltransferase, the C2GnT, which creates saccharide ligands on 0-glycans that are recognized by galectin-l. The C2GnT enzyme also regulates susceptibility of T cells to galectin-1 induced death, indicating that a common glycosylation pathway may control cell death in epithelial and lymphoid cells. Identification of a mechanism that enhances galectin-1 prostate cancer cell death mal allow novel therapeutic approaches to manipulate tumor cell glycosylation to overcome tumor cell resistance to apoptosis.
DTIC
Cancer; Cells (Biology); Death; Prostate Gland

20040055559 Vanderbilt Univ., Nashville, TN
Human Prostate Cancer in a Tissue Recombination Model
Williams, Karin; Hayward, Simon; Dec. 2003; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0037
Report No.(s): AD-A421360; No Copyright; Avail: CASI; A02, Hardcopy

In vivo models based on human epithelial cells (hPrE) provide powerful tools with which to investigate cancer initiation and progression. Tissue recombinations (TR) composed of hPrE and rat urogenital sinus mesenchyme (rUGM) grafted beneath the renal capsule of immunocompromised rodent hosts recapitulate many key events in prostatic development and adult

function. The stable integration of known or putative oncogenes into the hPrE component of such TRs is a powerful tool with which to study the effects of these genes in vivo. The cMYC gene (a known oncogene) has been introduced into hPrE. cMYC is expressed in a very tightly regulated manner in non-malignant prostate but is deregulated in PIN and overexpressed/ deregulated in high-grade human prostate cancer, suggesting a role in both the pathogenesis of PIN and subsequent progression to cancer. The high efficiency LZRS/Phoenix retroviral system was used to insert the cMYC gene into hPrE under the control of the constitutively active CMV promoter. TR composed of infected hPrE and rUGM were made and grafted into SCID hosts. Hosts were sacrificed after carrying the grafts for 28 days. We have visualized reporter and transgene expression. The TR's showed a rapidly growing metastatic PSA- expressing adenocarcinoma.
DTIC
Cancer; Prostate Gland

20040055560 SRI International Corp., Menlo Park, CA
Analytical and Characterization Studies of Organic Chemicals, Drugs and Drug Formulation
Lim, Peter; Feb. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-97-C-7052
Report No.(s): AD-A421361; No Copyright; Avail: CASI; A02, Hardcopy

The overall purpose of this contract was to perform chemical/physical analyses on bulk pharmaceutical substances and formulated drug products of interest to the USAMRMC Drug Development Program for parasitic and infectious diseases, chemical and biological defense, etc. Specific objectives were to design, develop, validate, and apply methods to determine chemical and physical characteristics on bulk drugs and drug products. For the entire contract period, 1 July l997 to 6 January 2004, ll7 samples of bulk drugs and dosage formulations were analyzed for identity and purity or potency; 31 samples were studied for bulk stability, solubility and solution stability. Chiral chromatographic separation methods were developed and validated for five bulk drugs. Extensive dissolution studies in four media were performed on five batches of tablets. A special project was development of methods to isolate anti- malarial agents from rabbit plasma and applying the methods to determine these drugs in 128 samples of rabbit plasma. A second and much more important special project was development of a highly sensitive and specific method to determine squalene in 17 lots of Anthrax Vaccine Adsorbed. As a result of this work, several awards were presented to members of the project team and to SRI International. A third special project was development and production of a formulated drug product for artesunic acid. Two batches of this drug product were produced and sent to the Army for toxicological evaluations. A poster presentation was made at the 2000 Bioscience Review, and one publication appeared in press.
DTIC
Chemical Analysis; Drugs; Parasites

20040055565 Jackson (Henry M.) Foundation, Rockville, MD
Spine Research at Walter Reed Army Medical Center
Kuklo, Timothy R.; May 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-C-0067
Report No.(s): AD-A421375; No Copyright; Avail: CASI; A02, Hardcopy

Active duty military personnel commonly are exposed to physically high-load environments. This can often result in spinal trauma as a cause of back pain and back problems. Treatment of these spinal injuries may allow for return to duty of some of these soldiers when treated in an optimal fashion. Construction of our biomechanics lab is under way and will test the following: Treatment of back pain due to spinal trauma; increase understanding of biomechanical effects of spinal reconstruction for spinal trauma; characterize effects on adjacent segments of various spinal reconstruction techniques at the thoracolumbar junction; characterize effect of corpectomy reconstruction using a cage/ polyethylene cylinder. Lab is slotted for completion on May 10, 2004. To date: we have hired a project manager (2/04) and an associate research coordinator (10/03), purchased the MTS (biomechanical testing) machine and a Fluoroscopy C-ar, completed the asbestos abatement, ordered the lab furniture and begun construction. The first research protocol has been written and is pending IRB approval. On March 22, 2004, we are hosting a tri-service forum in which military specialist will discuss the current impact of spinal injuries to high-risk military personnel and detail how current advancements in this surgical arena may be used to retain special-operations fighting forces and pilots in their trained military professions.
DTIC
Medical Science; Spine

20040055571 Naval Health Research Center, San Diego, CA

Seeking Treatments for Gulf War Veterans' Illnesses

McKeehan, Jamie; Clark, Suzanne; Ryan, Margaret; Jan. 2001; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421398; NHRC-01-19; No Copyright; Avail: CASI; A02, Hardcopy

Gulf War veterans in the San Diego area were given an important opportunity to help researchers learn how to treat chronic multi-symptom illnesses. The Department of Defense (DOD) Center for Deployment Health Research at the Naval Health Research Center, San Diego, is participated in two large clinical trials to treat nonspecific illnesses among Gulf War veterans. One of more than 30 sites nationwide, the Naval Health Research Center is the only Navy site involved in these Department of Veterans Affairs (VA)-DOD cooperative studies. Other sites include the Walter Reed Army Medical Center, Washington, DC, and 28 VA medical centers across the country. Two VA DOD Cooperative studies were used: #470, Exercise and Cognitive Behavioral Therapy Trial and #476, Antibiotic Treatment Trial.

DTIC

Gulfs; Personnel; Sicknesses; Warfare

20040055573 Ohio State Univ., Columbus, OH

C/EBP(delta): A Candidate Tumor Suppressor Gene in Breast Cancer

DeWille, James W.; Sep. 2003; 53 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0389

Report No.(s): AD-A421404; No Copyright; Avail: CASI; A04, Hardcopy

Inactivation of tumor suppressor genes, through a variety of mechanisms, is a key pathological step in breast cancer development and progression. The overall goal of this research is to investigate the regulation, expression and clinical relevance of CCAAT/Enhancer binding protein 5 (C/EBP5, CEBPD) as a candidate tumor suppressor gene in breast cancer. Our hypothesis is that C/EBP5 is a key regulator of mammary epithelial cell growth arrest and that loss in C/ EBP5 function is part of the cascade of molecular events that facilitate the progression to metastatic breast cancer. In previous reports we have shown that C/EBP8 expression is associated with growth arrest in mouse mammary epithelial cells. The data presented in this research report demonstrate the association between STAT3 activation, C/EBP8 gene expression and growth arrest in human mammary epithelial cells. 'Loss of function' alterations in the Stat3/C/EBP5 are common in human breast cancer cell lines. In addition, we show that the C/EBP5 gene exhibits relatively few nucleotide sequence alterations in clinical breast cancer. The C/EBP6 gene promoter, however, exhibits extensive CpG methylation and gene silencing in the SUM-52PE cell line and variable CpG methylation that is associated with reduced C/EBP8 gene expression in primary human breast cancer samples. Hence, alterations in the Stat3/C/EBP5 growth inhibitory pathway may play an important role in the etiology or progression of breast cancer.

DTIC

Cancer; Genes; Mammary Glands; Suppressors; Tumors

20040055576 Duke Univ., Durham, NC

Functional Role of the Casein Kinase I (CKI) Family in the Transforming Growth Factor-Beta (TGF-Beta) Signaling Pathway

Waddell, David; Liberati, Nicole T.; Wang, Xiao-Fan; Apr. 2003; 49 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0229

Report No.(s): AD-A421409; No Copyright; Avail: CASI; A03, Hardcopy

The regulation of the Transforming Growth Factor- Beta (TGF-Beta signaling pathway and its role in cancer is an area of intense research. We are investigating the regulatory role of casein kinase I (CKI) in the TGF-Beta signaling cascade. We have found that all CKI isoforms (alpha, delta, epsilon, and gamma) can bind to Smads in vitro and that this interaction is mediated through the Mad Homology 2 (MH2) domain of the smad proteins. Furthermore, we have shown that CKI-epsilon can interact with smads and receptors in vivo, and that the CKI-epsilon/Type I and CKI-epsilon/Type II receptor interactions is independent of TGF-Beta ligand activity, while CKI-epsilon/Smad interaction is transiently disrupted by ligand stimulation. Since, CKI family members are serine/threonine kinase, we determined that CKI-epsilon and CKI-gamma-2 can both phosphorylate the receptor-activated Smads and the Type II Receptor, while CKI-gamma-2 can also phosphorylate the co-smad, Smad4 in vitro. Transcriptional reporter assays revealed that in the absence of TGF-Beta, transient overexpression of CKI-epsilon or CKI-gamma-2 dramatically reduced basal reporter activity, but in the presence of ligand CKI-epsilon enhanced and CKI-gamma-2 inhibited TGF-Beta mediated transcription. Furthermore, CKI- epsilon is also capable of significantly enhancing the transcriptional activity of smad3. Finally, we have shown that transient siRNA knock-down of all CKI isoforms resulted in dramatic increases in both basal and ligand stimulated transcriptional reporter activity. Taken

together, these observations provide exciting evidence for a functional role for CKI in the TGF-Beta pathway, a pathway that has been shown to be involved in the development and progression of many different - types of cancers.
DTIC
Cancer; Mammary Glands; Peptides; Proteins

20040055577 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Regulation of Chemokine Expression by Lipopolysaccharide In Vitro and In Vivo
Kopydlowski, Karen M.; Jun. 10, 2002; 276 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421412; No Copyright; Avail: CASI; A13, Hardcopy

The host response to Gram negative LPS is characterized by an influx of inflammatory cells into host tissues which is mediated predominantly by the localized production of chemokines. The influx and activation of inflammatory leukocytes, in combination with their overproduction of proinflammatory mediators, are believed to result in the tissue damage that precedes the multiple organ failure and death associated with sepsis. The overall goal of this work was to identify cellular and molecular mechanisms that contribute to the differential regulation of chemokine expression in response to LPS, in an effort to enhance our understanding of the unique roles of individual chemokines in a disease process as complex as sepsis. Our in vitro examination of LPS-inducible chemokine genes revealed variability in the magnitude and kinetics of expression in response to LPS, as well as differential patterns of expression in response to various modulators of inflammation, endotoxin tolerance, and mediators of transcriptional regulation. When similarities in regulation were observed, the chemokine genes involved were not restricted to genes of like biological function or classification within a specific chemokine subfamily. These findings provide insight into the complexity of the regulatory mechanisms that may account for their selective expression and function in vivo. Next, we observed a profound and rapid induction of chemokines that were temporally and spatially regulated following LPS exposure in vivo. Not only do these findings underscore the contribution of chemokines to the inflammatory process that precedes the pathophysiology of sepsis, but also indicate unique functions in the regulation and progression of the inflammatory response during sepsis. Finally, our evaluation of mice with a targeted disruption in the gene encoding the neutrophil chemoattractant, KC, r
DTIC
In Vitro Methods and Tests; In Vivo Methods and Tests

20040055578 California Univ., Irvine, CA
Anti-Angiogenic Therapeutic Indictors in Breast Cancer
Su, Min-Ying L.; Aug. 2003; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0178
Report No.(s): AD-A421413; No Copyright; Avail: CASI; A03, Hardcopy

This project studies the therapeutic indicators in ant-angiogenic therapy. Every animal with mammary tumor was scheduled to receive a baseline MRI, core biopsy, then followed by 4 treatments with weekly MRI follow-up. The tumors were categorized into responders, stabilizers, and non- responders depending on the final tumor size compared to the baseline size. The results obtained so far indicated that majority of infiltrating adenocarcinomas were responders and all papillary adenocarcinomas were responders and all papillary adenocarcinomas were stabilizer. The relationship between response and tumor type will be fully investigated when all data are available. In the responders, the Gd-DTPA- BMA enhancement at 2-min after injection showed a decreasing trend with treatment, which was not observed in the non- responders. However, the changes of MRI enhancement parameters with treatment did not show a significant differences among different response groups. We also completed the immunohistochemical staining study using available specimens of ENU induced tumors from another project. The ductal adenocarcinoma had the highest microvessel density, then in order were papillary adenocarcinoma, fibroadenoma, and the adenosis had the lowest microvessel density, which was consistent with the degree of malignancy and benignity. The IHC study on the tumors undergoing chemotherapy are currently in progress.
DTIC
Cancer; Clinical Medicine; Drugs; Mammary Glands; Therapy

20040055580 Academy of Health Sciences (Army), Fort Sam Houston, TX
Improving the Emergency Department's Processes of Coding and Billing at Brooke Army Medical Center
Lehning, Peter A.; Jun. 2, 2003; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421418; HCA-3-03; No Copyright; Avail: CASI; A04, Hardcopy

The Army Medical Department's (AMEDD) method by which it obtains reimbursement for patient care is undergoing a

major transformation. Beginning in October 2002, outpatient itemized billing was mandated for use in the AMEDD. This system shifted the process of billing for outpatient services from an allinclusive rate to one based on the actual care provided. This has placed focus on medical coding, which is transposing documented care into an alphanumeric format that is acceptable for billing purposes. As the primary portal into Brooke Army Medical Center, the emergency department (ED) is being forced to streamline its processes and operate on a more cost effective and efficient basis. This is a challenge as they are the only level one trauma center in the USA Army and treat a high volume of high acuity, diverse patients. The ED sees over 56,500 patients annually, five-percent of which are non-beneficiaries, and accounts for over 60 percent of all hospital admissions. The continuous inability to comprehensively bill for services has resulted in the ED being a major cost center for the hospital. In 2002 the ED provided over $1.25 million of billable care of which only $324,000 was actually billed. This was due to poor data entry, documentation, and coding. The ED is seeking methods to control expenditures, improve documentation, and increase coding compliance and subsequent billing. Medical treatment must be documented and efficiently coded to be billed and reimbursed. Medical coding is now the lynchpin for reimbursement.
DTIC
Coding; Emergencies; Management Planning; Management Systems; Medical Services

20040055581 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD
Filovirus Pathogenesis in Nonhuman Primates
Geisbert, Thomas W.; Jahrling, Peter B.; Larsen, Tom; Davis, Kelly J.; Hensley, Lisa; Jan. 2002; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421420; No Copyright; Avail: CASI; A03, Hardcopy

Infections with Ebola and Marburg viruses cause severe and fatal hemorrhagic disease in humans and nonhuman primates. While progress to define the mechanisms of filoviral pathogenesis has been made in the last decade, cultural mores, and a range of logistical problems, have hindered the systematic pathogenetic analysis of human filoviral infections. Nonhuman primate models of filoviral hemorrhagic fever (HF) have been developed, but with few exceptions, previous investigations examined animals naturally infected or killed when moribund, and shed little light on the pathogenesis of infection during the period before death. More recently, longitudinal analysis of pathogenetic events in nonhuman primate models of Ebola virus (EBOV) HF have revealed new and important findings. Specifically, tissue factor plays an important role in triggering the hemorrhagic complications that characterize EBOV infections, and dysregulation of protein C exacerbates disease. Moreover, replication of EBOV in endothelial cells was not consistently observed until the latter stages of disease, well after the onset of disseminated intravascular coagulation, suggesting that the characteristic coagulation abnormalities are not the direct result of filoviral-induced cytolysis of endothelial cells. Bystander lymphocyte apoptosis, previously described in end-stage tissues, occurred early in the disease course in intravascular as well as extravascular locations. Of note, apoptosis and loss of NK cells was a prominent finding suggesting the importance of innate immunity in determining the fate of the host. Accordingly, nonhuman primate models have been invaluable in identifying several new targets for chemotherapeutic interventions that may ameliorate the effects of filoviral HF.
DTIC
Pathogenesis; Primates; Viral Diseases

20040055582 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH
A Review of Firefighter Physical Fitness/Wellness Programs: Options for the Military
Palmer, Barbara; Carroll, Jon W.; Mirza, Atia T.; Nov. 20, 1998; 55 pp.; In English
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A421421; CSERIAC-RA-98-003; No Copyright; Avail: CASI; A04, Hardcopy

The US Air Force is the Executive Agent for the firefighter fitness programs for all military components. This Review & Analysis examines four suggested candidate firefighter physical fitness programs and related research in support of the ongoing Air Force/Department of Defense project to adopt a defensible and acceptable firefighter fitness training and testing program. The four programs that are compared and contrasted are the interim Air Force/ Department of Defense Fire Protection Program's Fire Fighter Physical Fitness Program, the Canadian Forces/Department of National Defence's new Fire Fighter Physical Fitness Maintenance Program, the emerging International Association of Fire Fighters/International Association of Fire Chiefs Fire Service Joint Labor Management Wellness/Fitness Initiative (IAFF/FC Initiative), and the National Fire Protection Association's work-in-progress, NFPA 1583.
DTIC
Aircraft Safety; Fire Fighting; Fires; Medical Services; Military Operations; Physical Fitness

20040055585 International Agency for Research on Cancer, Lyon

Breast Cancer Risk in Relation to Serum IGF-1, IGFBP-3, and Their Genetic Determinants: A Study Within the European Prospective into Cancer (EPIC)

Kaaks, Rudolf J.; Sep. 2003; 31 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0275

Report No.(s): AD-A421424; No Copyright; Avail: CASI; A03, Hardcopy

We are conducting a large case-control study nested within a prospective cohort, to estimate relative risks of breast cancer by serum levels of IGF-I and IGFBP-3, and to examine associations of polymorphisms in 15 candidate genes with levels of IGF-I, IGFBP-3, and cancer risk. Progress report: in the first two years of this project, 1084 breast cancer cases and 2116 control subjects were included in the study, and measurements of IGF-I and IGFBP-3 were (practically) completed. A first series of 23 SNPs were typed for all case and control subjects, and typing of 18 additional SNPs is ongoing. Major findings: Elevated serum IGF-I shows a moderate increase in breast cancer risk among postmenopausal women. Preliminary analyses also show significant associations of a number of SNPs and haplotypes with IGF-I, IGFBP-3, or breast cancer risk.

DTIC

Cancer; Genetics; Mammary Glands; Risk; Serums

20040055587 Uniformed Services Univ. of the Health Sciences, Bethesda, MD

Structural and Functional Analysis of HIV-1 Coreceptors: Roles of Charged Residues and Posttranslational Modifications on Coreceptor Activity

Chabot, Donald J.; Jan. 2000; 205 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421435; No Copyright; Avail: CASI; A10, Hardcopy

CXCR4 and CCR5 are chemokine receptors and are coreceptors for human immunodeficiency virus (HIV-1). Host cells must express CD4 and a coreceptor for optimal HIV-1 entry. The delineation of the critical regions involved in the interactions within the Env-CD4-coreceptor complex has been under intensive investigation. To define these regions we have employed an alanine-scanning mutagenesis strategy of the extracellular domains of CXCR4 coupled with a highly sensitive reporter-gene assay for HIV-1 Env-mediated membrane fusion. Using a panel of 47 different CXCR4 mutations, we have identified several charged residues that appear important for coreceptor activity for X4 Envs: mutations E15A and E32A in the N-terminus, D97A in extracellular loop (ecl)-1, and R188A in ecl-2 impaired coreceptor activity for X4 and R5X4 Envs. Mutation to alanine of one of the six tyrosines present in CXCR4, Y7, decreased coreceptor function. In addition, alanine substitution of any of the four extracellular cysteines alone resulted in conformational changes of varying degrees, while paired cysteine deletions could partially retain structure. Our data supports the notion that all four cysteines are involved in disulfide bond formation. We have also identified substitutions which greatly enhance or convert CXCR4 s coreceptor activity to support R5 Env-mediated fusion: N11A, R30A, D187A, and D193A. Mutation of the aspartic acid at position 187 had the greatest effect on tropism. Mutation of an analogous serine in CCR5 to aspartic acid reduced CCR5 coreceptor activity with R5X4 and some R5 isolates. Mutation of the N11, a putative glycosylation site, had the second greatest effect on CXCR4 tropism. We determined that this site has a large carbohydrate moiety that is responsible for preventing CXCR4 from supporting R5 Env-mediated membrane fusion. Our data suggests the presence of conserv

DTIC

Functional Analysis; Receptors (Physiology); Residues; Structural Analysis; Viruses

20040055588 Uniformed Services Univ. of the Health Sciences, Bethesda, MD

Student Anesthetist Learning Curve Perspectives on Sciatic Nerve Localization Proficiency - A Pilot Study

Lovejoy, Alan S.; Oct. 2000; 71 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421437; No Copyright; Avail: CASI; A04, Hardcopy

Regional anesthesia techniques are invaluable tools in the armamentarium of anesthesia practitioners. Utilization of visual and palpable anatomical landmarks in localizing deep-seated peripheral nerves has long been the mainstay of regional anesthesia. Accurate placement of local anesthetics is imperative to obtaining successful neural blockade. Disagreement exists concerning the utility of a peripheral nerve stimulator in nerve sheath location. Regardless of the technique used, anatomical landmarks and underlying structures need to be fully understood. Very little research exists addressing how best to instruct anesthesia students in regional nerve blockade. In this study, McAuliffe's (1993) model for advanced nursing practice education was used as a theoretical framework which describes the fact that multiple representations, or multiple attempts are required to obtain a level of proficiency. In this study, a student registered nurse anesthetist (SRNA) attempted to locate the

sciatic nerve using anatomical landmarks on a rat model. The data revealed that 15 attempts were required before an appropriate level of proficiency was obtained.
DTIC
Abilities; Anatomy; Anesthesia; Learning Curves; Nerves; Position (Location); Sciatic Region; Students

20040055591 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
The Effects of Dopamine and Estrogen Upon Cortical Parvalbumin Expression
Ross, Nicole R.; Jan. 2001; 123 pp.; In English
Report No.(s): AD-A421449; No Copyright; Avail: CASI; A06, Hardcopy

Estrogen plays a protective role in several neurologic disorders known to involve alterations in both the dopamine system and (gamma amino butyric acid containing) GABAergic neurons that contain parvalbumin. Two studies were conducted to identify the effects of estrogen and dopamine upon cortical parvalbumin expression. In the first study, organotypic slice cultures of the frontal cortex were prepared from male rats (postnatal age 2/3) and maintained for 14 days in serum-enriched medium or media containing either: dopamine, estrogen, or a combination of the two. In control slices, parvalbumin immunoreactive neurons were primarily clustered near cortical layer V. All treatment conditions increased the distribution of parvalbumin labeled neurons in layer VI and enhanced the maturation of dendritic measures of labeled neurons in the deep layers (V-VI). Both estrogen and the combination treatment induced similar alterations in the superficial cortical layers, as well. In the second study, gonadectomy (male rats, postnatal age 2) induced long lasting decreased in the density of parvalbumin immunoreactive neurons throughout all cortical layers. Estrogen replacement restored parvalbumin expression to control levels in the superficial cortical layers, only. Gonadectomy also increased dopaminergic neuron density in the substantia nigra, compacta and tyrosine hydroxylase fiber length in the cortex at 33 days postnatal. Estrogen replacement returned dopaminergic neuron density, but not cortical fiber length, to control levels. Neonatal 6- hydroxy dopamine (6-OHDA) lesions produced results in the cortex that were similar to those induced by gonadectomy, regardless of the loss in dopaminergic neurons. Taken together, these findings indicate that estrogen alters cortical parvalbumin expression and cortical and subcortical dopaminergic systems.
DTIC
Dopamine; Estrogens; Psychology; Simulators

20040055593 Ohio State Univ., Columbus, OH
Development of KGF Antagonist as a Breast Cancer Therapeutic
Sugimoto, Yasuro; Jul. 2003; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9341
Report No.(s): AD-A421458; No Copyright; Avail: CASI; A03, Hardcopy

This grant proposal was to synthesize potential KGF antagonists which will then be evaluated for efficacy in vitro assay systems. The results generated for the propose study would be useful for designing new therapeutic agent for breast cancer. We were able to show some potential intracellular KGFR target small molecules whereas extracellular target synthetic peptide antagonist was not able to do during this period We also added a new dimension to an estrogen-KGF involved human breast microenvironment (i.e. KGF regulates estrogen receptor a mRNA and protein expression).
DTIC
Cancer; Mammary Glands; Therapy

20040055594 Professional Staff Association of Los Angeles County/Univ. of Southern California Medical Center, Los Angeles, CA
Studies of Tissue Perfusion Failure at LAC+USCMC and the Incorporation of the Results into a National Trauma Database
Belzberg, Howard; Oct. 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-01-2-0070
Report No.(s): AD-A421459; No Copyright; Avail: CASI; A02, Hardcopy

No work was performed on this project during the second grant year, Research was suspended until protocol approval by the chairman of Human Subjects Research Review Board (HSRRB) was secured. This occurred on September 17, 2003.
DTIC
Data Bases; Diffusion; Failure

20040055595 Brooke Army Medical Center, Fort Sam Houston, TX

The Impact of Relaxation and Hypnosis on Medical Resources Utilization in Pediatric Asthma

Barber, Nancy H.; Oct. 2003; 4 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0706

Report No.(s): AD-A421460; No Copyright; Avail: CASI; A01, Hardcopy

Asthma is one of the most common chronic pediatric illnesses. Estimates about its prevalence among children and adolescents under the age of 18 range up to 7%/Compared to their peers, children with asthma missed an additional 10.1 million days of school, had 12.9 million more contacts with physicians, and were hospitalized 200,000,000 more times in 1988. The estimated economic impact of asthma in the USA exceeds $6.2 billion. Behavioral interventions have been shown to improve the management of pediatric asthma, as well as reduce the utilization of medical resources. The proposed study will determine if combining hypnosis and relaxation training interventions produces different medical resource utilization by pediatric asthma patients than the use of relaxation training alone. Twenty five pediatric asthma patients will be trained in relaxation techniques and self- hypnosis, twenty five will be trained in relaxation techniques alone and an additional twenty five patients will be receive no behavioral interventions. Medical resource utilization (clinic visits, emergency room visits, and hospitalization for asthma related events) will be examined in pre- and post- intervention for each group. Utilization will be compared between groups at 6 and 12 months following intervention. It is hypothesized that both intervention groups will demonstrate lower utilization post- intervention, and that the hypnosis grp will demonstrate that least utilization of medical resources.

DTIC

Asthma; Hypnosis

20040055596 Dorn Research Inst., Inc., Columbia, SC

Preliminary Investigation of the Role of Cellular Immunity in Estrous Cycle Modulation of Post-Resection Breast Cancer Spread

Hrushesky, William J.; May 2003; 54 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8016

Report No.(s): AD-A421466; No Copyright; Avail: CASI; A04, Hardcopy

It is hypothesized that the short term objectives of doing this proposal are to better understand which sex steroids and which cellular immune functions control post resection metastatic cancer spread. The long term goal is to use this understanding to develop testable hypotheses for 'neoadjuvant' hormonal/ immunological therapies, which when given at or around the time of a cancer resection, might result in diminishing the subsequent metastatic spread of the resected cancer. Progress has been made in each of the three technical directives and nine tasks, as outlined in the annual report.

DTIC

Cancer; Mammary Glands; Modulation

20040055598 Harvard School of Public Health, Boston, MA

Regulating Biological Agents: Balancing Security and Bio-Medical Research

Vidich, Charles; Jun. 10, 2003; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421472; No Copyright; Avail: CASI; A03, Hardcopy

Presentation on the regulation of biological agents; balancing security concerns with the needs of biomedical research.

DTIC

Balancing; Law (Jurisprudence); Medical Science; Security

20040055599 Dartmouth Medical School, Hanover, NH

Surge Capacity Planning Issues

Gougelet, Robert; Jun. 10, 2003; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421473; No Copyright; Avail: CASI; A03, Hardcopy

Presentation of surge capacity planning issues in the case of a bioterror attack.

DTIC

Emergencies; Surges

20040055600 Boston Public Health Commission, Boston, MA

Intersecting Missions: Public Health and Public Safety in the post-9/11 World

Serino, Richard A.; Jun. 10, 2003; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421478; No Copyright; Avail: CASI; A03, Hardcopy

Presentation on the need to integrate the pursuits of public health and public safety with the demands of disaster medicine in the case of bioterror attack.
DTIC
Emergencies; Public Health; Safety

20040055601 Harvard School of Public Health, Boston, MA
Using Short-term Surveys to Improve Communications during a Biological Threat
DesRoches, Catherine; Jun. 10, 2003; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421479; No Copyright; Avail: CASI; A03, Hardcopy

Presentation of survey findings regarding public opinion about infectious diseases, their transmission and dangers, and the need to effectively transmit information to the general public.
DTIC
Infectious Diseases; Surveys

20040055603 Academy of Health Sciences (Army), Fort Sam Houston, TX
An Examination of the Relationship of the AMEDD Population Health Clinical Optimization Training with Change in Patient and Staff Satisfaction
Galloway, Kevin T.; Jul. 27, 2003; 405 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421483; HCA-31-03; No Copyright; Avail: CASI; A18, Hardcopy

Following the five-day AMEDD Population Health Clinical Optimization training at the Moore Clinic, Fort Hood, Texas, there was a statistically significant increase in patient satisfaction but no significant change in overall staff satisfaction. There were, however, many facets of staff satisfaction that showed significant changes following the training. The significant changes observed in staff satisfaction with workload, treatment team, facility, autonomy, organization, professional experience, patient relationships, efficiency, quality, pay and benefits, overall satisfaction with current position and plan to separate from current position were not universal across the primary care teams disciplines. Providers, Nursing Staff, Certified Nursing Assistants, and Administrative Support Staff indicated that the training experience and optimization activities following the training affected each of these groups differently. There were difficulties implementing all of the planned changes that emerged from the optimization training and this might have resulted in some of the decreased levels of staff satisfaction. Further study is indicated to provide more clarity on the value of this training.
DTIC
Education; Health; Management Planning; Management Systems; Medical Services; Patients; Populations

20040055606 Army Soldier and Biological Chemical Command, Aberdeen Proving Ground, MD
A Mass Casualty Care Strategy for Biological Terrorism Incidents
Church, James; Dec. 2001; 33 pp.; In English
Report No.(s): AD-A421505; No Copyright; Avail: CASI; A03, Hardcopy

This publication provides basic information on the mass casualty care concept known as the Acute Care Center (ACC). The ACC is one component of a disaster medical system developed by the Domestic Preparedness Biological Weapons Improved Response Program (BW IRP). The system is intended to assist emergency planners and health care providers in planning and coordinating an effective medical response to a large-scale terrorism attack involving the use of a noncontagious biological weapon in a civilian community. The information contained in this publication can be tailored for individual community application. In recent years, concern over the likelihood of a terrorist attack involving unconventional threats has increased. In 1998, under the auspices of the Department of Defense (DoD) Domestic Preparedness Program (DPP), the BW IRP conducted a series of workshops aimed at identifying improved approaches to managing the consequences of a large-scale biological terrorism attack. One product of this effort was a multi-echelon interagency template for executing a fully integrated disaster response. The cornerstone of this strategy is the efficient use of a community's combined medical resources. The Modular Emergency Medical System (MEMS) represents the BW IRP's initial attempt to systematically address the need for rapidly enhancing a community's medical capacity. One component of this disaster care system is the ACC. This report describes the MEMS strategy and provides the following information about the ACC: purpose; level of care philosophy; standing admission orders; patient flow; facility and staffing requirements; and operational considerations, such as training, patient records and tracking, medical equipment and supplies, drugs, environmental health and sanitation, personnel

protection, staff support, food services, and hospice care. Appendixes provide a sample admission order, a sample job action sheet, and a list of pharmaceuticals and their purposes. (13 re7
DTIC
Casualties; Emergencies; Medical Services; Populations; Systems Integration; Terrorism; Warfare

20040055610 Tripler Army Medical Center, Honolulu, HI
A Joint Venture Analysis for a Combined Acute/Chronic Hemodialysis Clinic at Tripler Army Medical Center
Nolan, Lawrence P.; Jun. 2002; 72 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421510; No Copyright; Avail: CASI; A04, Hardcopy

The objective of this study was to determine the cost effectiveness and strategic implications of expanding the existing dialysis clinic at Tripler Army Medical Center (TAMC), Oahu, Hawaii, to allow Veterans Administration (VA) beneficiaries access for chronic dialysis care. The study analyzed the costs incurred by the Spark M. Matsunaga Veteran's Administration Medical and Regional Office Center (VAMROC) during FY2002 at private dialysis facilities and at TAMC. The VAMROC provides a broad range of primary medical care services and veteran's benefits, serving an estimated 127, 600 veterans throughout Hawaii and the Pacific Islands. It also provides outpatient services through an Ambulatory Care Clinic on Oahu and through five community-based outpatient clinics on neighboring islands. However, the VAMROC on Oahu does not have a hemodialysis unit. The majority of its beneficiaries requiring chronic hemodialysis treatment must be referred to private providers on the island. The fixed, variable, direct, and indirect costs for dialysis at the two facilities were analyzed and used to produce cost projection models for an expanded acute/chronic dialysis facility. Step costs for additional staff were built into the models and pharmaceutical cost projections were estimated based on historical data. The study indicated that it is in TAMC's best interest to focus on related diversification and expand to meet the chronic dialysis needs of the VA beneficiaries. Financially, through this project, TAMC would be able to significantly reduce its dialysis treatment costs and provide a competitive market price while simultaneously exceeding the other island dialysis providers' staffing ratios and skill sets. Based on the results of this study, it is recommended that a Joint Venture Acute/Chronic Hemodialysis Clinic staffed to support 28 chronic plus 4 acute/inpatient beneficiaries be initiated. (3 figures, 38 refs.)
DTIC
Clinical Medicine; Cost Effectiveness; Dialysis; Medical Services; Personnel; Therapy

20040055611 Oklahoma Univ. Health Sciences Center, Norman, OK
In-Situ Survival Mechanisms of Sulfate-Reducing Bacteria in Polluted Marine Sediments
Krumholz, Lee R.; Ballard, Jimmy D.; Suflita, Joseph M.; Mar. 23, 2004; 5 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0558
Report No.(s): AD-A421513; No Copyright; Avail: CASI; A01, Hardcopy

Sediment dwelling anaerobic bacteria are capable of utilizing a wide range of electron donors and acceptors, and they play a key role in the bioremediation of marine contaminants. We believe that these microorganisms have unique genes that are required only during exposure to the natural environment. Signature tagged mutagenesis (STM) has be used to identify these genes. Desulfovibrio strain G2O and Shewanella oneidensis MR-1 were studied in a model sediment system. Approximately 1-2% of all mutants screened were attenuated in sediment survival. Protein products from interrupted genes fell into several functional categories: energy production and conversion, amino acid & inorganic ion transport and metabolism, cell envelope biogenesis, cell motility and secretion, signal transduction and mechanisms, prophage functions and uncharacterized conserved proteins. These functions are believed to be crucial for sediment growth and will when fully characterized, will dramatically broaden our understanding of bacterial growth in natural systems.
DTIC
Anaerobes; Bacteria; Contaminants; Genes; Pollution; Sediments; Sulfates; Survival

20040055615 Uniformed Services Univ. of the Health Sciences, Bethesda, MD
Potential for Aedes albopictus and Ochlerotatus j. japonicus to Change the Field Ecology of Arboviruses of Human Health Importance in the Mid-Atlantic Region of the USA
Sardelis, Michael R.; Oct. 16, 2001; 201 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421536; No Copyright; Avail: CASI; A10, Hardcopy

Aedes albopictus and Ochlerotatus j. japonicus are mosquitoes that have been recently introduced into the USA. Since their introduction, they have been implicated in the transmission of one or more of the arboviruses of principal public health importance in the mid-Atlantic region. To more fully understand the potential of Ae. albopictus and Oc. j. japonicus to be

vectors of endemic arboviruses, field and laboratory studies were conducted to assess their distribution in the region and to determine their vector competence for arboviruses for which data are lacking. Aedes albopictus, a mosquito found in virtually all counties of states in the southeastern USA, was found to be established as far north as south-central Pennsylvania. Ochlerotatus j. japonicus, a mosquito that is generally found in more northern climates within its native range, was found to be established as far south as Maryland, and its relative abundance in Frederick County, Maryland, was found to be comparable to or greater than that of other container- inhabiting mosquito species. Laboratory studies showed that Oc. j. japonicus is a competent vector of West Nile (WN), St. Louis encephalitis (SLE), eastern equine encephalitis (EEE), and La Crosse (LAC) viruses. Estimated transmission rates for these viruses by Oc. j. japonicus and by known principal or suspected vector mosquito species were determined concurrently for comparison. Based on these comparisons, Oc. j. japonicus was a more efficient laboratory vector of WN virus than Culex quinquefasciatus, as efficient as Culex pipiens in transmitting SLE virus, a less efficient laboratory vector of EEE virus than Ae. albopictus, and as efficient as Aedes triseriatus in transmitting LAC virus. Additional studies indicated that the extrinsic incubation period (EIP) for WN and EEE virus in Oc. j. japonicus held at 26oC was between

DTIC

Animals; Diseases; Ecology; Health; Insects; United States; Viruses

20040055619 Uniformed Services Univ. of the Health Sciences, Bethesda, MD

Regeneration of the Adult Rat Spinal Cord in Response to Ensheathing Cells and Methylprednisolone

Nash, Holly H.; Jan. 2002; 158 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421550; No Copyright; Avail: CASI; A08, Hardcopy

Axons fail to regenerate after spinal cord injury (SCI) in adult mammals, leading to permanent loss of function. Following SCI, ensheathing cells promote recovery in animal models, whereas methylprednisolone promotes neurological recovery in humans. The aim of this research was to explore the effectiveness of ensheathing cells and methylprednisolone after acute SCI in the adult rat. Three studies were conducted to accomplish this goal. In the first study, a new method of purifying ensheathing cells was developed, resulting in a final population of ensheathing cells that were 93% pure. In the second study, the ability of a modified directed forepaw reaching (DFR) apparatus to accurately assess function of the corticospinal tract (CST) was examined. The data demonstrated that the modified apparatus prevented extinguishing of DFR behavior after SCI. In addition, the modified apparatus allowed for the collection of quantitative data to accurately assess CST function after bilateral, cervical spinal cord lesions. In the third study, the effectiveness of combining ensheathing cells and methylprednisolone after SCI was investigated. After lesioning the CST in adult rats, a purified population of ensheathing cells was transplanted into the lesion, and methylprednisolone was administered for 24 hours. At six weeks post injury, functional recovery was assessed by measuring successful DFR performance. Axonal regeneration was analyzed by counting the number of anterogradely labeled CST axons caudal to the lesion. Lesioned control rats, receiving either no treatment or vehicle, had abortive axonal regrowth (1 mm) and poor DFR success (38% and 42%, respectively). Compared to controls, rats treated with methylprednisolone for 24 hours had significantly more axons at 7 mm caudal to the lesion, and DFR performance was significantly improved (57%). Rats that received ensheathi

DTIC

Cells (Biology); Injuries; Rats; Spinal Cord

20040055640 Uniformed Services Univ. of the Health Sciences, Bethesda, MD

Cullin 5 Expression in the Rat: Cellular and Tissue Distribution, and Changes in Response to Water Deprivation and Hemorrhagic Shock

Ceremuga, Thomas E.; Feb. 28, 2003; 157 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421696; No Copyright; Avail: CASI; A08, Hardcopy

Protein degradation by ubiquitination and the 26S proteasome is used to modulate the steady-state levels of proteins and to regulate cellular processes. Proteins become targets of the proteasome by covalent attachment of polyubiquitin chains, which requires three main enzymes (E1, E2, and E3). It is the E3 ubiquitin ligases that control the selection and specificity of substrate ubiquitination. Cullin- 5 (Cul-5), a member of the cullin family of E3 ubiquitin ligases, remains obscure. The goals of this research project were to characterize Cul-5, and investigate its response to cellular stresses of water deprivation and hemorrhagic shock in the rat.

DTIC

Shock (Physiology); Water Deprivation

20040055645 Dana Farber Cancer Inst., Boston, MA

The Mechanism of Retinoblastoma Protein-Mediated Terminal Cell Cycle Arrest

Rajabi, Hasan N.; Sep. 2003; 21 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0224

Report No.(s): AD-A421731; No Copyright; Avail: CASI; A03, Hardcopy

A characteristic feature of most cancers is an increase in the percentage of proliferating cells, often referred to as mitotic index. Upon differentiation most cells in the body enter an irreversible terminal cell cycle arrest. Failure to maintain this growth-arrested state is thought to contribute significantly to the development of most forms of human cancer including those of the breast. The retinoblastoma protein (pRb) has been shown to participate in the maintenance of a terminal cell cycle arrest (12), however, the mechanism by which it accomplishes this task are not understood. This is in contrast to the role of PRb in controlling proliferation in a cycling population, which is well characterized. The purpose of these studies described here are to elucidate the molecular mechanism by which pRb maintains a terminal cell cycle arrest. Initial focus is placed on the study on skeletal muscle differentiation since both in vitro and in vivo studies have clearly demonstrated a role for pRb in maintaining an arrested state following terminal differentiation of this tissue type (12, 17). Information gained from this analysis will then be applied to study of mammary gland differentiation. Inactivation of the retinoblastoma gene (Rb) is a common event in the development of several human cancers including those of breast. These studies thus likely have direct bearing of how loss of Rb contributes to the development of cancer.

DTIC

Cancer; Mammary Glands; Proteins; Retina; Tumors

20040055646 Baylor Coll. of Medicine, Houston, TX

To Ascertain Distinctive Gene Expression Patterns for the Prediction of Docetaxel (Taxotere) Chemosensitivity or Chemoresistance in Human Breast Cancer

Chang, Jenny C.; Oct. 2003; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-3-0132

Report No.(s): AD-A421734; No Copyright; Avail: CASI; A03, Hardcopy

Chemotherapy is of proven benefit in reducing the risk of death for a subset of patients with early breast cancer, but doctors have problems deciding exactly who should receive this therapy, and which therapy will be most effective for a given patient. As a result, some patients needlessly receive chemotherapy. Even in those patients who clearly require chemotherapy, doctors cannot identify those patients whose tumors might not be responsive to a particular chemotherapy drug. Chemotherapy is also associated with high costs and toxicity including nausea, vomiting, damage to nerves, etc. and increased risk of infections that are sometimes life threatening. The emerging cDNA array technology provides a means to comprehensively appreciate genetic variations in different breast tumors, and may be utilized as a test for chemotherapy sensitivity. Taxotere has one of the highest response rates in breast cancer, and is widely prescribed for the treatment of breast cancer. The aims of this study are therefore, to investigate and validate differential gene expression patterns from core biopsies from patients whose breast tumors either shrank after Taxotere chemotherapy, or failed to respond. These genes whose expression patterns are associated with Taxotere response could be used to create a simple test of predictor genes to help doctors treat breast cancer more effectively.

DTIC

Cancer; Chemotherapy; Gene Expression; Mammary Glands

20040055647 Alabama Univ., Birmingham, AL

Interdisciplinary Breast Cancer Training Program

Lamartiniere, Coral A.; Sep. 2003; 19 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0119

Report No.(s): AD-A421736; No Copyright; Avail: CASI; A03, Hardcopy

The goal of the University of Alabama at Birmingham Interdisciplinary Breast Cancer Training Program (IBCTP) is to educate and train predoctoral students in a multidisciplinary environment with a focus on breast cancer research. The aims are to l)recruit predoctoral trainees to the Interdisciplinary Breast Cancer Training program; 2) assure that predoctoral trainees obtain a broad-based breast cancer education and carry out interdisciplinary breast cancer research; 3)administer this program with sufficient oversight to ensure high-quality education and training, efficient completion of degree requirements, and productive research careers. For academic year 2003-2004, we recruited 3 new students, resulting in a total of 9 students in the IBCTP. The previous 6 students are in good academic standing. The IBCTP hosted 9 scientists to present seminars on cancer related research and to talk to the predoctoral trainees. The Breast Cancer Causation and Regulation course and Breast

Cancer Journal Club reveived 'very good' evaluations. One second year student and mentor submitted and received a Susan Komen predoctoral award for breast cancer research, and two new research grants were awarded to faculty, in part, because of student data used in the preparation of the grant applications. Five abstracts/presentations were made by 3 students at breast cancer related scientific meetings.
DTIC
Cancer; Education; Mammary Glands

20040055648 Cleveland Clinic Foundation, Cleveland, OH
A Novel Role for Integrin-Linked Kinase in Breast Cancer
Karnik, Pratima; Sep. 2003; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0205
Report No.(s): AD-A421737; No Copyright; Avail: CASI; A03, Hardcopy

Allelic loss at the short arm of chromosome 11 is one of the most common and potent events in the progression and metastasis of breast cancer. Here, we present evidence that the Integrin-Linked Kinase (ILK) gene maps to the commonly deleted chromosome 11p15.5 and suppresses malignant growth of human breast cancer cells both in vitro and in vivo. ILK is expressed in normal breast tissue but not in metastatic breast cancer cell lines or in advanced breast cancers. Transfection of wild-type ILK into the MDA-MB-435 mammary carcinoma cells potently suppressed their growth and invasiveness in vitro, and reduced the cells' ability to induce tumors and metastasize in athymic mice. Conversely, expression of the ankyrin repeat or catalytic domain mutants of ILK failed to suppress the growth of these cells. Growth suppression by ILK is not due to apoptosis but is mediated by its ability to block cell cycle progression in the Gi phase. These findings directly demonstrate that ILK deficiency facilitates neoplastic growth and suggest a novel role for the ILK gene in tumor suppression.
DTIC
Cancer; Enzymes; Mammary Glands; Phosphorus

20040055649 Cornell Univ., Ithaca, NY
The Role of RASGRF1 in Neurofibromatosis- Validating a Potential Therapeutic Target
Soloway, Paul D.; Jun. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0652
Report No.(s): AD-A421738; No Copyright; Avail: CASI; A01, Hardcopy

The goal of this research is to expand the knowledge of the genes that contribute to neurofibromatosis beyond the GAPi-related domain in NFl. It is hypothesized that the gene encoding RASGRFl, a GTP exchange factor (GEF), is one of these genes. Over-expression of Rasgrfl is predicted to exacerbate neurofibromatosis while Rasgrfl silencing will attenuate it. Two novel strains of mice ideally suited to test this hypothesis that were developed in my lab are being used to evaluate the role or Rasgrfl on the manifestations of neurofibromatosis type 1. One strain of mice over-express Rasgrfl, the other has diminished expression. These were crossed with a mouse model for NFl and the effects of the altered level of RASGRFl on tumorigenesis were monitored. The results indicate that over-expression of Rasgrfl significantly hastens the time of tumor onset and increase the overall frequency of tumor incidence. Tn contrast, diminished expression modestly delays the timing of tumor development, but overall frequency of tumor development is not changed.
DTIC
Fibrosis; Targets; Therapy

20040055650 Alabama Univ., Birmingham, AL
Endothelial Progenitors as Vectors for Systemic Gene Therapy of Breast Cancer
Blackwell, Jerry L.; Aug. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0116
Report No.(s): AD-A421740; No Copyright; Avail: CASI; A03, Hardcopy

One promising new treatment modality for breast cancer is the application of vector- mediated gene therapy. A noted problem with many vector systems however, including both viral and non-viral vectors, used for gene therapy is the lack of efficient and targeted delivery to the primary tumor and disseminated metastases. To address this issue, we propose the use of CD34+ and/ or Flk-l+ endothelial progenitor cells (EPCs), which have the propensity of homing to sites of neovascularization. Key to the success of this approach is efficient genetic modification of the EPCs. In this regard, we have shown previously that CD34+ EPCs are efficiently transduced using live-viral vectors with relatively low doses and associated toxicity. We hypothesize that the modified EPCs can, after intravascular injection, localize into sites of tumor

neovascularization and deliver therapeutic payloads. Further, the natural targeting capacity of EPCs will allow their use vectors for gene therapy of both local and disseminated breast cancer.
DTIC
Cancer; Gene Therapy; Mammary Glands

20040055651 University of South Florida, Tampa, FL
Improving Breast Cancer Research Through Automated Matching of Patients to Clinical Trials
Hall, Lawrence O.; Aug. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0244
Report No.(s): AD-A421741; No Copyright; Avail: CASI; A03, Hardcopy

An enhanced Web based prototype intelligent agent/expert system for matching breast cancer patients to clinical trials has been built. It allows for cost preferences to be entered. Therefore, the system user can choose to rule patients out of trials as quickly as possible without regard to the cost of tests necessary to do this. A user can choose to have questions appear so that the patient is ruled out of the trial with the minimal set of costs (tests) or can choose some combination of approaches. The system has been tested with 14 protocols and designed for maximal responsiveness and scalability as new protocols are added. The files of 178 former patients have been used to test the accuracy of the system. Additionally, the files of 169 current patients have been tested for eligibility. Patients for each of the protocols were correctly found eligible for one or more trials. We found 160 new matching clinical trials for the 169 current patients. A probable listed prototype system has been developed to reorder questions based on the probability they will determine the patient is ineligible for trial and preliminary experiments have shown up to 13% less questions will be required on average. We have also developed a prototype system to quickly add new clinical trials. This has been successfully used by novices to enter new trials.
DTIC
Cancer; Expert Systems; Mammary Glands; Patients

20040055937 Armed Forces Research Inst. of Medical Sciences, Bangkok, Thailand
Research and Operational Support for the Study of Militarily Relevant Infectious Diseases of Interest to USA and Royal Thai Governments
Sangkharomaya, Suebpong; Nitayaphan, Sorachai; Jan. 2004; 64 pp.; In English
Contract(s)/Grant(s): DAMD17-01-2-005
Report No.(s): AD-A421356; No Copyright; Avail: CASI; A04, Hardcopy

Cooperative agreement # DAMDl7-Ol-2-OOO5 was implemented January 1, 2001 to provide funding support for Royal Thai Army at Armed Forces Research Institute of Medical Sciences (AFRIMS) engaged in research activated in collaboration with US Army. Administrative, logistical, and scientific personnel required to support the ongoing US Army AFRIMS research efforts, and utilities and maintenance required to support the US Army AFRIMS research effort.
DTIC
Governments; Infectious Diseases; United States

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*.

20040055454 Naval Health Research Center, San Diego, CA
Trial-to-Trial Variance in Choice Reaction Time as a Measure of the Effect of Stimulants During Sleep Deprivation
Babkoff, Harvey; Kelly, Tamsin L.; Naitoh, Paul; Jan. 1998; 18 pp.; In English
Contract(s)/Grant(s): Proj-MM3930
Report No.(s): AD-A421224; NHRC-98-27; No Copyright; Avail: CASI; A03, Hardcopy

Performance stability, as assessed by trial-to- trial variance in a choice reaction time (RT) task, was evaluated as a measure of stimulant effects on performance during sleep deprivation. Administration of methyiphenidate, pemoline, and a placebo began 16 hr into a 64-hr sleep- deprivation protocol. Performance stability deteriorated significantly. especially during the circadian nadirs. In absolute terms, sleep depriva- tion increased trial-to-trial variance more than it increased the mean correct RT. In ad- dition, this measure demonstrated differing effects of the 2 drug regimens. Pemoline, at a dose of 37.5 mg every

12 hr, significantly reduced the overall average effeets of sleep loss on performance stability during the first 24 hr of drug administration. Pemoline also reduced circadian-related instability in performance throughout the study. Methylphenidate, at a dose of 10 mg every 6 hr, counteracted circadian-related instability in performance during the first 24-hr period of drug administration (1640 hr of sleep deprivation) but not during the second 24-hr period (4O%64 hr of sleep de- privation). Methylphenidate did not significantly affect the overall average effects of sleep loss on performance stability. Thus, trial-to-trial variance appears to be a valu- able measure for elucidating stimulant effects during sleep deprivation.
DTIC
Human Performance; Reaction Time; Selection; Sleep Deprivation; Stimulants

20040055463 Naval Health Research Center, San Diego, CA
A Survey of Self-Reported Injuries Among Special Boat Operators
Ensign, Wayne; Hodgdonl, James A.; Prusaczyk, W. .K.; Ahlers, Steven; Shapiro, Dave; Jan. 2000; 23 pp.; In English
Report No.(s): AD-A421234; NHRC-00-48; No Copyright; Avail: CASI; A03, Hardcopy

Special Operations place great physical demands on personnel. In most Navy settings, greater physical demands are associated with greater musculoskeletal injury rates. Within the Special Operations community, Special Boat operators have a unique set of risks. Small boats operating in the open ocean are subject to large shock and vibration forces. Exposure to such forces can lead to discomfort, injury and performance degradation. In an effort to begin assessing the prevalence of injuries related to operations in small Special Operations craft, a self-report survey of injuries (SBUlS) was administered to 154 operator personnel drawn from Special Boat Units 12, 20 and 22. Sample mean age was 32.0 +/- 5.9 yr., mean years of military service was 12.0 +/- 5.5, and mean time in Special Boats was 4.7 +/- 3.0 yr. The SBUlS obtained demographic information, unit assignment and role information, past general pain levels, details up to three specific injuries, and exercise history information. Specific injury information included type and location of injury, and type and duration of care for that injury. The most prevalent type of injury was sprains and strains followed by disc problems and trauma. The most prevalent injury sites were the lower back, knee and shoulder. 94.8% injuries occurred on the job. The sample population represented 722 person-years of Special Boat Unit exposure. In this sample, injuries resulted in 145 days of hospitalization, 929 days of sick leave, 4,223 days of limited duty, 4,218 days of limited job/mission performance, 2, 294 days of lost mission training time, and 4,089 days of lost physical conditioning time. It was possible to compare hospitalization rates for this sample with rates for the Navy as a whole. Only constructionmen (CN), seamen (SN), firemen (FN), and airmen (AN) had greater hospitalization rates than SBU respondents.
DTIC
Injuries; Surveys

20040055471 Naval Health Research Center, San Diego, CA
Modeling Run Test Validity: A Meta-Analytic Approach
Vickers, Ross R., Jr; Jan. 2002; 42 pp.; In English
Report No.(s): AD-A421244; NHRC-02-27; No Copyright; Avail: CASI; A03, Hardcopy

Previous summaries of the research evidence have shown that run tests are valid indicators of VO2max, but analysis also indicated that validity differed from one test situation to another. This study utilized data from 166 samples (N = 5,757) to test the general hypothesis that differences in testing methods could account for the cross- situational variation in validity. Only runs >2 km or >12 min were included. These criteria restricted attention to tests with maximal validity. The estimated average validity (r= .75). Validity was higher for fixed-time runs than for fixed- distance runs and in samples with greater variability in VO2max. This difference must be interpreted cautiously because studies that directly compared these 2 types of run test have found little or no difference. Validity was not related to the age, gender, fitness, or running experience of the population tested or to the method used to measure VO2max. A random- effects model estimated the 95% credibility interval for the validity of run tests at r = .52 to r = .84. The evidence was consistent with the view that some methods factors affect run test validity, but tests are equally valid for different types of people. This summary provides a point of. departure for the design and interpretation of future run test validation studies.
DTIC
Physical Fitness

20040055476 Army Research Inst. of Environmental Medicine, Natick, MA
Total Energy Expenditure Estimated Using Foot- Ground Contact Pedometry
Hoyt, Reed W.; Buller, Mark J.; Santee, William R.; Yokota, Miyo; Weyand, Peter G.; Nov. 2004; 16 pp.; In English
Report No.(s): AD-A421249; USARIEM-M-03-47; No Copyright; Avail: CASI; A03, Hardcopy

Routine walking and running, by increasing daily total energy expenditure (TEE), can play a significant role in reducing the likelihood of obesity. The objective of this field study was to compare TEE estimated using foot-ground contact time (Tc)-pedometry (TEEPEDO) with that measured by the criterion doubly labeled water (DLW) method. Eight male U. S. Marine test volunteers 27 +/- 4 YEARS of AGE (MEAN +/- SD); weight = 83.2 +/- 10.7 kg; height = 182.2 +/- 4.5 cm; body fat = 17.0 +/- 2.9% engaged in a field training exercise were studied over 2 days. TEEPEDO was defined as (calculated resting energy expenditure + estimated thermic effect of food + metabolic cost of physical activity), where physical activity was estimated by Tc-pedometry. Tc-pedometry was used to differentiate inactivity, activity other than exercise (i.e. , non-exercise activity thermogenesis, or NEAT), and the metabolic cost of locomotion (MLoco), where MLoco was derived from total weight (body weight + load weight) and accelerometric measurements of Tc. TEEPEDO data were compared with TEEs measured by the DLW (2H218O) method (TEEDLW): TEEDLW = 15.27 +/- 1.65 MJ/day and TEEPEDO = 1529 +/- 0.83 MJ/day. Mean bias (i.e., TEEPEDO - TEEDLW) was 0.02 MJ, and mean error (SD of individual differences between TEEPEDO and TEEDLW) was 1.83 MJ. The Tc-pedometry method provided a valid estimate of the average TEE of a small group of physically active subjects where walking was the dominant activity.
DTIC
Energy Consumption; Estimating; Walking

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*.

20040053287 RECOM Technologies, Inc., Moffett Field, CA, USA, Caelum Research Corp., Moffett Field, CA, USA
Fast Transformation of Temporal Plans for Efficient Execution
Tsamardinos, Ioannis; Muscettola, Nicola; Morris, Paul; [1998]; 8 pp.; In English; American Association for Artificial Intelligence, 26-30 Jul. 1998, Madison, WI, USA
Contract(s)/Grant(s): NAS2-14219; NSF IRI-92-58392; NSF IRI-96-19579; 632-30-00; Copyright; Avail: CASI; A02, Hardcopy

Temporal plans permit significant flexibility in specifying the occurrence time of events. Plan execution can make good use of that flexibility. However, the advantage of execution flexibility is counterbalanced by the cost during execution of propagating the time of occurrence of events throughout the flexible plan. To minimize execution latency, this propagation needs to be very efficient. Previous work showed that every temporal plan can be reformulated as a dispatchable plan, i.e., one for which propagation to immediate neighbors is sufficient. A simple algorithm was given that finds a dispatchable plan with a minimum number of edges in cubic time and quadratic space. In this paper, we focus on the efficiency of the reformulation process, and improve on that result. A new algorithm is presented that uses linear space and has time complexity equivalent to Johnson s algorithm for all-pairs shortest-path problems. Experimental evidence confirms the practical effectiveness of the new algorithm. For example, on a large commercial application, the performance is improved by at least two orders of magnitude. We further show that the dispatchable plan, already minimal in the total number of edges, can also be made minimal in the maximum number of edges incoming or outgoing at any node.
Author
Occurrences; Algorithms; Costs

20040053291 NASA Ames Research Center, Moffett Field, CA, USA
Perceptual Properties of Immersive Environments: Differentiating Necessary, Sufficient, and Nice
Kaiser, Mary K.; May 27, 1998; 24 pp.; In English; SIGGRAPH 1998, 19-24 Jul. 1998
Contract(s)/Grant(s): 199-06-12; No Copyright; Avail: CASI; A03, Hardcopy

Immersive environments for virtual reality in flight simulation are reviewed in this viewgraph presentation. The presentation covers the effects of latency on the realism of an immersive environment, state of the art graphics from 1978 and 1998, billboarding, the resolution and texture of Hi-Lo Stereo, and the aesthetics of virtual environments.
CASI
Flight Simulation; Virtual Reality; Visual Perception

20040053295 Sterling Software, Inc., Moffett Field, CA, USA

Securing the User's Work Environment

Cardo, Nicholas P.; [2004]; 1 pp.; In English; Gray User Group Conference, 15-19 Jun. 1998, Stuttgart, Germany

Contract(s)/Grant(s): NAS2-13619; RTOP 519-40-42; No Copyright; Avail: Other Sources; Abstract Only

High performance computing at the Numerical Aerospace Simulation Facility at NASA Ames Research Center includes C90's, J90's and Origin 2000's. Not only is it necessary to protect these systems from outside attacks, but also to provide a safe working environment on the systems. With the right tools, security anomalies in the user s work environment can be deleted and corrected. Validating proper ownership of files against user s permissions, will reduce the risk of inadvertent data compromise. The detection of extraneous directories and files hidden amongst user home directories is important for identifying potential compromises. The first runs of these utilities detected over 350,000 files with problems. With periodic scans, automated correction of problems takes only minutes. Tools for detecting these types of problems as well as their development techniques will be discussed with emphasis on consistency, portability and efficiency for both UNICOS and IRIX.

Author

Aerospace Environments; Security; Detection; Anomalies; Directories

20040053452 NASA Ames Research Center, Moffett Field, CA, USA

Status of Regenerative Life Support Research and Technology Program at NASA Ames Research Center

Kliss, Mark; [1998]; 1 pp.; In English; IES-CELSS International Conference on Closed Ecological Systems for Terrestrial and Space Applications, 21-23 Jul. 1998, Japan

Contract(s)/Grant(s): 199-61-01; No Copyright; Avail: Other Sources; Abstract Only

Future long duration manned space missions will require life support systems that minimize resupply requirements and ultimately approach self-sufficiency in space. This presentation will provide an overview of the Advanced Life Support program unclassified fundamental research and technology development activities being conducted at NASA Ames Research Center. Top level program goals and technical objectives, and the role of NASA-Ames within the Advanced Life Support program, will be reviewed. The presentation will focus on FY97 and FY98 research tasks that were directed at physicochemical processes with emphasis on system closure and self-sufficiency. Research areas include solid waste processing and resource recovery, water recycling, air regeneration, and regenerative system dynamics. Proposed future work and potential applications of this research to both terrestrial and space closed ecology experimentation in space will be addressed.

Author

Life Support Systems; Recycling; Regeneration (Engineering); Solid Wastes; Waste Water; Ecology

20040055012 Lockheed Martin Engineering and Science Services, Moffett Field, CA, USA

A Thermal Physiological Comparison of Two HazMat Protective Ensembles With and Without Active Convective Cooling

Williamson, Rebecca; Carbo, Jorge; Luna, Bernadette; Webbon, Bruce W.; [1998]; 40 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Wearing impermeable garments for hazardous materials clean up can often present a health and safety problem for the wearer. Even short duration clean up activities can produce heat stress injuries in hazardous materials workers. It was hypothesized that an internal cooling system might increase worker productivity and decrease likelihood of heat stress injuries in typical HazMat operations. Two HazMat protective ensembles were compared during treadmill exercise. The different ensembles were created using two different suits: a Trelleborg VPS suit representative of current HazMat suits and a prototype suit developed by NASA engineers. The two life support systems used were a current technology Interspiro Spirolite breathing apparatus and a liquid air breathing system that also provided convective cooling. Twelve local members of a HazMat team served as test subjects. They were fully instrumented to allow a complete physiological comparison of their thermal responses to the different ensembles. Results showed that cooling from the liquid air system significantly decreased thermal stress. The results of the subjective evaluations of new design features in the prototype suit were also highly favorable. Incorporation of these new design features could lead to significant operational advantages in the future.

Author

Cooling; Hazardous Materials; Physiology; Protective Clothing; Heat Tolerance; Safety Devices

20040055542 Army Research Inst. of Environmental Medicine, Natick, MA

Performance of an Ambulatory Cardiorespiratory Monitoring System During Rest and Exercise

Karis, Anthony J.; Buller, Mark J.; Wallace, Robert F.; Cymerman, Allen; Fulco, Charles S.; Oct. 2003; 20 pp.; In English Report No.(s): AD-A421341; TN04-01; No Copyright; Avail: CASI; A03, Hardcopy

The aim of this study was to evaluate the performance of a unique ambulatory system when used with physically active individuals. Seven physically active male volunteers were monitored during three different periods under varying exercise conditions. The monitoring sessions were approximately 18 hours in duration and consisted of no activity, sedentary activity, and vigorous exercise. After the monitoring sessions the system was downloaded and signal performance was analyzed for electrocardiogram (ECG), respiration rate (RESP), and blood oxygen saturation (SpO2). The results showed that signal performance across all activity levels and sensor types was able to provide an acceptable signal 84% of the time (ECG=96.9 +/- 3.0%, RESP=71.2 +/- 13.1%, and SpO2=83.7 +/ - 13.8%). With the exception of the RESP signal, this instrument demonstrated that it could reliably provide the same accuracy in active persons as it does in sedentary persons. (4 tables, 3 figures, 12 refs.)

DTIC

Bioinstrumentation; Electrocardiography; Exercise Physiology; Heart Function; Medical Services; Physical Exercise; Portable Equipment; Respiration

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*.

20040053333 NASA Ames Research Center, Moffett Field, CA, USA, Lockheed Martin Corp., USA

Worms on the International Space Station

Szewczyk, Nate; Kirven-Brooks, Melissa; Conley, Cassie; [2002]; 1 pp.; In English; West Coast Worm Meeting, 10-13 Aug. 2002, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

C. elegans was proposed as a model system for space biology studies in 1991 and has since flown on STS-42, STS-76, and STS-95. Data obtained from these flights have confirmed that C. elegans requires adequate in flight oxygenation and displays an increased rate of mutation, much like other organisms in space. Unlike vertebrates, C. elegans has been observed to successfully complete two continuous full life cycles in space without gross developmental abnormalities. These observations, could with the utility of C. elegans as a terrestrial, fully sequenced, model system make C. elegans a good candidate for long term research onboard the International Space Station (ISS). We are currently working on technology to support biological studies aboard the ISS. A component of this effort is in the development of the Space Station Biological Research Program (SSBRP) Incubator which will be able to house organisms at a constant temperature setpoint ranging from 4deg C to 45deg C. The SSBRP Incubator provides air exchange, power, data and video ports and, when placed in the collaborative NASA/NASDA 2.5M centrifuge rotor, will be capable of providing a lg gravity control. Current plans for validation of the Incubator include video monitoring and periodic sampling of C. elegans in the Incubator onboard the ISS. Once returned to earth, samples will be distributed for analysis via a specimen sharing plan and analyzed for gene expression and other parameters of growth and development in space flight. These data should provide the C. elegans research community with a baseline from which to propose studies for future flights. We have also been developing an appropriate method of culturing C. elegans in liquid media in order to remove the need for the crew to assure that strains are properly fed. Currently, we are growing strains in the chemically defined, axenic, media developed by Dr. Nancy Lu. Wild-type animals complete multiple generations and appear generally healthy after being grown in unchanged media for a minimum of three to four weeks. To assure proper oxygenation we have chosen to grow animals in ten milliliter OptiCells(TradeMark). The choice of the OptiCell(TradeMark) also allows for automation of culturing as demonstrated for cell cultures grown in the OptiCell(TradeMark). Arrangements have been made for the liquid media to be commercially produced by Mediatech, Inc. and OptiCells(TradeMark) are available from BioCrystal Ltd.

Author

Worms; Exobiology; International Space Station; Oxygenation; Life (Durability); Gene Expression

20040055327 California Univ., Berkeley, CA, USA

Europa's Icy Crust as a Habitat and Repository of Life

Lipps, Jere H.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 44; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Life, if it exists or existed on Europa, could be abundant and varied, as well as preservable in the surface ice. Europa's probable sub-ice ocean would provide a large number of habitats. By analogy with Earth's icy habitats, many ecologic settings are likely in and on the ice, as well as the on the ocean's floor and in the water column. All of these could have been preserved in place or transported to the icy crust through oceanographic, geologic, glaciologic or biologic processes. Habitats in the ice include the large fissures and refrozen areas, areas below clear ice that transmits light, tiny cracks, brine channels, inter-crystal water films, ice surfaces in the water, and oases caused by impact, volcanic heat, or surface meltwater. Some of these places might be inhospitable to life because of extreme chemical, radiation or other conditions, but are included here for more careful consideration, given the tenacity of life in Earth's ice-influenced environments. The ice would likely preserve current life and fossil organisms, traces or biomarkers once they were incorporated into it. Later geologic processes may have brought them close to, or exposed them, at the surface where they could be imaged and sampled. Europa's geology indicates a relatively young, dynamic crust that created many terrains and exposures that could be targeted for further exploration. These sites include the areas of refrozen ocean, the ridges and rills associated with fissures, low areas where water may have collected, and dirty ice that may include benthic material floated to the surface by bottom anchor ice or gouged by ice, as well as the wide variety of ice habitats. Pelagic life might be preserved abundantly. Because the ice on Europa varies in age and a stratigraphy can be assembled, a history of life may also be reconstructed. Thus, a sampling strategy for life and its history on Europa should include paleontological and molecular biological objectives that would clearly document the present and former existence of life on Europa. The strategy should include pre-landing detailed imaging of sites with probable preserved or extant ice habitats, followed by surface exploration with impactors, penetrators, ice clippers, or rovers to outcrop and surface materials.
Author
Europa; Ice; Extraterrestrial Life; Habitats; Crusts

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*.

20040052870 NASA Langley Research Center, Hampton, VA, USA
Using High Resolution Design Spaces for Aerodynamic Shape Optimization Under Uncertainty
Li, Wu; Padula, Sharon; March 2004; 32 pp.; In English
Contract(s)/Grant(s): WU 762-20-61-01
Report No.(s): NASA/TP-2004-213003; L-18355; No Copyright; Avail: CASI; A03, Hardcopy

This paper explains why high resolution design spaces encourage traditional airfoil optimization algorithms to generate noisy shape modifications, which lead to inaccurate linear predictions of aerodynamic coefficients and potential failure of descent methods. By using auxiliary drag constraints for a simultaneous drag reduction at all design points and the least shape distortion to achieve the targeted drag reduction, an improved algorithm generates relatively smooth optimal airfoils with no severe off-design performance degradation over a range of flight conditions, in high resolution design spaces parameterized by cubic B-spline functions. Simulation results using FUN2D in Euler flows are included to show the capability of the robust aerodynamic shape optimization method over a range of flight conditions.
Author
High Resolution; Shape Optimization; Variational Principles; Parameter Identification; Robustness (Mathematics); Computational Fluid Dynamics; Airfoils; Aerodynamic Coefficients

20040053296 NASA Ames Research Center, Moffett Field, CA, USA, Caelum Research Corp., Moffett Field, CA, USA
Distributed Control with Collective Intelligence
Wolpert, David H.; Wheeler, Kevin R.; Tumer, Kagan; [2004]; 7 pp.; In English; Neural Information Processing Systems Conference, 1 Dec. 1998, Denver, CO, USA
Contract(s)/Grant(s): NAS2-14217; 632-30-00; No Copyright; Avail: CASI; A02, Hardcopy

We consider systems of interacting reinforcement learning (RL) algorithms that do not work at cross purposes , in that their collective behavior maximizes a global utility function. We call such systems COllective INtelligences (COINs). We present the theory of designing COINs. Then we present experiments validating that theory in the context of two distributed control problems: We show that COINs perform near-optimally in a difficult variant of Arthur's bar problem [Arthur] (and in

particular avoid the tragedy of the commons for that problem), and we also illustrate optimal performance in the master-slave problem.
Author
Algorithms; Artificial Intelligence; Mathematical Models; Neural Nets; Distributed Processing; Control Theory

20040053355 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
Journal of the Chinese Institute of Engineers, Volume 27, No. 1
Chen, Shun-Tyan, Editor; Tsai, Hsien-Lung, Editor; Shiou, Fang-Jung, Editor; Lee, Liang-Sun, Editor; Young, Der-Liang, Editor; Pan, Ching-Tsai, Editor; Chen, Jean-Lien, Editor; Chung, Chung-Ping, Editor; Chao, Ching-Kong, Editor; Chang, Kai, Editor, et al.; January 2004; ISSN 0253-3839; 160 pp.; In English; Copyright; Avail: Other Sources

This journal consists of original research papers on all aspects of engineering and related fields in applied sciences. The contents include: 1) Using Context-Sensitive Neuro-Fuzzy Systems for Nonlinear System Identification; 2) A Nonlinear Observer-Based Sliding-Mode Control for Piezoelectric Actuator Systems: Theory and Experiments; 3) Simultaneous Tracking and Almost Disturbance Decoupling for Nonlinear Systems with Uncertainties; 4) Fuzzy Sliding-Mode Controlled Induction Motor Servo Drive Based on Real-Time Genetic Algorithm; 5) LMI Approach to Simultaneous Output-Feedback Stabilization for Discrete-Time Interval Systems; 6) Design of a Multi-Layer Fuzzy Logic Controller Using Pole Assignment for Bipedal Walking at Varying Speeds; 7) Estimating the Aging Trend of Dry-Type Current Transformer; 8) Right-Angled Triangle Property in inversion of General Tridiagonal Matrices; 9) A New Method for Designing a Tool Database System of Automated Manufacturing Systems; 10) Numerical Study of Spacing Effect on Unsteady Blade Aerodynamics in a Transonic Turbine Stage with Different Turbulence Models; 11) Lock-On Phenomena in Cavity Flows; 12) Spectra and Autocorrelation Functions of a Geometrically Nonlinear Beam; 13) Robust Multiple Mobile Angle Tracking Using H Filtering Algorithm; 14) A Design of Fast-Locking without Overshoot Frequency-Locked Servo System by Fuzzy Control Technique; 15) Ranking Alternatives via Maximizing Set and Minimizing Set Based Fuzzy MCDM Approach; and 16) The design of an RF Monolithic CMOS Down-Converter.
CASI
Engineering; Periodicals; Science; Research and Development; China

20040053627 Swedish Defence Research Establishment, Linkoeping
Survey of Methods for Detection of Extended Ground Targets in EO/IR Imagery
Karlholm, J.; Ulvklo, M.; Nyberg, S.; Lauberts, A.; Linderhed, A.; Jun. 2003; In English
Report No.(s): PB2004-102641; FOI-R-0892-SE; Copyright; Avail: National Technical Information Service (NTIS)

The report summarizes a study of methods for detection of extended ground targets in EO/IR imagery conducted at FOI Linkoping. The following topics are treated: target appearance variability; generation and selection of image features; detectors and classifiers; computationally efficient search strategies. The principal result is the identification of a class of algorithms designed as a sequence of increasingly complex classifiers, which, in conjunction with efficient feature extraction, permits (near) real-time processing of video sequences on standard desktop computers.
NTIS
Image Processing; Target Acquisition

20040053628 Helsinki Univ. of Technology, Espoo, Finland
Security in Sensor Networks
Blomqvist, E.; Feb. 2003; In English
Report No.(s): PB2004-102661; Copyright; Avail: National Technical Information Service (NTIS)

This document aims at studying things. First there is a need to define and describe the terms Ad Hoc Network and Sensor Network in a structured way. There have so far been no clear and unique definitions of these terms and no structured way of describing such networks. Second, there is a need for a summary and categorization of existing security measures for both general Ad Hoc Networks and Sensor Networks. The final question is if it is possible to, using a realistic example of a Sensor Network, suggest a full covering security system for that network, with today's knowledge of the area.
NTIS
Sensors; Warning Systems

20040053638 National Inst. of Standards and Technology, Gaithersburg, MD
TIN Techniques for Data Analysis and Surface Construction
Witzgal, C.; Bernal, J.; Cheok, G. S.; Jan. 2004; 76 pp.; In English
Report No.(s): PB2004-104089; NISTIR-7078; No Copyright; Avail: CASI; A05, Hardcopy

This report addresses the task of meshing point clouds by triangulated elevated surfaces referred to as TIN surfaces. It describes the general features of this approach, and refers to prototype TIN software employed at NIST for research into the analysis of 3D point data acquired by LADAR instrumentation. Inherent in the TIN approach is the establishment of neighbor relations between data points, which provide the basis for various smoothing, filtering, and screening procedures. In particular, the TIN structure is utilized to define the boundary of a planar point set. The report provides theoretical background for subsequent documentation of experimental results about the accuracy of LADAR data and their processing by TIN methods.
NTIS
Laser Range Finders; Optical Radar; Data Processing

20040053679 Lawrence Livermore National Lab., Livermore, CA
Mining of Multivariate Temporal Biological Data: A Framework for the Rational Design of Data-Driven Models
Kamimura, R. T.; Bicciato, S.; Shimizu, H.; Alford, J.; Stephanopoulos, G. N.; May 10, 2001; 16 pp.; In English
Report No.(s): DE2004-15006266; UCRL-JC-143802; No Copyright; Avail: Department of Energy Information Bridge
A framework is presented that emphasizes the need to understand the strengths and weaknesses of the data prior to modeling. In short, given a list of constraints, the idea is to let the data sort itself along those guidelines. Once the data has been organized into some coherent faction, the user has a better understanding of what the strengths and weaknesses of the data are as the analysis proceeds. The goal is to understand the character of the data so that the user is not overwhelmed but is able to systematically organize and decompose information so as to facilitate the analysis and build an effective model. The data analyzed is that from an industrial fermentation but the framework presented is generic enough that it can be used in any application involving multivariate time series data, such as time varying microarray measurements.
NTIS
Fermentation; Mining; Multivariate Statistical Analysis; Time Series Analysis

20040053681 Lawrence Livermore National Lab., Livermore, CA
Algorithm for Projecting Points onto a Patched CAD Model
Henshaw, W. D.; May 29, 2001; 16 pp.; In English
Report No.(s): DE2004-15006268; UCRL-JC-144016; No Copyright; Avail: Department of Energy Information Bridge
We are interested in building structured overlapping grids for geometries defined by computer-aided-design (CAD) packages. Geometric information defining the boundary surfaces of a computation domain is often provided in the form of a collection of possibly hundreds of trimmed patches. The first step in building an overlapping volume grid on such a geometry is to build overlapping surface grids. A surface grid is typically built using hyperbolic grid generation; starting horn a curve on the surface, a grid is grown by marching over the surface. A given hyperbolic grid will typically cover many of the underlying CAD surface patches. The fundamental operation needed for building surface grids is that of projecting a point in space onto the closest point on the CAD surface. We describe a fast algorithm for performing this projection, it will make use of a fairly coarse global triangulation of the CAD geometry. We describe how to build this global triangulation by first determining the connectivity of the CAD surface patches. This step is necessary since it is often the case that the CAD description will contain no information specifying how a given patch connects to other neighboring patches. Determining the connectivity is difficult since the surface patches may contain mistakes such as gaps or overlaps between neighboring patches.
NTIS
Algorithms; Computer Aided Design; Structured Grids (Mathematics)

20040053682 Lawrence Livermore National Lab., Livermore, CA
Abstract Description Approach to the Discovery and Classification of Bioinformatics Web Sources
Rocco, D.; Critchlow, T.; May 01, 2003; 16 pp.; In English
Report No.(s): DE2004-15006274; UCRL-JC-152980; No Copyright; Avail: Department of Energy Information Bridge
The World Wide Web provides an incredible resource to genomics researchers in the form of dynamic data sources-e.g. BLAST sequence homology search interfaces. The growth rate of these sources outpaces the speed at which they can be manually classified, meaning that the available data is not being utilized to its full potential. Existing research has not addressed the problems of automatically locating, classifying, and integrating classes of bioinformatics data sources. This paper presents an overview of a system for finding classes of bioinformatics data sources and integrating them behind a unified interface. We examine an approach to classifying these sources automatically that relies on an abstract description format: the service class description. This format allows a domain expert to describe the important features of an entire class of services without tying that description to any particular Web source. We present the features of this description format in the context

of BLAST sources to show how the service class description relates to Web sources that are being described. We then show how a service class description can be used to classify an arbitrary Web source to determine if that source is an instance of the described service. To validate the effectiveness of this approach, we have constructed a prototype that can correctly classify approximately two-thirds of the BLAST sources we tested. We then examine these results, consider the factors that affect correct automatic classification, and discuss future work.
NTIS
Classifications; Data Integration; Biology

20040053684 Lawrence Livermore National Lab., Livermore, CA
Component Technology for High-Performance Scientific Simulation Software
Epperly, T.; Kohn, S.; Kumfert, G.; Nov. 09, 2000; 18 pp.; In English
Report No.(s): DE2004-15006282; UCRL-JC-140549; No Copyright; Avail: Department of Energy Information Bridge

We are developing scientific software component technology to manage the complexity of modem, parallel simulation software and increase the interoperability and re-use of scientific software packages. In this paper, we describe a language interoperability tool named Babel that enables the creation and distribution of language-independent software libraries using interface definition language (IDL) techniques. We have created a scientific IDL that focuses on the unique interface description needs of scientific codes, such as complex numbers, dense multidimensional arrays, complicated data types, and parallelism. Preliminary results indicate that in addition to language interoperability, this approach provides useful tools for thinking about the design of modem object-oriented scientific software libraries. Finally, we also describe a web-based component repository called Alexandria that facilitates the distribution, documentation, and re-use of scientific components and libraries.
NTIS
Computer Programs; Computerized Simulation; Programming Languages

20040053686 Lawrence Livermore National Lab., Livermore, CA
Cell Projection of Meshes with Non-Planar Faces
Max, N.; Williams, P.; Silva, C.; Nov. 27, 2000; 18 pp.; In English
Report No.(s): DE2004-15006288; UCRL-JC-141516; No Copyright; Avail: Department of Energy Information Bridge

Volume rendering converts a scalar function on a 3D volume into varying colors and opacities, and creates an image by integrating the color and opacity effects along viewing rays through each pixel. For data specified on a regular grid, the ray tracing is straightforward, and similar effects can be obtained with 3D textures. For curvilinear or irregular grids, these methods are only applicable after the data has been resampled. An alternative, which works directly on these more general grids, is cell projection. The cells composited onto the image in back to front sorted order. The projections of the edges of a single cell divide the image plane into polygons, which can be scan converted and composited by standard graphics hardware.
NTIS
Color; Pixels; Polygons; Scanners; Textures

20040053688 National Inst. of Standards and Technology, Gaithersburg, MD
Object-Oriented Representation of Electro-Mechanical assemblies Using UML
Rachuri, S.; Han, Y. H.; Feng, S. C.; Roy, U.; Sriram, R. D.; Oct. 2003; 102 pp.; In English
Report No.(s): PB2004-104512; NISTIR-7057; No Copyright; Avail: CASI; A06, Hardcopy

Most electromechanical products are assemblies of several components, for various technical as well as economic reasons. This report provides an object-oriented definition of an assembly model called the Open Assembly Model (OAM) and defines an extension to the NIST Core Product Model (NIST-CPM). The assembly model represents the function, form, and behavior of the assembly and defines both a system level conceptual model and associated hierarchical relationships. The model provides a way for tolerance representation and propagation, kinematics representation, and engineering analysis at the system level. The assembly model is open so as to enable plug-and-play with various applications, such as analysis (FEM, tolerance, assembly), process planning, and virtual assembly (using VR techniques). With the advent of the Internet more and more products are designed and manufactured globally in a distributed and collaborative environment. The class structure defined in OAM can be used by designers to collaborate in such an environment. The proposed model includes both assembly as a concept and assembly as a data structure.
NTIS
Object-Oriented Programming; Electromechanical Devices; Data Structures

20040055267 Lawrence Livermore National Lab., Livermore, CA

Spectral-Element Agglomerate Coarsening in AMGe

Vaassilevski, P. S.; Dec. 06, 2000; 46 pp.; In English

Report No.(s): DE2004-15006289; UCRL-JC-141519; No Copyright; Avail: Department of Energy Information Bridge

In this talk the authors present a highly accurate coarsening algorithm for constructing coarse finite element spaces to be used in algebraic multigrid methods designed for finite element problems on generally unstructured meshes. The new algorithm relies on removing certain percentage of the high oscillating components from the spectrum of local stiffness matrices corresponding to element agglomerations. By doing so, one is guaranteed that the hierarchical complement finite element subspace gives rise to a well conditioned matrix. The coarsening consists of an agglomeration step and of computing a few minimal eigenvectors of the corresponding assembled agglomerate stiffness matrix. The method requires access to the individual element matrices. Based on the topological agglomeration algorithms they employed one is able to define coarse elements and coarse element matrices thus allowing for recursive use of the same algorithm. Some numerical illustration for elliptic problems is also given.

NTIS

Algorithms; Mathematical Models; Equations; Multigrid Methods

20040055268 Lawrence Livermore National Lab., Livermore, CA

Adaptive Signed Distance Transform for Curves with Guaranteed Error Bounds

Laney, D. E.; Duchaineau, M. A.; Max, N. L.; Dec. 04, 2000; 22 pp.; In English

Report No.(s): DE2004-15006290; UCRL-JC-141577; No Copyright; Avail: Department of Energy Information Bridge

In this paper we present an adaptive signed distance approximation for curves in two dimensions. Our transform produces an approximation of the signed distance function of a given curve. A signed distance function defines a scaler field that specifies the minimum distance to a curve for every point in the plane, with the sign distinguishing between inside and outside. Distance functions have been used in image processing for some time. Distance functions in three dimensions are also a promising shape representation with interesting applications in geometric design and surface reconstruction. Furthermore, they are well suited to representing dynamic curves and surfaces with changing topology. However, most research relies on distance transforms which sample a distance function without regard to sampling rate requirements. In addition, most transform algorithms for surfaces do not provide error bounds. Our goal is an adaptive distance transform which provides guaranteed error bounds and enables local refinement operations to increase accuracy. The algorithm should not require preset sampling rates or other constraints. We are investigating distance functions in the plane as a precursor to a full three dimensional method. In two dimensions, the error analysis is simplified, and the behavior of the algorithm and data structures can be clearly visualized.

NTIS

Algorithms; Transformations (Mathematics)

20040055430 Carnegie-Mellon Univ., Pittsburgh, PA, USA

Solving Large Problems Quickly: Progress in 2001-2003

Mowry, Todd C.; Colohan, Christopher B.; Brown, Angela Demke; Steffan, J. Gregory; Zhai, Antonia; April 2004; 105 pp.; In English

Report No.(s): CMU-CS-04-127; No Copyright; Avail: CASI; A06, Hardcopy

This document describes the progress we have made and the lessons we have learned in 2001 through 2003 under the NASA grant entitled 'Solving Important Problems Faster'. The long-term goal of this research is to accelerate large, irregular scientific applications which have enormous data sets and which are difficult to parallelize. To accomplish this goal, we are exploring two complementary techniques: (i) using compiler-inserted prefetching to automatically hide the I/O latency of accessing these large data sets from disk; and (ii) using thread-level data speculation to enable the optimistic parallelization of applications despite uncertainty as to whether data dependences exist between the resulting threads which would normally make them unsafe to execute in parallel. Overall, we made significant progress in 2001 through 2003, and the project has gone well.

Author

Compilers; Data Bases; Parallel Processing (Computers); Problem Solving

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*.

20040055462 Massachusetts Inst. of Tech., Lexington, MA
Ubiquitous MIMO Multifunction Digital Array Radar . .. and the Role of Time-Energy Management in Radar
Rabideau, D. J.; Parker, P. A.; Mar. 10, 2004; 78 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A421233; PR-DAR-4; ESC-TR-2003-059; No Copyright; Avail: CASI; A05, Hardcopy

Future navy surface radars will need large Power- Aperture-Gain (PAG) products so as to perform challenging Air and Missile Defense functions. Oftentimes, these radars will operate in littoral regions, where their large PAG products will cause strong clutter returns. Unfortunately, radar equipment specifications can become stressed by the need to detect small targets in such strong clutter. Stressing hardware specifications include dynamic range, phase noise, system stability, isolation and spurs. Moreover, the additional desire for Low Probability of Intercept (LPI) radar operation will also influence radar hardware design. Hence, as radar PAG increases, it may become increasingly difficult to design conventional radar equipment to operate as desired in littoral regions. To partially address these issues, some future radar phased arrays (sometimes called 'digital array radars') will employ high degrees of aperture digitization. Typically, this digitization is performed near each of the receive elements in the array, enabling faster search rates, increased dynamic range, and improved adaptive beamforming performance. However, while such arrays offer many benefits, they still operate much like Their predecessors, i.e., They look in one narrow sector at a time, and perform a single function at any given instant. This report describes alternative approaches to operating phased array radars, especially digital arrays. These approaches involve transmit- array time-energy management; together, these alternative approaches are shown to ease the stressing hardware requirements described above. Time-energy managed digital arrays, for example, can be used to generate both highly focused transmit beams (e.g., for track) and broad transmit illumination (e.g., for search). Broad transmit illumination provides broad angular coverage, analogous to so-called 'ubiquitous' radars (i.e., radars that 'look everywhere, all the time').
DTIC

Digital Radar Systems; Digital Systems; Energy Policy; Mimo (Control Systems); Phased Arrays; Radar Antennas

20040055614 Tektronix Federal Systems, Inc., Beaverton, OR
Universal Network Access System
Boyer, Kirk; Davies, Bob; Nov. 2003; 156 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-C-0218; DARPA ORDER J180; Proj-G300
Report No.(s): AD-A421525; AFRL-IF-RS-TR-2003-258; No Copyright; Avail: CASI; A08, Hardcopy

Develop and demonstrate a Universal Network Access engine using an innovative bit-rate adaptive demultiplexer/ multiplexer, a reconfigurable physical layer protocol engine, and a reconfigurable cell/packet engine. FUNCTION: This work supports Air Force C3I Communications Networks. OPPORTUNITY: The effort will provide the network equivalent of a power adapter/extension cord for flexibility interconnecting a wide range of broadband information sources and local networks over the next generation internet. CONTRIBUTION: The capability to rapidly deploy high bandwidth, interoperable network which integrate information from different sources.
DTIC

Communication Networks; Interoperability

20040055635 Carnegie-Mellon Univ., Pittsburgh, PA
A Life-Cycle View of Architecture Analysis and Design Methods
Kazman, Rick; Nord, Robert L.; Klein, Mark; Sep. 2003; 38 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A421679; CMU/SEI-2003-TN-026; No Copyright; Avail: CASI; A03, Hardcopy

Many architecture-centric analysis and design methods have been created in the past 10 years at the Software Engineering Institute, beginning with the Software Architecture Analysis Method (SAAM). The SAAM inspired the creation of other methods, namely the Architecture Tradeoff Analysis MethodSM, the Quality Attribute Workshop, the Cost- Benefit Analysis Method, Active Reviews for Intermediate Designs, and the Attribute-Driven Design method. As these methods become more widespread, more widely adopted, and integrated into the software development life cycle, organizations inevitably will want to tailor them. Consequently, organizations that wish to include quality- attribute-based requirements, explicit architecture

design, and architecture analysis in their software development life cycles will be best served if they can do so 'organically.' The steps and artifacts of the five methods listed above, therefore, may require tailoring, blending, and, in some cases, removal when integrated into an existing life cycle. This report examines these methods and activities to understand their commonalities and relationships to life-cycle changes, and proposes a means of tailoring the activities so that they can fit more easily into existing life-cycle models.
DTIC
Architecture (Computers)

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.

20040051135 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Documentation of the Software Package GomeCal
vanGeffen, J.; September 09, 2003; ISSN 0169-1708; 82 pp.; In English
Report No.(s): KNMI-TR-255; Copyright; Avail: Other Sources

The Global Ozone Monitoring Experiment (GOME) is a nadir-viewing ultraviolet and visible spectrometer aboard the ERS-2 (European Remote Sensing) satellite launched by the European Space Agency (ESA) in April 1995. GOME measures the spectra of sunlight scattered in the atmosphere and reflected by the surface of the Earth in the wavelength range 240 to 790 nm, and once a day a direct solar spectrum is measured. Solar and earthshine spectra, the so-called level-1 data, are the official product release of the GDP (GOME Data Processor) of the ESA Processing and Archiving Facility at DLR in Oberpfaffenhofen, Germany. These data are released on CD-ROMs and via the Internet. GomeCal is a spectral recalibration tool for GOME/GDP level-1 spectra. The main program of the GomeCal software package is called gomecal. That program can perform several calibration corrections on GOME/GDP level-1 spectra extracted from the GDP-made CD-ROMs, where the user can choose which correction steps are to be performed.
Author
Ozone; Applications Programs (Computers); Data Processing Equipment; Solar Spectra; Terrestrial Radiation

20040051248 Research Inst. for Advanced Computer Science, Moffett Field, CA, USA
Corpus-Based Optimization of Language Models Derived from Unification Grammars
Rayner, Manny; Hockey, Beth Ann; James, Frankie; Bratt, Harry; Bratt, Elizabeth O.; Gawron, Mark; Goldwater, Sharon; Dowding, John; Bhagat, Amrita; April 10, 2000; 14 pp.; In English
Report No.(s): RIACS-TR-00.08; ACL-397; No Copyright; Avail: CASI; A03, Hardcopy

We describe a technique which makes it feasible to improve the performance of a language model derived from a manually constructed unification grammar, using low-quality untranscribed speech data and a minimum of human annotation. The method is on a medium-vocabulary spoken language command and control task.
Author
Grammars; Speech

20040052878 RECOM Technologies, Inc., Moffett Field, CA, USA
A Comparison of Different HCI styles in a KBSE System
Lazzeri, Santos Gerardo; April 1, 1995; 3 pp.; In English; PROLAMAT 1998, 8-12 Sep. 1998, Trento, Italy
Contract(s)/Grant(s): NAS2-14217; No Copyright; Avail: CASI; A01, Hardcopy

There has been a sizable amount of research about the relative merits of different styles of human-computer interfaces and information presentation. However, it has not been possible to declare a definitive winner between graphical and text-based interfaces. Each of these interface styles provides its own advantages that may be more relevant than the other depending on the domain and characteristics of the user population in which they are applied. This paper compares graphical and text-based interfaces for formal specifications in the context of the Amphion system. It focuses in those features that make the text-based interface desirable as a substitute or a complement to a graphical interface. In order to address these problems, a new, text-based interface has been developed as an alternative/complement to the existing graphical interface. The text-based interface avoids problems by representing the information about objects and their relationships in the form of natural language sentences. This representation makes it easy for novice users to better understand the specifications. By presenting the

specification information organized in the form of outlines that can be selectively expanded and collapsed, the user is given a high degree of control over the information that is displayed at any given time.
Derived from text
Human-Computer Interface; Texts; Graphical User Interface; Knowledge Based Systems

20040053408 Research and Technology Organization, Neuilly-sur-Seine, France
C3I and Modelling and Simulation (M and S) Interoperability
March 2004; 272 pp.; In English; C3I and Modelling and Simulation (M and S) Interoperability, 9-10 Oct. 2003, Antalya, Turkey; See also 20040053409 - 20040053431
Report No.(s): RTO-MP-MSG-022; AC/323(MSG-022)TP/10; Copyright; Avail: CASI; A12, Hardcopy; C01, CD-ROM

The NATO Modelling and Simulation Group (NMSG) Conference (MSG-022) Command, Control, Communications and Intelligence (C3) and Modelling & Simulation (M&S) Interoperability was conducted in Antalya, Turkey from 9 to 10 October 2003. All sessions of the Conference were unclassified. The Conference audience of 128 persons included experts from NATO countries, Partnersfor- Peace (PfP), as well as invited nations. Nineteen papers were selected for presentation. In addition, two keynote presentations and a capstone paper were given. Interoperability of Command, Control, Communications and Intelligence (C3I) and Modelling & Simulation (M&S) systems is a necessary requirement for effective and efficient support of future military operations, including; procurement, acquisition, test and evaluation, training, and application of necessary functionality within the ongoing operation. In order to be able to support this task, a close understanding and knowledge of the software architecture, the communications protocols, possible interfaces, data and object models, and the management procedures used on the C3I and M&S side is mandatory. The majority of the actual solutions are interface driven to link stove-piped developed legacy systems. The use of common reference models facilitating the necessary data alignment and information exchange is a first step to broader and reusable solutions. Newer systems with configurable interfaces making use of these technical potentials are pointing to the next set of solutions.
Author
Military Operations; Command and Control; Interoperability

20040053560 Yale Univ., New Haven, CT, USA
Computational And Experimental Study Of Energetic Materials In A Counterflow Microgravity Environment
Smooke, M. D.; Parr, T. P.; Hanson-Parr, D. M.; Yetter, R. A.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 105-108; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Counterflow diffusion flames are studied for various fuels flowing against decomposition products from solid AP pellets in order to obtain fundamental understanding of composite propellant flame structure and chemistry. In this paper, we illustrate this approach through a combined experimental and numerical study of a fuel mixture consisting of CO and H2 flowing against solid AP. For this particular AP-fuel system, the resulting flame zone simulates the flame structure that is expected to exist between reaction products from fine AP crystals and a hydrocarbon binder with the decomposition products from large AP crystals, characteristic of a bimodal AP propellant. As in all our experimental studies, quantitative species and temperature profiles have been measured between the fuel exit and AP surface. Species measured included CN, NH, NO, OH, N2, O2, CO2, H2, CO, HCl, and H2O. Temperature was measured using a thermocouple at the exit, spontaneous Raman scattering measurements throughout the flame, OH rotational population distributions, and NO vibrational population distributions. The burning rate of the AP was also measured for this flame s strain rate, given by a separation distance of 5 mm. The measured 12 scalars are compared with predictions from a detailed gas-phase kinetics model consisting of 86 species and 531 reactions. Model predictions are found to be in good agreement with experiment and illustrate the type of kinetic features that may be expected to occur in propellants when AP particle size distributions are varied. Furthermore, the results constitute the continued development of a necessary database and validation of a comprehensive model for studying more complex AP-solid fuel systems in microgravity.
Author
Computer Programs; Experimentation; Counterflow; Binders (Materials); Microgravity

20040055370 NASA Ames Research Center, Moffett Field, CA, USA
A Pseudo Ramp Manager Workstation for the Laboratory Development of Airline-ATC Collaborative Arrival Planning Tools
Zelenka, Richard; Mathan, Santosh; Quinn, Cheryl; Dorsky, Susan; [1998]; 1 pp.; In English; IEEE/AIAA Digital Avionics Systems Conference, 31 Oct. - 6 Nov. 1998, Seattle, WA, USA
Contract(s)/Grant(s): RTOP 538-18-24; No Copyright; Avail: Other Sources; Abstract Only

The continued expansion of air traffic and air carrier economic pressures are demanding changes to air traffic management and the relationship between the air traffic control service provider and the system user. Such pressures have motivated efforts to increase the flexibility of air traffic management operations and allow collaboration between the service provider and system user. The government/industry 'free-flight' initiative, whose ultimate vision is to allow users to select their own path and speed in real-time with air traffic control imposing restrictions only when necessary, is the most visible of such efforts. Shared decision making and collaboration between system users and service providers has been identified as providing benefits necessary to support subsequent phases of free-flight. In the terminal arrival phase of flight, many restrictions and a high degree of control are placed on system users without regard for individual user operational preferences. Commonly imposed airborne delays applied to arriving aircraft on a first-come, first-serve basis do not allow the system users to prioritize for late arrivals or to economically optimize their arrival sequence. Service provider/system user collaborative arrival planning decision support tools are being developed to allow such priorities. Airline preferences are most important to an airline's 'hub operation,' where off-schedule arrival aircraft are common and sought to be corrected, as they cause serious airport ramp difficulties and result in large airline operational inefficiencies. In this work, a simulated ramp manager workstation is described which was developed to support the laboratory simulation development of collaborative arrival planning tools. These tools are derived from the NASA Center/TRACON Automation System (CTAS). The workstation presents a 'gant chart' type display of arriving and departing aircraft sorted by airport gate, as typically used by 'hub and spoke' air carriers in their airport ramp towers. This Pseudo Ramp Manager is a critical element for proper laboratory development of future service provider/system user cooperative ATM decision support tools.
Author
Air Traffic Control; Computerized Simulation; Workstations; Decision Making; Real Time Operation

20040055455 Naval Health Research Center, San Diego, CA
User Ratings of a Web-Based Personalized Alcohol Misuse Prevention Feedback Program
Simon-Arndt, Cynthia M.; Hurtado, Suzanne L.; Patriarca-Troyk, Laura A.; Jan. 2003; 28 pp.; In English
Report No.(s): AD-A421225; NHRC-03-25; No Copyright; Avail: CASI; A03, Hardcopy

The use of web-based programs for health education, risk reduction, and health promotion can be a valuable tool in the effort to improve the health of a population. Providing personalized feedback through such a method can be particularly useful in alcohol misuse prevention efforts. A brief alcohol use feedback program was developed for members of the U.S. Marine Corps and user-satisfaction ratings were collected from 167 participants. Approximately 44% of the sample found the program to be useful or very useful and 46% of the sample reported that they were likely or very likely to recommend the web site to others. The Web-based format with tailored responses was preferred by 85% of respondents over other more traditional methods of alcohol training, and 80% of participants felt that the feedback was appropriate for Marines in their community. Significantly higher usefulness, likelihood of recommending the program to others, and overall ratings of the program were reported among younger and non- heavy-drinking participants ($p < .05$). Results indicate that this computerized assessment and feedback program is a promising mechanism with which to provide personalized alcohol misuse prevention information.
DTIC
Alcohols; Feedback; Internets; Prevention; Ratings

20040055515 Florida Univ., Gainesville, FL
On Metastable Molecules in Ground and Excited States: Theory Development, Implementation and Applications
Bartlett, Rodney J.; Mar. 12, 2004; 15 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0072
Report No.(s): AD-A421301; AFRL-SR-AR-TR-04-0173; No Copyright; Avail: CASI; A03, Hardcopy

The objectives of our work for AFOSR include the following: Develop new theory based upon coupled-cluster theory, density functional theory, and density matrix functional theory to more accurately and easily describe the structure, spectra, and reactions of molecules. Implement these new methods into general-purpose computer programs, such as ACES II, to enable their routine application by non-experts to problems of their interest. Use these methods to provide numerical results for problems pertinent to AFOSR. These range from suggesting and exploring new rocket fuels, to plume identification and detection, to the detailed characterization of atmospheric species.
DTIC
Excitation; Ground State; Metastable State; Molecules

20040055522 Army Research Lab., Aberdeen Proving Ground, MD

Vulnerability/Lethality Server High Level Architecture (HLA) Interface Control Document

Sauerborn, Geoffrey C.; Feb. 2004; 17 pp.; In English

Contract(s)/Grant(s): Proj-621618H80

Report No.(s): AD-A421311; ARL-MR-0575; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Army Research Laboratory (ARL) vulnerability/lethality table look-up server has gone through several iterations of development since first introduced in 1997 introduced in 1997 (then as the distributed interactive simulation DIS lethality communications server).These development iterations represented migration from its original transmission control protocol/ internet protocol client/server communication form based in DIS, to combined DIS-high level architecture (HLA) form used during the 2001 Research, Development, and Engineering Center (RDEC) Federation 'CalEx' (calibration experiments) and onto this current form that is all HLA and was designed for the RDEC command '1stApp' (First Application) experiment 2003 and presented in this report. This interface control document (ICD) describes the current state of exposed interface control components of the ARL vulnerability/lethality table look-up server (the server). The ICD describes the interface to an existing implementation of the server (with its look-up table capability). The interface described in this report includes an area that provides for further expansion, allowing delivery of damage descriptions from near real-time physics-based vulnerability modes (future dynamic calculation capability).

DTIC

Distributed Interactive Simulation; Documents; Human-Computer Interface; Lethality; Vulnerability

20040055531 Arizona State Univ., Tempe, AZ

The Monitoring, Detection, Isolation and Assessment of Information Warfare Attacks Through Multi-Level, Multi-Scale System Modeling and Model Based Technology

Ye, Nong; Jan. 2004; 150 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-99-1-0506; Proj-H502

Report No.(s): AD-A421322; AFRL-IF-RS-TR-2004-6; No Copyright; Avail: CASI; A07, Hardcopy

With the goal of protecting computer and networked systems from various attacks, the following intrusion detection techniques were developed and tested using the 1998 and 2000 MIT Lincoln Lab Evaluation Data: Exponentially Weighted Moving Average techniques for autocorrelated and uncorrelated data to detect anomalous changes in the audit event intensity; a learning and inference algorithm based on a first-order Markov chain model of a normal profile for anomaly detection; two multivariate statistical process control techniques based on chi-square and Canberra distance metrics for anomaly intrusion detection; the technique of probabilistic networks with undirected links to represent the symmetric relations of audit event types during normal activities, build a long-term profile of normal activities, and then perform anomaly detection; and Decision tree techniques to automatically learn intrusion signatures, and to classify information system activities into normal or intrusive for producing useful intrusion warning information. Finally, this report presents a research prototype of an Intrusion Detection System (IDS) integrating the intrusion detection techniques and a process model of a computer and network system.

DTIC

Detection; Isolation; Security; Warfare; Warning Systems

20040055540 Army Research Lab., Aberdeen Proving Ground, MD

Lethality/Vulnerability Server Functional Description and Interface Control Document for MATREX V0.5

Sauerborn, Geoffrey C.; Christy, Tranese S.; Mar. 2004; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-621618H80

Report No.(s): AD-A421337; ARL-MR-0582; No Copyright; Avail: CASI; A03, Hardcopy

This report describes the lethality/ vulnerability server's interface control. That is it describes how other high level architecture (HLA) simulations can interact with the lethality/ vulnerability server. The use of war game simulations to conduct weapon systems analysis has an established history. With the advancement of computer and network capabilities, it became practical and efficient to segment simulated systems across various computer platforms. This advancement in distributed simulation also brought with it new dilemmas such as how to ensure a 'fair fight'. For example, when a set of heterogeneous simulations is brought together, each simulation may treat the data (vulnerability data, terrain, or other synthetic environment representations) with subtle differences that create an unfair advantage for some simulated weapons. Distributing applications also increases the risk of having incorrect or stale data configurations on one or more of the systems. The lethality/ vulnerability server is a tool that was designed to overcome some of these obstacles and help ensure a valid weapon system assessment. It allows diverse applications to draw from the same vulnerability description data set during a simulation run.

The server can increase simulation preparation efficiency because configuring vulnerability damage is done once for all serviced applications. The lethality server currently delivers data descriptions in terms of standard fully damaged 'mobility, ' 'firepower,' and 'catastrophic' states. With relatively minor modifications, the server can be expanded to deliver partial (or degraded) damage and other types of data. This document is a functional description of the server with an emphasis on its HLA interface for the Modeling Architecture for Technology and Research EXperience (MATREX) VO.5 release, January 2004.
DTIC
Distributed Interactive Simulation; Documents; Lethality; Vulnerability

20040055625 Carnegie-Mellon Univ., Pittsburgh, PA
An Integrated Approach to Software Process Improvement at Wipro Technologies: Veloci-Q
Subramanyam, V.; Deb, Sambuddha; Krishnaswamy, Priya; Ghosh, Rituparna; Mar. 2004; 71 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A421628; CMU/SEI-2004-TR-006; ESC-TR-2004-006; No Copyright; Avail: CASI; A04, Hardcopy

This report captures the details of Wipro's quality journey through continuous process improvement. This journey towards excellence has led to the prestigious Institute of Electrical and Electronics Engineers (IEEE) Computer Society Award for Software Process Achievement in 2003. This award is for achieving high software process capability and establishing a basis for moving to a broad improvement program that concerns people and products, rather than just the processes. This report details the process improvement activities and the evolution of y processes and systems over a period of time. Wipro's integrated approach to quality-velocl-Q-Is detailed with an emphasis on the process improvement initiatives, supporting technology, and people capability that bring positive business results and enable Wipro to meet its customers' ever-increasing demands. The challenges and benefits accrued from Wipro's total quality approach are outlined, including the quantitative results of measuring the impact of Wipro's process improvement model.
DTIC
Computer Programming; Computer Programs; Software Engineering

20040055629 Defence Science and Technology Organisation, Salisbury
Joint Warrior Interoperability Demonstration (JWID) Web Data Collection Tool (WDCT) Installation Manual
Kuster, Egon; Sep. 2003; 38 pp.; In English
Report No.(s): AD-A421659; DSTO-GD-0378; DODA-AR-012-921; No Copyright; Avail: CASI; A03, Hardcopy

The Web Data Collection Tool (WDCT) allows for the collection of demonstration assessment information from geographically disperse locations. This installation manual provides the WDCT administrator with instructions on how to install and configure the WDCT software. The WDCT in the past has been used for the assessment of JWID (Joint Warrior Interoperability Demonstration) and the CINC21 (Commander in Chief for the 21st Century) ACTD (Advanced Concept Technology Demonstrator). WDCT is a web-based tool that connects to an Oracle database to store its analysis information and configuration settings. Over the past few years that the WDCT has been used within JWID it has proven to be a valuable tool in eliciting feedback from the warfighters using the demonstrations being assessed.
DTIC
Command and Control; Data Acquisition; Data Systems; Installation Manuals; Interoperability; Warfare

20040055631 Carnegie-Mellon Univ., Pittsburgh, PA
Army strategic Software Improvement Program (ASSIP) Survey of Army Acquisition Program Management Results of the 2003 Survey of Army Acquisition Managers
Kasunic, Mark; Mar. 2004; 148 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A421663; CMU/SEI-2004-TR-003; ESC-TR-2004-003; No Copyright; Avail: CASI; A07, Hardcopy

This report analyzes a survey that the Software Engineering Institute conducted on behalf of the Army Strategic Software Improvement Program (ASSIP). The survey was directed to Army program managers (PMs) and covered four areas of the acquisition system: the acquirer's environment, the developer's environment, communication between the acquirer and developer, and external factors that could affect the acquisition system. The study aimed to discover how PMs perceived major acquisition-related problem areas and to provide preliminary data upon which to base future data- gathering activities. Although the survey results were not conclusive, they indicated that requirements management was a primary area of concern among those who responded to the survey.
DTIC
Computer Programming; Computer Programs; Project Management; Software Engineering; Surveys

20040055633 Defence Science and Technology Organisation, Salisbury
Joint Warrior Interoperability Demonstration (JWID) Web Data Collection Tool (WDCT) Developer Guide
Kuster, Egon; Sep. 2003; 53 pp.; In English
Contract(s)/Grant(s): DSTO-GD-0377
Report No.(s): AD-A421669; DODA-AR-012-920; No Copyright; Avail: CASI; A04, Hardcopy

This document has been created for the developer of the WDCT system. It contains documentation of the WDCT architecture and components that are part of the system. To support this document is the WDCT Developer CD-ROM, which contains all the WDCT source files and support files that are required in the development or alteration of the system. The structure of the database and the data contained within is explained. All Java Class files are discussed as to their function within the WDCT. Each JSP used is described as to the functionality that it provides. Also contained is a brief discussion of what new functionality that could be added.
DTIC
Data Acquisition; Data Bases; Interoperability

20040055634 Carnegie-Mellon Univ., Pittsburgh, PA
COTS Acquisition Evaluation Process: Preacher's Practice
Sai, Vijay; Jan. 2004; 40 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A421675; CMU/SEI-2004-TN-001; No Copyright; Avail: CASI; A03, Hardcopy

This paper reflects a successful effort to apply commercial off-the-shelf (COTS)-based engineering principles to a software acquisition by the Financial and Business Services (FABS) and Information Technology (IT) departments at the Software Engineering Institute. The team responsible for the execution of the project was guided by the principles taught in the 'COTS-Based Systems for Program Managers' and 'COTS Software Evaluation for Practitioners' training programs conducted by the COTS-Based Systems Initiative at the Software Engineering Institute. Some of the major expectations set and realized included precise comprehension of requirements and preferences, ability to identify weak links in the proposed solutions, support for the 'buy versus build' decision and the product recommendation, the promise of a shorter implementation phase, and brimming confidence based on a well- informed project approach.
DTIC
Commercial Off-the-Shelf Products; Computer Programs

20040055636 Defence Science and Technology Organisation, Salisbury
An Introduction to Bayesian Belief Networks and their Applications to Land Operations
Starr, Colin; Shi, Peng; Jan. 2004; 38 pp.; In English
Report No.(s): AD-A421681; DSTO-TN-0534; DSTO-AR-013-005; No Copyright; Avail: CASI; A03, Hardcopy

Bayesian belief networks are graphical tools that aid reasoning and decision-making under uncertainty. The networks represent a system over which a probability distribution is defined, modelling uncertainty both quantitatively and qualitatively. They allow a user to make inferences when only limited information is available. Mathematically, a Bayesian network is a directed acyclic graph whose nodes represent variables. A link from one node to another represents a causal dependency. This report investigates the use of Bayesian networks in the land force environment. It provides a simple introduction to the networks, how they are constructed and how they are used. Some examples are presented to demonstrate the capabilities of the networks, a range of land force applications are discussed, and some theoretical extensions are examined.
DTIC
Belief Networks; Computer Networks; Decision Making; Warfare

20040055637 Carnegie-Mellon Univ., Pittsburgh, PA
Common Concepts Underlying Safety Security and Survivability Engineering
Firesmith, Donald G.; Dec. 2003; 76 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A421683; CMU/SEI-2003-TN-033; No Copyright; Avail: CASI; A05, Hardcopy

This technical note presents a consistent set of information models that identify and define the foundational concepts underlying safety, security, and survivability engineering. In addition, it shows how quality requirements are related to quality factors, subfactors, criteria, and metrics, and it emphasizes the similarities between the concepts that underlie safety, security, and survivability engineering. The information models presented in this technical note provide a standard terminology and set

of concepts that explain the similarities between the asset-based, risk-driven methods for identifying and analyzing safety, security, and survivability requirements as well as a rationale for the similarity in architectural mechanisms that are commonly used to fulfill these requirements.
DTIC
Architecture (Computers); Safety; Security

20040055652 Honeywell Technology Center, Minneapolis, MN
MASA-CIRCA: Multi-Agent Self-Adaptive Control for Mission-Critical Systems
Musliner, David J.; Goldman, Robert P.; Pelican, Michael J.; Drebsbach, Kurt D.; Feb. 2004; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-C-0017; DARPA ORDER-J124; Proj-J124
Report No.(s): AD-A421747; AFRL-IF-RS-TR-2004-32; No Copyright; Avail: CASI; A04, Hardcopy

The goal of this contract effort was to begin extending the Cooperative Intelligent Real-Time Control Architecture (CIRCA) with abilities to automatically monitor its own performance and adapt in real-time, forming Multi- Agent Self Adaptive (MASA) CIRCA. CIRCA is a coarse-grained architecture designed to control autonomous systems which require both intelligent, deliberative planning activity and highly reliable, hard real-time reaction to safety threats. The MASA-CIRCA project extended this architecture with the ability to reason accurately about its own real-time behavior, and adapt that behavior in response to performance feedback. Major issues investigated during this project include formally verifying real-time control plans, dynamically decomposing long-term plans into sub goals, and building real- time control plans using probabilistic information to reason about most-likely states first. We provided digital video demonstrations of these features, with MASA-CIRCA operating in a combat oriented multi-aircraft flight simulation domain.
DTIC
Adaptive Control; Self Adaptive Control Systems

20040055653 Michigan Univ., Ann Arbor, MI
Multilevel Coordination Mechanisms for Real-Time Autonomous Agents
Durfee, Edmund H.; Feb. 2004; 95 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-2-0142; DARPA ORDER-J356; Proj-AGEN
Report No.(s): AD-A421748; AFRL-IF-RS-TR-2004-33; No Copyright; Avail: CASI; A05, Hardcopy

This report summarizes the research and development efforts performed in the DARPA-sponsored project in Multilevel Coordination Mechanisms for Real-Time Autonomous Agents, as part of the DARPA Control of Agent Based Systems (CoABS) program. The work was performed from May of 1998 to April of 2003. During the course of the project, significant advances have been made in the area of plan-based control and coordination of semi-autonomous agents. Specifically, techniques for modeling and coordinating agents based on hierarchical representations of their plans have been shown to be efficient and effective in enabling multiple agents, each with its own sophisticated plans and objectives, to predict and resolve unintended conflicts between their operations, as well as to anticipate and exploit opportunities for cooperation. The basic research results have been implemented into a Multilevel Coordination Agent (MCA) that operates on the CoABS Grid. The MCA has been demonstrated as part of the Coalition Agents Experiment (CoAX), culminating in the October 2002 demonstration at the Naval Warfare Development Center in Newport, RI.
DTIC
Adaptation; Autonomy; Coordination; Real Time Operation

20040055894 Florida Gulf Coast Univ., Fort Myers, FL, USA
ACUMEN: Astronomy Classes Unleashed: Meaningful Experiences for Neophytes
Fauerbach, M.; Schonberg, S.; Mon, M. J.; Lunar and Planetary Science XXXV: Education Programs Demonstations; March 19, 2004; 1 pp.; In English; See also 20040055893; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The majority of non-science undergraduate students enrolling in astronomy classes do so to either fulfill a course requirement or because they want to look at stars. While visual observations are a frequent and very important component of such courses, alternate activities are necessitated by inclement weather or for explicating abstract concepts. In the past, such activities were primarily paper labs and written exercises. In an effort to enhance the learning experience for astronomy students, (both inside and outside the classroom), the investigators developed two freely-distributable computer-based laboratory exercises. The first involves measuring feature heights on the Moon, in which students may either use supplied

pictures of the Moon, or measure digital images that they have taken themselves during a previous lab setting. The second lab relates to one of the more difficult topics for non-science undergraduate students: stellar spectra. Accompanying student manuals were kept concise, whereas instructor manuals include ideas of variations and extensions to the exercises.
Derived from text
Visual Observation; Stellar Spectra; Computer Techniques; Educational Resources; Computer Assisted Instruction

20040056019 NASA Langley Research Center, Hampton, VA, USA
Simulating Nonlinear Deformations of Solar Sail Membranes Using Explicit Time Integration
Wang, John T.; Chen, Tzikang; Sleight, David W.; Tessler, Alex; Mar. 26, 2004; 15 pp.; In English; 45th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 19-22 Apr. 2004, PalmSprings, CA, USA
Contract(s)/Grant(s): 755-06-00
Report No.(s): AIAA Paper 2004-1580; No Copyright; Avail: CASI; A03, Hardcopy

In this study, the explicit time integration method is employed to predict deformation of highly flexible solar sail structural components. The nonlinear static analysis of a highly flexible ribbon structure is presented to demonstrate the need for having the explicit time integration method in the analysis toolbox for solar sail. Static analyses of the ribbon structure produce ambiquous results whereas the explicit time integration method determines the correct results. Extensive benchmarking examples are also presented to build confidence in the use of the explicit method. Previously determined nonlinear wrinkling deformations of solar sail membranes are found by the explicit method. As the explicit method is known to often require more computational time than nonlinear static methods, a study on mass scaling was also conducted. The computational times are reported for the nonlinear static and explicit time integration solutions to calibrate the advantage of using mass scaling for these problems.
Author
Nonlinearity; Deformation; Simulation; Solar Sails; Membranes

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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.

20040053409 North Atlantic Treaty Organization, Huntsville, AL, USA
Interoperability Performance of CORBA Architecture
Fiore, Franco; Mercati, Massimo; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 13-1 - 13-9; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Multinational coalitions are the standard for land forces in the full spectrum of land war fighting from operations other than war to armed conflict. Recent military events have underlined the necessity of interaction among the peacekeeping participants, most notably through the channels of liaison. Interoperability of the nationals systems, Command and Control (C2) data information exchange, reliability of the systems are chiefly the goals for future National Military Architecture. The goal of this paper is to describe the opportunity offered to MEADS by the adoption of CORBA (Common Object Request Broker Architecture). The intent is not to describe the current MEADS architecture neither its future planned development; it simply shows, using MEADS as an example, a possible implementation able to underline the advantages that such architecture could provide to a complex Air Defence system.
Derived from text
Simulation; Interoperability; Air Defense; Network Analysis; Computer Programs

20040053411 QinetiQ Ltd., Fort Halstead, UK
Soldier System Information Interoperability
Dooley, Peter; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 12-1 - 12-9; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper overviews the standardisation work being undertaken by NATO Topical Group 1, Soldier System Interoperability. The Group s work on systems analysis for dismounted operations is described, with special emphasis on the approach being taken to C4I. The rationale for the development of a STANAG to facilitate low-level tactical data exchange

is also described, including an overview of the experimental and demonstration work being undertaken to inform STANAG development.
Author
Interoperability; Standardization; Systems Analysis

20040053412 Research and Technology Organization, Neuilly-sur-Seine, France
EUCLID RTP11.13: Realising the Potential of Networked Simulation in Europe Including C3I and Voice Interface for CGI
Dumetz, J.; C3I and Modelling and Simulation (M and S) Interoperability; March 2004; In English; See also 20040053408; Copyright; Avail: Other Sources; Paper was not available at the time of publication
Paper not available at time of publication.
Derived from text
Command and Control; Computer Networks; Telecommunication; Computerized Simulation

20040053415 Virginia Modeling, Analysis and Simulation Center, Norfolk, VA, USA
Overview of Recent Findings of the Study Groups of the Simulation Interoperability Workshop Dealing with C3I and M and S Interoperability
Tolk, Andreas; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 1-1 - 1-21; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy
The Simulation Interoperability Standards Organization (SISO) is dedicated to the promotion of modelling and simulation interoperability and reuse for the benefit of diverse M&S communities, including developers, procurers, and users, world-wide. SISO originated over ten years ago. The initial conferences rapidly on general simulation interoperability evolved into the Distributed Interactive Simulation (DIS) Workshops. The DIS Workshops transformed in 1996 into a more functional organization called SISO participating actively in the standardization efforts related to the High Level Architecture (HLA). Today, SISO is concerned with all sorts of standard development and application facilitating interoperability between simulation systems as well as between simulation systems and real life systems.
Derived from text
Distributed Interactive Simulation; Interoperability; Siso (Control Systems)

20040053416 NATO Consultation, Command, and Control Agency, The Hague, Netherlands, Belgium
A Multi-National, Distributed Testbed for Extended Air Defence BMC3I: Past Experiences and Vision for the Future
Allmon, David; Schoonen, Andre; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 2-1 - 2-13; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy
The development and testing of the BMC3I for NATO s extended air defence mission has many challenges. The BMC3I element is responsible for the coordination and integration of the other three primary EAD functional areas: Active Defence, Passive Defence, and Conventional Counte rforce and can involve weapon and sensor systems widely distributed over land, sea, air, and even space. These systems may be operated by individual nations or integrated into NATO s command and control structure directly. In addition, the missile defence aspect of extended air defence is relatively new to military operations, with defensive systems capable of negating ballistic missiles being deployed only within the last 10 to 15 years. NATO recognises the need for a more integrated approach to countering the emerging ballistic missile threat as is evidenced by the recently sponsored NATO Active Layered Theatre Ballistic Missile Defence (TBMD) Feasibility Study. This paper summarizes NC3A s use of modelling and simulation in support of NATO s EAD mission, specifically in the area of C2 interoperability at the technical, systems, and operational levels. It provides a summary of lessons learned from Cannon Cloud 02 and other similar NATO exercises. It gives an overview of some on-going activities that are aimed at developing a strategy for a more cohesive, coordinated approach to the employment of M&S in support of EAD C2 within the NATO community, and some insights into what that future environment might look like.
Derived from text
Air Defense; North Atlantic Treaty Organization (NATO); Simulation; Ballistic Missiles; Computer Programs

20040053417 Marmara Research Inst., Turkey
Exploiting Virtual C4ISR Simulation in Training Decision Makers and Developing New Concepts: TUBITAK's Experience
Hocaoglu, M. Fatih; Firat, Cuneyd; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 3-1 - 3-7; In English; See also 20040053408; Copyright; Avail: CASI; A02, Hardcopy

C4ISR as an integrated military structure attracts more emphasize in parallel to developments on information technologies and knowledge engineering. C4ISR systems merge both physical components and information-oriented aspects like decision-making and message exchange between participating components. Combining both world layers, physical and information, provides wider worldviews allowing modelers and analysts to design inclusive and comprehensive defense simulation tools addressing war games, C2 analysis, concept development and gaining management experiences on them. In simulation literature, information and physical items flows are known as opposite to each other. Bringing both flows together and satisfying analysis requirements of being together is not an easy task making more elegant modeling approach especially for reusability, modularity and interoperability, mandatory. As an integrated and complicated domain, the problem of C4ISR concepts development as well as staff training generally requires experimenting on complex scenarios. Simulating these scenarios in virtual environments and coupling them to real C4ISR systems and staff is significantly cost-effective solution for the problem. From the simulation point of view, modeling information layer is pretty different from modeling physical layer. Variety of information types, concurrency, probabilistic nature of information and its flow among operational nodes, in addition to all, infeasibility of fully automated decision making as well as data fusion make modeling a very complicated task. So, that requires knowledge intensive and highly autonomous components in addition to wellformulated mathematical models solvable by operational research methods. This reveals manin- the-loop simulation as a practical solution for the problem. That is one of the essential factors for planning C4ISR simulation tools interacting with human in run time. TUBITAK is developing an open, reusable, modular and interoperable simulation system for modeling and executing C4ISR architectures. This paper summarizes the lessons-learned upto now and relevant projections for future. The simulation system has an open architecture on two points. The first point is generating a distributed infratructure consisting of reusable components. This is achieved by setting up the whole system on HLA/RTI middleware; it is possible to insert external simulation or software components, even in run-time to a scenario which is being executed as a federation as well as deploying the components in other HLA federations. The other point emphasizes openness to new developments by having modular and well-interfaced component architectures. The system could serve for concept development, analysis and training purposes. Military Concept development is achieved by being able to try different scenarios. They consists architectures of C4I and SR components allowing declaration of operational information flow among each other. Results of scenario execution are elaborated using the analysis functions of the system. Analysis outcomes are revised to restructure the scenario for better architectural concepts. The analysis has done in two ways; in the classical way, as is the simulation postdata analysis, and the second way, optimization for component behaviors with respect flexibly defined criteria. Moreover, trainees are faced with different cases in scenarios to examine and feedback their strong and weak sides in developing C2 decision and actions.
Derived from text
Simulation; Interoperability; Computer Programs; Operations Research; Cost Effectiveness

20040053418 North Atlantic Treaty Organization, Brussels, Belgium
Training and Education Enhancement Programme (TEEP): Current Status and Way Ahead of Advanced Distributed Learning (ADL) and Simulation Portion
dAndurain, Jean; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 4-1 - 4-11; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Endorsed at the Washington Summit, confirmed at the Prague Summit, the Training and Education Enhancement Programme is viewed as a useful tool to achieve interoperability and considerable progress has been made in several areas in the past year, especially in its Advanced Distributed Learning and Simulation component. A number of studies have been completed with the expertise of the RTA/NMSG, the NATO Training Group (NTG) and others in support of NATO Strategic Commands, with Allied Command Transformation (ACT) in the lead. The ADL prototype is considered a success and the establishment of a NATO/PfP ADL capability supporting NATO/PfP Education and Training is feasible. ACT has been requested to propose a course of action to implement it, including the continuation of the prototype use with National contributions until a Capability Package (CP) is developed. It is feasible and cost-effective to use distributed simulation for training. ACT has been requested to propose a course of action to implement it through the execution of a set of distributed NATO/PfP prototype exercises, and the development of a CP including a successor of Allied Command Europe (ACE) Command and Staff Training Programme (ACSTP).
Derived from text
Simulation; North Atlantic Treaty Organization (NATO); Education; Interoperability; Command and Control

20040053419 Delegation Generale de l'Armement, Issy-les-Moulineaux, France

ESTHER: HLA Synthetic Environment Framework for Command Post Exercises

Khimeche, Lionel; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 5-1 - 5-19; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The newly fielded French Regimental Information System (SIR), covering both Battle group (Battalion Level) and Elementary units (Company Level), urgently requires an improvement to the current education and training methods. Previous training courses and CAX architectures are no longer suitable as they do not take into account the added value provided by C4I systems. They do not stimulate SIR with appropriate C4I data. ESTHER (Acronym for 'Environnement Synth tique de TH tre pour l Entra nement des PC R gimentaire') is a French MoD R&T program. It is dedicated to exploring the feasibility of providing the French Army with a plug-in framework allowing national and nation-wide connections of distributed C4I and HLA Simulations and offering services to achieve preparation, execution and analysis of training courses. The highest priority Army requirement is for ESTHER to bridge the gap between the legacy Modelling and Simulation tools and fielded C4I systems to support Army education and training activities. Moreover, ESTHER addresses the interoperability between SIR and JANUS HLA. Beneficial results have been obtained in the area of M&S and C4I interoperability according to the two-stage approach. The first stage is the configuration of M&S and C4I systems prior to their deployment and common use. This stage covers the identification of the relevant, shared data and distribution. This is called static interoperability. In the operational area, static data like order of battle, terrain, initial units location & resources, tactical communication network and operational limits have to be consistent in both systems. In the technical area, static data covers the configuration of reference time, C4I Mail addresses, systems IP addresses, network masks, RTI (rid file) and routers. Currently, the operational static data are shared out between M&S and C4I systems and their initialisation imposes a selective distribution. Up to now, as M&S and C4I were developed along separate tracks, interchange standards are not compatible. This usually forces manual replication of information from one system to another. Those operations are time and resource consuming and introduce risks of errors due to wrong interpretation. Thus, mechanisms have to be developed to automate the common configuration of M&S and C4I systems with appropriate data. The second stage concerns the bi-directional connection and the co-ordination between M&S and C4I systems during the federation and C4I execution. This is called dynamic interoperability. From the operational point of view, it means providing the capability for C4I to send orders to its subordinate units (i.e. simulated units) and to receive reports from the M&S world (subordinates location, minefields status, logistic data etc.). It also means providing control and synchronisation of both systems activities. From the technical perspective, dynamic interoperability implies a common understanding of the digital battle space in order to handle the information consistently, and the use of the same interchange standard to carry the information between both systems. The C4I Data Model and the Simulation/Federation Object Model must converge, or at least partially overlap, otherwise no interoperability could take place. Currently, gateways are used to translate and map the information between systems. However, those systems are made to run in a limited environment and must cope with the improvements of the legacy C4I. That is why, beyond the alignment of data models, it appears mandatory in the future to align the architecture by sharing a common structure.

Derived from text

Simulation; Interoperability; Communication Networks; Data Simulation; Computerized Simulation; Janus

20040053420 Slovak Air Force Academy, Kosice, Slovakia

Simulation Federation in Coherence with C3I AF ATC System on CAX Platform

Necas, Pavel; Olejnik, Frantisek; Gulas, Lubos; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 6-1 - 6-6; In English; See also 20040053408; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modeling and Simulation at the Slovak Armed Forces has been since earlier 90's utilized to improve training, develop doctrine, tactics and materials, and improve combined and joint coordination. Recently the question of linking existing and future C3I systems with the Simulation Federation has emerged and is being reflected. The ability to develop a versatile modeling and simulation system in Slovakia linked with Air Force C3I ATC system, that can evolve with standards and tools is a big challenge. An approach has recently been identified to meet this challenge through modular, open-architecture Training and Simulation Centers (TSC). The TSC provide a robust combined arms environment where tactics, equipment, and training development can be addressed. The TSC is capable of brigade, air wing and below level CAX exercises, and include pre-loaded scenarios with real world databases. The TSC are being enhanced through the addition of Virtual Full Mission Simulators training facilities, Digital Communications emulators, and with the links to the Air Force C3I system standard called 'LETVIS', which is an important element of the Slovak C3I ASOC system. This interoperable vital concept was and is being successfully implemented at the Air Force Academy and appropriate C3I posts in Slovakia The functional link and

consistent communication standard between TSC and C3I system provides Slovak Armed Forces with the capability to train commanders, staff personnel, pilots, tank crew and cadets on developing tactics and standard procedures. Each configuration of CAX using C3I link feedback information has simulation tools, equipment, and capability for planning and executing operations interoperable with other DIS/HLA simulation and C3I nodes and operational facilities. This concept provides an expandable and flexible simulation, command and control environment suitable for training and the development of tactics and equipment, which significantly supports the process of Slovakia integration to NATO.
Author
Command and Control; Computerized Simulation; Architecture (Computers); Data Bases; Education

20040053421 German Armed Forces, Cologne, Germany
Integrated Army Modelling and Simulation Data Network
Zimmermann, Bernd; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 8-1 - 8-13; In English; See also 20040053408; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The concept of a future Modelling and Simulation Network is based on a methodology of knowledge and information management. In the framework of this methodology the Integrated Army M&S Data Network will be established as an operational and technical concept to allow knowledge transfer between operational headquarters, study facilities, procurement agencies and training installations. The Concept of the Integrated Army M&S Data Network has the following objectives: Efficient data acquisition, processing and administration for a Modelling and Simulation environment, Data exchange between simulation systems and possible data sources (other simulation systems, C4Isystems, databases, etc.) based on a common information language, Installation of a common data management process to define, establish and administer a common information language The represented results reflect a series of substantial studies conducted by civil contractors. Special thanks go to Dr. Stefan Krusche, Mr. Peter Arwanitis and Mr. Ralf Pfrogner, IABG GmbH, Munich for their outstanding work on this subject.
Author
Information Management; Data Simulation; Computer Networks; Data Acquisition; Environment Simulation

20040053422 Technical Univ. of Istanbul, Turkey
A Graphical Interface and a Data Filtering Scheme for Joint Theater Level Simulation
Cayirci, Erdal; Gokmen, Muhittin; Oktug, Sema; Ayar, Tacettin; Cebiroglu-Eryigit, Gulsen; Coplu, Tolga; Okcu, Evren; Akgun, Ilker; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 7-1 - 7-9; In English; See also 20040053408; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Joint Theater Level Simulation (JTLS) is the constructive simulation used to support joint/combined exercises at operational and higher levels in Turkish Armed Forces. However, JTLS does not fit all the requirements in these exercises. The tactical considerations may sometimes have a major impact on the decisions at higher levels. Especially, the resolution of terrain data does not allow simulating the required tactical details in JTLS. Moreover, participants of an exercise should interact with a simulation by using either real or realistic C2 systems. The standard user interfaces of JTLS, namely GIAC, MPP and IMT, cannot emulate these C2 systems in most of the cases. During the game, all the participants that use standard JTLS interfaces have the same perception of the operational picture if they are at the same side. This is not very realistic. JTLS cannot provide multiple perceptions for the same side. HOGAY is a generic graphical interface and filtering system developed to minimize these weaknesses of JTLS. In this paper we introduce the architecture of HOGAY, and the method to propagate data in HOGAY.
Author
Data Simulation; Graphs (Charts); Images; Graphical User Interface

20040053423 Physics and Electronics Lab. TNO, The Hague, Netherlands
Interoperability between the RNLA C2 Workstation and the 'Kibowi' Constructive Simulation Tool for Operational Support and Training
Huiskamp, Wim; Kwaijtaal, Angela; Fiebelkorn, Stephan; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 9-1 - 9-10; In English; See also 20040053408; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Royal Netherlands Army (RNLA) is currently developing the C2 WorkStation (C2WS), which is a configurable,

distributed information system that provides generic functionality to support the Command and Control process. One of the main tasks of the C2WS is to support the users in building and maintaining a Common Operational Picture (COP) that provides adequate situational awareness. TNO-FEL has performed experimental studies on the C2WS to investigate the issues related to interoperability between C2 systems and simulators. The aim is twofold : support the staff training process by using the C2WS as an interface between trainees and simulation tool (train as you fight) and investigate the options for operational C2 decision support tools based on simulators. The RNLA performs staff training through Computer Assisted eXercises (CAX) with the KIBOWI constructive simulator. Currently manned Lower-Control cells provide the interface between the simulation and the trainees. The vision for the future is to develop more automated interfaces between the simulator and the C2 systems. The simulation will provide stimuli to the C2WS (e.g. unit detection or displacement) and thus interact with the trainees through the operational C2 systems. Instructors can now also better assess the user's performance with these C2 systems. Interoperability with Decision Support Systems (DSS) concentrates on Course of Action (COA) analysis and mission planning. The mission plan is defined in the C2WS and automatically transferred to the DSS. The DSS analyses this input through simulation and predicted results (e.g. rendezvous times) are routed back into the C2WS as a new planning overlay available for evaluation by the C2 operator. The architectural approach to our interoperability need is to provide a software gateway between the C2WS communication network (based on XML messaging) and the High Level Architecture (HLA) standard. The link to HLA provides the possibility to connect many modern simulation components to the C2WS architecture. The HLA development process that was followed provides a generic approach to simulation interoperability for the C2WS. This process concentrates on defining a data model that matches the requirements and features of both the C2 system and the available simulation assets. This paper presents an overview of the possible use of interoperability between C2 systems and simulation systems, an overview of the architecture, the development of the demonstrator and our results to date.
Author
Command and Control; Communication Networks; Systems Simulation; Information Systems; Decision Support Systems; Interoperability

20040053424 Swedish Defence Research Establishment, Stockholm, Sweden
NetSim: A Network Based Environment for Modelling and Simulation
Ekloef, Martin; Ulriksson, Jenny; Moradi, Farshad; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 10-1 - 10-16; In English; See also 20040053408; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modelling and Simulation (M&S) is a powerful tool that is used to support training and analysis of military operations, development of military concepts and gradually, it is becoming an integral part of modern C3I systems. As the web has evolved, new ways of carrying out modelling and simulation and realizing C3I systems have emerged. These achievements address some of the research issues considered vital for future development of the M&S/C3I domain. Firstly, web related technologies provide means of overcoming the interoperability barriers, for example through standardized data exchange formats (such as XML), platform independent software (for example Java) and shared knowledge of a domain (semantics). Secondly, networked environments offer ways of setting up virtual organisations, sharing common goals and interests, to efficiently collaborate in problem solving. Finally, computer networks promote efficient sharing of resources, which for example could increase the reuse of existing models or utilize idle processing capacity of computers. At the Swedish Defence Research Agency (FOI) there is ongoing research, targeting the role of network/web based technologies in M&S, to support defence communities in their work. Our vision comprises an environment supporting the entire M&S-process, including conceptualization, scenario definition, design, development and execution. All these tasks should be maintained by a framework for collaboration, which lets users; developers, analysts, administrators etc, jointly work on a project. During the first phase of this research focus has been on efficient resource sharing and means of collaboration. Through experimental research and implementation of a prototype (NetSim), methods and techniques have been identified to form a framework for collaborative work, resource management and distributed execution. Following current trends within development of networked applications, decentralized (Peer-to-Peer) solutions were of primary focus when implementing the prototype. Based on the open source Peer-to-Peer platform JXTA, two distinct components of our envisioned system were implemented, namely; a decentralized resource management system deploying a network of workstation for execution of HLA federations and a collaborative environment for joint modelling of federations. Our results show that the utilization of Peer-to-Peer concepts for resource sharing and collaboration are favourable in terms of scalability, robustness and fault tolerance. The technology allows formation of virtual organisations without the need of intermediate resources like centralized and powerful servers. However, some aspects of our implementation temporarily rely on central control, thereby diminishing the benefits of the Peer-to- Peer paradigm. Future research will therefore address distributed algorithms for synchronisation of collaborative work and a more flexible and extendable approach to resource management. Furthermore, as many studies have

pointed out before, one of the great challenges of any type of Peer-to-Peer system is discovery and matching of resources. This is an area that deserves great attention when planning for the next generation C3I/M&S tools.
Author
Algorithms; Computer Networks; Environment Simulation; Interoperability; Resources Management

20040053425 INTRACOM S.A., Athens, Greece
Bridging a BMS and a CGF System Using XML
Detsis, Georgios; Gonidakis, Venardos; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 11-1 - 11-13; In English; See also 20040053408; Copyright; Avail: CASI; A03, Hardcopy

This paper presents part of the work that is performed internally for INTRACOM Defense Department. As an integral part of this work, a Battle Management System (INTRACOM iBMS) and a Computer Generated Forces System (produced by INTRACOM for this purpose) are linked together. As an example of Lessons learnt from past experience in linking M&S and C3I, the paper discusses the approach that was used to connect the two systems.
Author
Interoperability; Management Systems; Computerized Simulation; Education; Computer Systems Design; Technology Transfer

20040053428 Turkish General Staff Headquarters, Ankara, Turkey
Modeling Command and Control Centers
Undeger, Cagatay; Ercetin, Askin; Ipekkan, Ziya; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 16-1 - 16-11; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To date, legacy simulations of all operation levels have not dealt with the C4ISR aspects of the battle space. Nearly all of these simulations assumed either perfect C4ISR capability on both sides or employed some unjustified approaches to take C4ISR capabilities of the opposing forces into account. These approaches to modeling C4ISR did not make it possible to evaluate C4ISR systems and their contribution to the mission effectiveness. Currently, especially developed countries are well aware of the potential contributions of robust and integrated C4ISR systems to overall military effectiveness and working on concepts like Information Warfare, Network Centric Warfare and etc. Most of these countries are spending large portions of their budgets on procuring / developing C4ISR systems. C4ISR systems are inherently very complex and as a result it is very hard, if not possible, to develop architecture, concept and tactics with pure analytical approaches. At this point, simulation seems to be the most suitable candidate for this kind of C4ISR analysis. This paper will present a detailed description of the Command, Control, Communication and Computer Analysis Tool (C4AT) that is currently being developed by the Turkish General Staff Scientific Decision Support Center. When the first version is completed, the tool will be capable of simulating peace time activities of the strategic and operational level command and control centers. The second version will also have the ability to simulate and analyze crisis and conflict time activities of the similar command and control centers.
Author
Command and Control; Systems Integration; Simulation; Computer Techniques

20040053429 Federal Armed Forces Univ., Munich, Germany
Essential Preconditions for Coupling Model-Based Information Systems
Hofmann, Marko A.; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 17-1 - 17-12; In English; See also 20040053408; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Command, control, communication and intelligence (C3I) systems as well as simulation systems belong to the class of model-based information systems. This is obvious in the case of simulations, which are always based on models. But C3I systems, too, have to be based on models of the corresponding real world processes in order to manage the tremendous complexity of military systems. The latter becomes immediately clear when thinking of terrain representation in form of military maps, which are a perfect example for reliable models. However, since model designers necessarily abstract and simplify reality according to their own perception and conceptions, models can significantly differ in several aspects. Experiments with the high resolution combat simulation system COSIMAC (developed at the Institute for Applied Systems Science and Operations Research (IASFOR) at the University of the Federal Armed Forces Munich, Department of Computer Science) and some modules implementing basic C3I functionality (command and control modules) have shown that there are some essential preconditions for coupling such model based information systems. Our results indicate that technical and

syntactic preconditions (addressed by HLA and ATCCIS, for example), which have been in the focus of interest for almost a decade, are not sufficient to guarantee a successful interaction. The crucial tasks are to ensure that syntactical structures are attributed with the same meanings in all involved models and that the same actions are triggered by identical orders and reports. These findings have been confirmed during a study we performed for the German Armed Forces addressing the standardization of command and control components for different Army simulation systems. As a consequence of the importance of meanings and triggered actions we have chosen a linguistic approach to understand the problems of interoperability, which is based on the idea of successful communication between models / model users. That might seem a bit strange at first sight, but regarded from the perspective of the model designer, the coupling of models is in fact a sophisticated kind of communication with his counterpart.
Derived from text
Simulation; Operations Research; Interoperability; Information Systems; Command and Control

20040053430 Mitre Corp., McLean, VA, USA
C4ISR/Sim Technical Reference Model Applicability to NATO Interoperability
Carr, Francis H.; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 18-1 - 18-15; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 1998 Computer Generated Forces (CGF) Conference included a paper which proposed a Technical Reference Model (TRM) for interoperability between U.S. Command, Control, Communication, Computers, Intelligence, Reconnaissance, and Surveillance systems (C4ISR)1 and Computer Generated Force simulations (Sim). This TRM characterized the type of information that is necessary to pass between C4ISR and CGF systems . Since then, changes have occurred in technology for interfaces; the uses for interfaces; and the Architecture(s) upon which they are based. In addition, significant changes have occurred in the respective source and target systems that these interfaces connect, namely C4ISR systems and simulations. Finally, substantial interest has been expressed in the availability of C4ISR hosted simulation components, as well as the integration and exchange of components between the two domains. A recent Simulation Interoperability Standards Organization (SISO) Simulation Interoperability Workshop (SIW) paper has proposed substantial changes to reflect the evolution of technology, supported systems, current interface practices, and near term future uses for C4ISR M&S interfaces. This paper briefly describes the revised version of the TRM. It suggests when and how to use the TRM in reference to NATO Command, Control, Communication, and Intelligence (C3I) system to modeling and simulation (M&S) interoperability or integration efforts. It shows the TRM s relationship to current NATO models and standards in the C3I domain, as an aid to those concerned with interoperability, integration, or standardization efforts between the two types of systems. The paper explores the use of the TRM in light of NATO interoperability efforts, and reflects on the relationship between the C4ISR/Sim TRM and NATO guidance documents/standards such as the NATO C3 Technical Architecture (NC3TA), the NATO Common Operating Environment (NCOE) Model (NCOM), and others.
Derived from text
Simulation; Interoperability; North Atlantic Treaty Organization (NATO); Intelligence; Command and Control

20040053431 Supreme Allied Commander Atlantic, Norfolk, VA, USA
Allied Command Transformation Role in Modelling and Simulation
Welch, Jon; C3I and Modelling and Simulation (M and S) Interoperability; March 2004; 4 pp.; In English; See also 20040053408; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Allied Command Transformation has been assigned the mission of leading the transformation of NATO forces. It will be accountable for producing forces that bridge the difference in alliance capabilities and capitalize on the competitive advantages of national contributions. Supreme Allied Commander Atlantic transitioned to become the Transformation Strategic Commander for NATO on June 19 2003. SACEUR became the sole Operational Strategic Command through a realignment of functions/ tasks along an operational/functional line. The NATO Transformation process is now established allowing one command to be the driver for change, to provide the focused effort necessary to advance new technology, policy and doctrine within the Alliance. This one command will have the ability to concentrate on Transformation with the other strategic commander focusing on operations. Allied Command Transformation will be the advocate for new doctrine, concepts, and innovations within the Alliance.
Author
Simulation; Technologies; Policies

20040055384 NASA Ames Research Center, Moffett Field, CA, USA, Caelum Research Corp., Moffett Field, CA, USA
Using Collective Intelligence to Route Internet Traffic
Wolpert, David H.; Tumer, Kagan; Frank, Jeremy; [1998]; 7 pp.; In English; Neural Information Processing Systems Conference, Dec. 1998, Denver, CO, USA
Contract(s)/Grant(s): NAS2-14217; 632-30-00; No Copyright; Avail: CASI; A02, Hardcopy

A Collective Intelligence (COIN) is a community of interacting reinforcement learning (RL) algorithms designed so that their collective behavior maximizes a global utility function. We introduce the theory of COINs, then present experiments using that theory to design COINs to control internet traffic routing. These experiments indicate that COINs outperform previous RL-based systems for such routing that have previously been investigated.
Author
Internets; Intelligence; Algorithms

20040055602 Harvard Medical School, Boston, MA
Innovations in Public Health Surveillance: The National Bioterrorism Syndromic Surveillance Demonstration Project
Lazarus, Ross; Jun. 10, 2003; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421482; No Copyright; Avail: CASI; A03, Hardcopy

Presentation on the National Bioterrorism Syndromic Surveillance Demonstration project.
DTIC
Public Health; Surveillance

20040055624 Massachusetts Inst. of Tech., Cambridge, MA
An Exception Handling Service for Software Agent Ensembles
Klein, Mark; Feb. 2004; 123 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-2-0099; Proj-AGEN
Report No.(s): AD-A421591; AFRL-IF-RS-TR-2004-34; No Copyright; Avail: CASI; A06, Hardcopy

The objective of this project has been to develop technology that enables robust operation in open multi-agent systems (MAS) where we have, in principle, no guarantees of reliable, compliant, or even friendly agents and infrastructures, since we have no control or even necessarily any knowledge over how they are implemented. As part of this project we have developed a substantial web-accessible knowledge base of widely usable exception handling expertise, as well as technology that enables (I) the creation of better contingent contracts between agents (both human and software- based) as well as (2) exception-handling agents that monitor MAS for problem symptoms, diagnose the underlying problems, and intervene as appropriate to avoid or resolve these problems.
DTIC
Computer Programs

20040055632 Carnegie-Mellon Univ., Pittsburgh, PA
State of the Practice of Computer Security Incident Response Teams (CSIRTs)
Killcrece, Georgia; Kossakowski, Klaus-Peter; Ruefle, Robin; Zajicek, Mark; Oct. 2003; 292 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A421664; CMU/SEI-2003-TR-001; ESC-TR-2003-001; No Copyright; Avail: CASI; A13, Hardcopy

Keeping organizational information assets secure in today's interconnected computing environment is a challenge that becomes more difficult with each new 'e' product and each new intruder tool. There is no one solution for securing information assets; instead a multi-layered security strategy is required. One of the layers that many organizations are including in their strategy today is a computer security incident response team, or CSIRT. This report provides an objective study of the state of the practice of incident response, based on information about how CSIRTs around the world are operating. It covers CSIRT services, projects, processes, structures, and literature, as well as training, legal, and operational issues. The report can serve as a resource both to new teams that are setting up their operations and to existing CSIRTs that are interested in benchmarking their operations.
DTIC
Computer Information Security; Security

20040055638 Carnegie-Mellon Univ., Pittsburgh, PA

Organizational Models for Computer Security Incident Response Teams (CSIRTs)

Killcrece, Georgia; Kossakowski, Klaus-Peter; Ruefle, Robin; Zajicek, Mark; Dec. 2003; 156 pp.; In English

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A421684; CMU/SEI-2003-HB-001; No Copyright; Avail: CASI; A08, Hardcopy

When a computer security attack on an organization occurs, an intrusion is recognized, or some other kind of computer security incident occurs, it is critical for the organization to have a fast and effective means of responding. One method of addressing this need is to establish a formal incident response capability or a Computer Security Incident Response Team (CSIRT). When an incident occurs, the goal of the CSIRT is to control and minimize any damage, preserve evidence, provide quick and efficient recovery, prevent similar future events, and gain insight into threats against the organization. This handbook describes different organizational models for implementing incident handling capabilities, including each model's advantages and disadvantages and the kinds of incident management services that best fit with it. An earlier SEI publication, the Handbook for Computer Security Incident Response Teams (CSIRTs) (CMU/SEI-2003-HB-002), provided the baselines for establishing incident response capabilities. This new handbook builds on that coverage by enabling organizations to compare and evaluate CSIRT models. Based on this review they can then identify a model for implementation that addresses their needs and requirements.

DTIC

Computer Information Security; Security

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*.

20040053322 NASA Ames Research Center, Moffett Field, CA, USA, San Francisco State Univ., CA, USA, San Jose State Univ., CA, USA, Ultimode Systems, USA

On-board Science Understanding: NASA Ames' Efforts

Roush, Ted L.; Cheeseman, Peter; Gulick, Virginia; Wolf, David; Gazis, Paul; Benedix, Gretchen; Buntine, Wray; Glymour, Clark; Pedersen, Liam; Ruzon, Mark, et al.; [1998]; 1 pp.; In English; Automated Learning and Discovery Conference, 11-12 Jun. 1998, Pittsburgh, PA, USA

Contract(s)/Grant(s): RTOP 623-30-34; No Copyright; Avail: Other Sources; Abstract Only

In the near future NASA intends to explore various regions of our solar system using robotic devices such as rovers, spacecraft, airplanes, and/or balloons. Such platforms will likely carry imaging devices, and a variety of analytical instruments intended to evaluate the chemical and mineralogical nature of the environment(s) that they encounter. Historically, mission operations have involved: (1) return of scientific data from the craft; (2) evaluation of the data by space scientists; (3) recommendations of the scientists regarding future mission activity; (4) commands for achieving these activities being transmitted to the craft; and (5) the activity being undertaken. This cycle is then repeated for the duration of the mission with command opportunities once or perhaps twice per day. In a rapidly changing environment, such as might be encountered by a rover traversing hundreds of meters a day or a spacecraft encountering an asteroid, this historical cycle is not amenable to rapid long range traverses, discovery of novelty, or rapid response to any unexpected situations. In addition to real-time response issues, the nature of imaging and/or spectroscopic devices are such that tremendous data volumes can be acquired, for example during a traverse. However, such data volumes can rapidly exceed on-board memory capabilities prior to the ability to transmit it to Earth. Additionally, the necessary communication band-widths are restrictive enough so that only a small portion of these data can actually be returned to Earth. Such scenarios clearly require the enabling of some crucial decisions to be made on-board by these robotic explorers. These decisions transcend the electromechanical control, health, and navigation issues associated with robotic operations. Instead they focus upon a long term goal of automating scientific discovery based upon data returned by sensors of the robot craft. Such an approach would eventually enable it to understand what is interesting because the data deviates from expectations generated by current theories/models of planetary processes that could have resulted in the observed data. Such interesting data and/or conclusions can then be selectively transmitted to Earth thus reducing memory and communications demands.

Author

Robotics; Display Devices; Roving Vehicles; Electromechanics

20040053356 NASA Langley Research Center, Hampton, VA, USA
Cockpit System Situational Awareness Modeling Tool
Keller, John; Lebiere, Christian; Shay, Rick; Latorella, Kara; [2004]; 6 pp.; In English; 2nd Conference on Human Performance, Situation Awareness and Automation Technology, 22-25 Mar. 2004, Daytona Beach, FL, USA
Contract(s)/Grant(s): 23-728-40-00; Copyright; Avail: CASI; A02, Hardcopy

This project explored the possibility of predicting pilot situational awareness (SA) using human performance modeling techniques for the purpose of evaluating developing cockpit systems. The Improved Performance Research Integration Tool (IMPRINT) was combined with the Adaptive Control of Thought-Rational (ACT-R) cognitive modeling architecture to produce a tool that can model both the discrete tasks of pilots and the cognitive processes associated with SA. The techniques for using this tool to predict SA were demonstrated using the newly developed Aviation Weather Information (AWIN) system. By providing an SA prediction tool to cockpit system designers, cockpit concepts can be assessed early in the design process while providing a cost-effective complement to the traditional pilot-in-the-loop experiments and data collection techniques. Author

Cockpits; Human Performance; Situational Awareness; Adaptive Control; Aircraft Pilots; Systems Engineering; Mathematical Models

64
NUMERICAL ANALYSIS

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

20040051116 NASA Langley Research Center, Hampton, VA, USA
Finite Element Analysis in Concurrent Processing: Computational Issues
Sobieszczanski-Sobieski, Jaroslaw; Watson, Brian; Vanderplaats, Garrett; [2004]; 20 pp.; In English; 45th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 19-22 Apr. 2004, Palm Springs, CA, USA
Report No.(s): AIAA Paper 2004-1764; Copyright; Avail: CASI; A03, Hardcopy

The purpose of this research is to investigate the potential application of new methods for solving large-scale static structural problems on concurrent computers. It is well known that traditional single-processor computational speed will be limited by inherent physical limits. The only path to achieve higher computational speeds lies through concurrent processing. Traditional factorization solution methods for sparse matrices are ill suited for concurrent processing because the null entries get filled, leading to high communication and memory requirements. The research reported herein investigates alternatives to factorization that promise a greater potential to achieve high concurrent computing efficiency. Two methods, and their variants, based on direct energy minimization are studied: a) minimization of the strain energy using the displacement method formulation; b) constrained minimization of the complementary strain energy using the force method formulation. Initial results indicated that in the context of the direct energy minimization the displacement formulation experienced convergence and accuracy difficulties while the force formulation showed promising potential.
Author

Concurrent Processing; Finite Element Method; Displacement; Factorization; Optimization

20040053399 Centre de Recherches du Bouchet, Vert de Petit, France
Numerical Modeling of Internal Flow Aerodynamics, Part 1, Steady State Computations
Guery, Jean-Francois; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 9-1 - 9-16; In English; See also 20040053390; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Internal ballistics in a SRM can be solved with various ways and for various objectives. The motor design engineer wants to predict or understand the burning characteristics and the global performances of the motor, seek the efficiency of thermal insulation and nozzle design, check the reliability of ignition and motor design for the life cycle of the motor, take into account variability induced by manufacturing processes, etc. Different ways can be followed to reach the same goal. The reasons why a project manager uses numerical simulations are multiple. In the predictive mode, the aim is to design the system which fulfills the specifications at the lowest development cost (by minimizing the number of prototypes and tests). In the explanatory mode, the desire is to explain an observed and unknown phenomenon that happened during the development phase of a program. For solid rocket motors, the objectives of internal flow computations are to predict the global performance and reliability of the rocket, avoid, minimize or master undesired behaviors (like thrust oscillations, erosive burning), take into account flow/grain and casing interactions (mechanical and thermal loads), etc. The internal aerodynamics inside a solid rocket

motor can be modeled with increasing degrees of complexity from the simplest global equations to a full 3D numerical simulations. An AGARD Lecture Series has already been organized on the Design Methods in Solid Rocket Motors. The objective of this special course is not to duplicate the materials developed in AGARD-LS-150. We will focus on multidimensional simulations of internal flows.
Derived from text
Mathematical Models; Numerical Analysis; Internal Flow; Aerodynamics; Solid Propellant Rocket Engines; Nozzle Design

20040053400 Centre de Recherches du Bouchet, Vert de Petit, France
Numerical Modeling of Internal Flow Aerodynamics, Part 2, Unsteady Flows
Guery, Jean-Francois; Internal Aerodynamics in Solid Rocket Propulsion; January 2004, pp. 10-1 - 10-18; In English; See also 20040053390; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has been widely reported in the open literature that large segmented and axisymmetric Solid Rocket Motors (SRM) are subject to pressure oscillations caused by vortex shedding at annular restrictors or cavities in the grain, and acoustic feedback resulting from impingement of the vortices on the nozzle or other obstacles. If they are well suited for combustion instabilities studies in tactical rocket motors, acoustic balance methods have proven inefficient in predicting stability of large segmented rocket motors (e.g. Ariane 5 MPS and Titan IV SRMU).For those situations, the full unsteady numerical simulation of the internal flow becomes the adequate solution. In general, simulations are done within two objectives: 1. Explanation: this is the numerical simulation of a geometry defined at the time (web thickness) of maximum pressure oscillation after the firing of a SRM. This simulation will be generally made in a fixed geometry corresponding at that web thickness for a few acoustic periods. Frequencies and levels are expected from numerical simulation. The objective is to compute and explain the non linear coupling mechanisms between hydrodynamic instabilities and acoustics leading to such levels, with associated processes (conditions for resonance, aluminum combustion, fluid-structure coupling, ...). 2. Prediction: in this simulation, we want to assess the effect of a change in SRM geometry, propellant, burning rate [1],... on thrust oscillations, before any firing. In that case, all the firing has to be examined since there is no way to determine a priori the time of maximum pressure oscillation.
Derived from text
Mathematical Models; Numerical Analysis; Internal Flow; Aerodynamics; Solid Propellant Rocket Engines

20040053426 Swedish Defence Research Establishment, Stockholm, Sweden
Generic Representation of Military Organisation and Military Behaviour: UML and Bayesian Networks
Suzic, Robert; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. 14-1 - 14-10; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To be able to model systems for C2 we have to evaluate and find appropriate methodology for modelling and representation of our knowledge about military organisations and military behaviour. Military organisation and military behaviour are important parts of C2. In this paper we present a study of modelling military organisation and military behaviour in a generic manner, using two different knowledge representation techniques: the Unified Modeling Language (UML) and Bayesian Networks. The class diagram that is provided by UML is well suited for representing military organisations whose structure is well-known, since military units and their interrelations can be represented as classes and interrelations between the classes. On the other hand, it is a much harder task to represent military organisations that are not well-known or military behaviour because of the uncertainty associated with them. Different behaviours are triggered in different environments using different doctrines, and the outcomes of the behaviours are uncertain. Due to complexity, time constraints and war friction, causal relations between different factors, which play an important role in warfare, may be uncertain. Bayesian Networks seems to be a reasonable choice for representing uncertain military behaviour as well as uncertain military organizations, since this method combines uncertainty and a priori knowledge in a homogeneous way. We can compare those models and facilitate the verifying process. As result we get a more reliable BN and the modelling time decreases.
Author
Mathematical Models; Network Analysis; Knowledge Representation; Bayes Theorem; Military Operations

20040053460 Hampton Univ., VA, USA
Numerical Simulation of One-and Two-Phase Flows in Propulsion Systems
Blankson, Isaiah M., Technical Monitor; Gilinsky, Mikhail; [2002]; 19 pp.; In English
Contract(s)/Grant(s): NAG3-2422; No Copyright; Avail: CASI; A03, Hardcopy

In this report, we present some results of problems investigated during joint research between the Hampton University Fluid Mechanics and Acoustics Laboratory (FM&AL), NASA Glenn Research Center (GRC) and the Hyper-X Program of the NASA Langley Research Center (LaRC). The main areas of current scientific interest of the FM&AL include an investigation of the proposed and patented advanced methods for aircraft engine thrust and noise benefits. These methods are based on nontraditional 3D corrugated and composite nozzle, inlet, propeller and screw designs such as the Bluebell and Telescope nozzles, Mobius-shaped screws, etc. These are the main subject of our other projects, of which one is the NASA MURED's FAR Award. Working jointly with this project team, our team also analyzes additional methods for exhaust jet noise reduction. These methods are without essential thrust loss and even with thrust augmentation.
Derived from text
Numerical Analysis; Propulsion System Performance; Thrust Augmentation; Aircraft Engines; Acoustics

20040053469 NASA Ames Research Center, Moffett Field, CA, USA
The Generalization of Mutual Information as the Information between a Set of Variables: The Information Correlation Function Hierarchy and the Information Structure of Multi-Agent Systems
Wolf, David R.; [2004]; 19 pp.; In English
Contract(s)/Grant(s): NAS2-14217; No Copyright; Avail: CASI; A03, Hardcopy

The topic of this paper is a hierarchy of information-like functions, here named the information correlation functions, where each function of the hierarchy may be thought of as the information between the variables it depends upon. The information correlation functions are particularly suited to the description of the emergence of complex behaviors due to many- body or many-agent processes. They are particularly well suited to the quantification of the decomposition of the information carried among a set of variables or agents, and its subsets. In more graphical language, they provide the information theoretic basis for understanding the synergistic and non-synergistic components of a system, and as such should serve as a forceful toolkit for the analysis of the complexity structure of complex many agent systems. The information correlation functions are the natural generalization to an arbitrary number of sets of variables of the sequence starting with the entropy function (one set of variables) and the mutual information function (two sets). We start by describing the traditional measures of information (entropy) and mutual information.
Derived from text
Complex Systems; Correlation; Information Theory

20040053470 NASA Glenn Research Center, Cleveland, OH, USA
Nonlinear Resonant Oscillations of Gas in Optimized Acoustical Resonators and the Effect of Central Blockage
Li, Xiao-Fan; Finkbeiner, Joshua; Raman, Ganesh; Daniels, Christopher; Steinetz, Bruce M.; [2003]; 13 pp.; In English
Contract(s)/Grant(s): NCC3-798
Report No.(s): AIAA Paper 2003-0368; No Copyright; Avail: CASI; A03, Hardcopy

Optimizing resonator shapes for maximizing the ratio of maximum to minimum gas pressure at an end of the resonator is investigated numerically. It is well known that the resonant frequencies and the nonlinear standing waveform in an acoustical resonator strongly depend on the resonator geometry. A quasi-Newton type scheme was used to find optimized axisymmetric resonator shapes achieving the maximum pressure compression ratio with an acceleration of constant amplitude. The acoustical field was solved using a one-dimensional model, and the resonance frequency shift and hysteresis effects were obtained through an automation scheme based on continuation method. Results are presented for optimizing three types of geometry: a cone, a horn-cone and a half cosine- shape. For each type, different optimized shapes were found when starting with different initial guesses. Further, the one-dimensional model was modified to study the effect of an axisymmetric central blockage on the nonlinear standing wave.
Author
Resonators; Gas Pressure; Standing Waves; Resonant Frequencies; Mathematical Models; Pressure Ratio; Waveforms; Oscillations

20040053581 Iowa Univ., Iowa City, IA, USA
Numerical Simulation And Experimental Investigation Of The Lift-Off And Blowout Of Enclosed Laminar Flames
Venuturmilli, Rajasekhar; Zhang, Yong; Chen, Lea-Der; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 257-260; In English; See also 20040053504
Contract(s)/Grant(s): NCC3-666; No Copyright; Avail: CASI; A01, Hardcopy

Enclosed flames are found in many industrial applications such as power plants, gas-turbine combustors and jet engine

afterburners. A better understanding of the burner stability limits can lead to development of combustion systems that extend the lean and rich limits of combustor operations. This paper reports a fundamental study of the stability limits of co-flow laminar jet diffusion flames. A numerical study was conducted that used an adaptive mesh refinement scheme in the calculation. Experiments were conducted in two test rigs with two different fuels and diluted with three inert species. The numerical stability limits were compared with microgravity experimental data. Additional normal-gravity experimental results were also presented.
Derived from text
Diffusion Flames; Launching; Numerical Stability; Afterburning; Burners; Grid Refinement (Mathematics)

20040055519 Army Research Lab., Aberdeen Proving Ground, MD
A Human Steering Model Used to Control Vehicle Dynamics Models
Pearson, Richard J.; Fazio, Peter J.; Dec. 2003; 92 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-AH80
Report No.(s): AD-A421307; ARL-TR-3102; No Copyright; Avail: CASI; A05, Hardcopy

This report documents the modification of a legacy human steering model with the addition of a new three- dimensional driving sensor model. The three-dimensional sensor model was developed to replace the two-dimensional sensor model in the original code. The report also covers the integration of the resulting modified human steering model with a vehicle dynamics model developed in commercial off-the- shelf(COTS) simulation software. The COTS software is called the Dynamic Analysis and Design System (DADS). In this study, the legacy model was adapted to interface with the current version of DADS. The modified human steering model was interfaced with a model of the high mobility multipurpose wheeled vehicle (HMMWV) in DADS. Experimental data exist for driving tests that use the HMMWV. These data were used to validate the integrated human steering model.
DTIC
Steering

20040055538 Colorado State Univ., Fort Collins, CO
Optimization Problems in Multisensor and Multitarget Target Tracking
Poore, Aubrey B.; Mar. 12, 2004; 12 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0108
Report No.(s): AD-A421334; AFRL-SR-AR-TR-04-0179; No Copyright; Avail: CASI; A03, Hardcopy

The central problem in any surveillance system is the data association problem of partitioning observations into tracks and false alarms. Over the last fifteen years and with support from AFOSR, a new approach has been developed based on the use of multi-dimensional assignment problem formulation and Lagrangian relaxation algorithms. (This approach is often called multiple frame assignments or MFA for short.) Four U. S. patents have now been issued for this work. What is more, based on this new technology, Lockheed Martin of Oswego, NY won the best of Breed Tracking Contest for the next upgrade to AWACS held at Hanscom AFB in Boston in 1996, and it has been chosen as the tracking system for the Navy's new multipurpose helicopter under the LAMPS program. Currently, it is a contender for national and ballistic missile defense in the Hercules Program funded by MD Advanced Systems, for STSS Program as funded by the Department of the Air Force (in 2001 and 2002) and MDA in 2003.
DTIC
Targets; Tracking (Position)

20040055567 Naval Facilities Engineering Service Center, Port Hueneme, CA
Grazing-Angle Fourier Transform Infrared Spectroscopy for Surface Cleanliness Verification
Hoffard, Theresa A.; Mar. 2003; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A421378; TR-2217-SHR; No Copyright; Avail: CASI; A04, Hardcopy

As part of the Surface Cleanliness Verification project, sponsored by the Strategic Environmental Research and Development Program, the Naval Facilities Engineering Service Center conducted an investigation of grazing-angle reflectance Fourier Transform Infrared (FTIR) Spectroscopy as a tool for online cleanliness verification at DOD maintenance and repair facilities. In the project's first year, the feasibility of grazing-angle reflectance FTIR was demonstrated in the laboratory for the detection of organic contaminant residues on reflective surfaces. In Years 2 and 3 this technology was transitioned from the laboratory into a portable field device capable of detecting organic and certain inorganic contaminants on reflective surfaces at very sensitive levels (< 1.0 microgram/sq cm). Examples of DoD applications where surface

cleanliness is critical include coating, plating and bonding of aircraft parts; beaming refurbishment; and shipboard surface tile mounting. Visual inspection and water break testing are often inadequate to detect contamination that may cause subsequent bonding or fouling problems if not removed.
DTIC
Cleanliness; Fourier Transformation; Grazing; Infrared Spectra; Infrared Spectroscopy

20040055568 Air Force Research Lab., Wright-Patterson AFB, OH
Non-Linear Control Allocation Using Piecewise Linear Functions: A Linear Programming Approach
Bolender, Michael A.; Doman, David B.; Feb. 2004; 20 pp.; In English
Report No.(s): AD-A421388; AFRL-VA-WP-TP-2004-303; AFRL-VA-WP-TP-2004-303; No Copyright; Avail: CASI; A03, Hardcopy

The performance of two different approaches to solving the non-linear control allocation problem is presented. The non-linear control allocation problem is formulated using piecewise linear functions to approximate the control moments produced by a set of control effectors. when the control allocation problem is formulated as a piecewise linear program, an additional set of constraints enter into the problem formation. One approach is to introduce a set of binary variables to enforce these constraints. The result is a mixed- integer linear programming problem that can be solved using any branch-and-bound software. A second approach is to solve the piecewise linear programming problem using a modified simplex method. The simplex algorithm is modified to enforce a subset of the decision variables to enter into the basis only if certain conditions are met. We will show that solving the optimization problem using the simplex based approach is significantly faster than solving the same problem using a mixed-integer formulation. We will then compare the closed- loop performance of a re-entry vehicle using both approaches.
DTIC
Linear Programming; Nonlinear Systems; Nonlinearity

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20040053645 Missouri Univ., Columbia, MO, USA
Bayesian Analysis for Various Order Restricted Problems
Molitor, J.; Dec. 1999; 116 pp.; In English
Report No.(s): PB2004-104530; No Copyright; Avail: CASI; A06, Hardcopy

This thesis consists of two distinct but related problems in the area of Bayesian order restricted inference. The first problem deals with the standard comparison of means with order restrictions in place. Here we will not only order individual parameters, but functions of parameters as well. While statistics literature has dealt with ordered parameter problems via Gibbs sampling, little has been mentioned about ordered parameter problems involving the ordering of functions of parameters. The second problem this thesis will address is order restricted inference for hierarchical spatial analysis where it is assumed that some kind of spatial correlation exists as the response varies from geographic region to region. Part of our study of this problem will address the subject of frequency validity for posterior Bayesian credible intervals.
NTIS
Bayes Theorem; Frequencies; Independent Variables

20040053646 Missouri Univ., Columbia, MO, USA
Bayesian Spatial Models for Small Area Estimation
Oleson, J.; May 2002; 150 pp.; In English
Report No.(s): PB2004-104531; No Copyright; Avail: CASI; A07, Hardcopy

This work consists of three parts. For the first portion the authors consider a generalized linear model with possible correlated random effects. The authors use a Bayesian hierarchical generalized linear mixed model to estimate success rates at a post-stratified level. The model includes an autoregressive process and spatially correlated random geographic effects. The application is the 1996 Missouri Turkey Hunting Survey. In the second portion the authors incorporate both pre- and post-stratification into a Bayesian hierarchical framework. The authors propose a new family of generalized linear mixed models with correlated random effects when there are two unknown canonical parameters. Such a family can be used to model both random sample sizes and success probabilities in small area estimation under pre-and post-stratification. General

formulae for Bayesian estimation and prediction at the post-stratification level are given. One application is the 1998 Missouri Turkey Hunting Survey, which was pre-stratified based on the hunter's place of residence.
NTIS
Bayes Theorem; Random Sampling; Probability Theory

20040055575 Dayton Univ., OH
Multi-Vehicle Cooperative Search with Uncertain Prior Information
Zhang, Chunlei; Ordonez, Raul; Schumacher, Corey; Feb. 2004; 13 pp.; In English
Contract(s)/Grant(s): F33615-01-C-3154; Proj-2403
Report No.(s): AD-A421407; AFRL-VA-WP-TP-2004-309; No Copyright; Avail: CASI; A03, Hardcopy

We present a possible solution for the multi- vehicle cooperative search problem via the surrogate optimization method. We establish a discrete mathematical model for the multi-vehicle cooperative search stationary target with uncertain prior information. We reformulate the Past, Present and Predicted Future (PPP) algorithm we introduced in previous work based on the new model and propose an implementation to adapt to the new scenario. Monte Carlo simulations indicate that the new implementation achieves better performance. Moreover, the scalability of the PPP algorithm is addressed.
DTIC
Algorithms

20040055613 Navy Personnel Research Studies and Technology, Millington, TN
The Feasibility of Utilizing Cluster Sampling in the Navy: A Demographic Comparison of Cluster and Stratified Random Samples
Newell, Carol E.; Dever, Jill A.; Apr. 2004; 16 pp.; In English
Report No.(s): AD-A421517; NPRST-TN-04-3; No Copyright; Avail: CASI; A03, Hardcopy

Traditional mail surveys sent to randomly selected members have been the predominant data collection mechanism to assess the attitudes and opinions of U. S. Navy personnel. Over the past ten years, response rates on large-scale Navy surveys have steadily declined. For example, the Navy Equal Opportunity/Sexual Harassment (NEOSH) Survey, which is mailed biennially to a Navy-wide sample, dropped from 60 percent in 1989 to 30 percent in 1999. On-site survey administration at selected Navy fleet concentration areas has been suggested as a possible solution; however, this sort of convenience sampling is not scientific and cannot be generalized to the Navy's population. If a methodology could be utilized that linked targeted command survey administration with representative, scientific sampling, many of the shortfalls in current Navy survey administration could be addressed. The purpose of this study was to determine the feasibility of utilizing cluster sampling to develop a statistically representative, scientifically valid sample at randomly selected Navy commands. This study statistically compared the demographics of a cluster sample to a stratified random sample.
DTIC
Data Acquisition; Demography; Random Sampling; Sampling

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20040052846 New Mexico State Univ., Las Cruces, NM, USA
Investigations into the Transient Analysis of System Reliability/Availability via Cumulant Functions
Matis, Timothy I.; [2004]; 21 pp.; In English
Contract(s)/Grant(s): NAG9-1547; No Copyright; Avail: CASI; A03, Hardcopy

The specific problem considered in this research is that of using cumulant functions to describe the reliability function of a system operating in a Markovian environment. The environment consists of non-fatal shocks that have the effect of weakening, though not destroying, the system on impact. Each shock has both an immediate repairable effect and a permanent non-repairable effect that increases the failure rate of the system in a non-linear fashion. These shocks may represent several events, most notably the failure of other system components as was originally described in the proposal. The use of cumulant functions is a novel approach to this problem. Our work focused on how this approach may be applied, the accuracy of the approximation under various cumulant truncation levels, and the computational efficiency of this method. The research findings described in the attached paper may be summarized as follows: 1) Cumulant-based methods may be applied to this reliability model in a straightforward fashion; 2) The accuracy of the reliability functions approximations do not deviate

greatly under varying cumulant truncation levels; 3) The robustness of the approximations increases with the order of cumulant truncation; and 4) The stability of the single system model provides evidence to the expandability of this procedure to large interacting systems. Empirical results were gathered using several 'test-sized' models that described various types of state-dependencies. In particular, the polynomial intensity functions were varied in rate, order, and mixture of terms. It was observed that the cumulant method performed well in most for most models under the various truncation levels.
Derived from text
Systems Analysis; Reliability Analysis; Markov Processes; Functions (Mathematics)

20040053410 Havelsan A.S., Ankara, Turkey
Potentials of Turkish Modeling and Simulation Market from Local Defense Industry
Yarman, Faruk A.; C3I and Modelling and Simulation (M and S) Interoperability; March 2004; 35 pp.; In English; See also 20040053408; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Modeling and Simulation (M&S) is an important issue in many application areas such defence, civil industry, trade, marketing, scientific research, etc. M&S has great business potential for 'DDI' countries. Computer simulation can be defined as simulating a real or virtual system/process in the computer. The process to be simulated can be very complicated and instead of manufacturing the product/system which can take too much time, effort and investment product developers can simulate the product to measure its technical quality, effectiveness and several other characteristics. The simulated process or product can easily be changed, redesigned, reconstructed or fine-tuned with less effort and cost in terms of human effort.
Derived from text
Defense Industry; Computerized Simulation; Systems Simulation; Dynamic Models

20040053413 Virginia Modeling, Analysis and Simulation Center, Norfolk, VA, USA
Technical Evaluation Report: MSG-022/SY-003 Conference on C3I and M and S Interoperability
Tolk, Andreas; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. TER-1 - TER-7; In English; See also 20040053408; Copyright; Avail: CASI; A02, Hardcopy

The importance of Modelling and Simulation (M&S) is now largely recognised within NATO. Among various military applications of M&S within the Alliance, Operational Support and Training are identified as high priority areas. In parallel NATO has developed an important activity in the Command, Control, Communication and Intelligence (C3I) Systems as the backbone support of military activities. Whilst C3I and M&S domains have many technical similarities, they have developed along separate tracks in the Alliance, as in many nations, sometimes differing by their purposes and priorities. As an example, different standards have been developed in parallel and are not largely understood and shared in both communities. The NATO Modelling and Simulation Master Plan - the capstone document for M&S systems - does not mention the NATO C3 Technical Architecture - the capstone document for C3I systems - and vice versa. For the efficient support of planning, training, and executing of operations, as well as NATO procurement and doctrine development, this gap should be closed. Consequently, the main objective of this conference was to contribute to a better understanding of and an improvement in interoperability between C3I and M&S systems as a first step towards a common information technology (IT) infrastructure supporting M&S as well as C3I systems, thus, overcoming the shortfalls of interface driven solutions. The following topics were given as a guideline for the authors: 1) Lessons learned from past experience in linking C3I and M&S; 2) Current Joint use of C3I and M&S in Computer Assisted Exercises (CAX); 3) Interoperability and data standards; and 4) Future projects. In addition, the conference addressed the themes of research, development and cost-effective co-operative application of C3I and M&S systems. Furthermore, the Data Consistency and Translation between C3I and Simulations was perceived to be a first valuable step into this direction.
Derived from text
Command and Control; Systems Simulation; Dynamic Models; Data Management

20040053414 Turkish General Staff Headquarters, Ankara, Turkey
Turkish Military Keynote Address
Pekar, B.; C3I and Modelling and Simulation (M and S) Interoperability; March 2004, pp. KN1-1 - KN1-3; In English; See also 20040053408; Copyright; Avail: CASI; A01, Hardcopy

In this presentation, Brigadier General, B. Pekar, the Head of the General Staff Scientific Decision Support Center, discusses the following issues: 1) The importance and application areas of the modeling and simulation activities for the Turkish armed forces; and 2) How to improve the effectiveness and the efficiency in modeling and simulation activities, specifically in the common ground of NATO. Within the limits of the defense budget, we focus our efforts to fulfill our needs

for: a) Conducting the defense planning and management activities while keeping pace with the rapid developments of this information age; b) Training our military personnel to have the ability to use all those state-of-the-art defense systems efficiently and effectively; and c) Preparing the forces for every type of mission, including the NATO or United Nation s peace operations in different crisis regions of the world, which the Turkish armed forces has never refrained from participation.
Derived from text
Technology Assessment; Systems Simulation; Dynamic Models

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20040055528 Army Construction Engineering Research Lab., Champaign, IL
Nonlinear Seismic Response of Asymmetric Structures
Sfura, Jon F.; Jul. 2003; 682 pp.; In English
Contract(s)/Grant(s): Proj-4A161102AT23
Report No.(s): AD-A421318; ERDC/CERL-MP-03-2; No Copyright; Avail: CASI; A99, Hardcopy

The purpose of this study was to investigate the nonlinear, inelastic response of one-story, symmetric- and asymmetric-plan structures to uniaxial and biaxial lateral earthquake ground motions. The investigation is a combined experimental and analytical program. Through the study, the lateral-torsional response of the system was studied for a range of system parameters with the goals of examining the adequacy of current building code torsional design assumptions and the ability of analytical software to predict inelastic response. The experimental part of the investigation involved subjecting a single-story steel moment-frame to a series of uniaxial and biaxial earthquake ground motions on the U.S. Army CERL shaketable. The analytical part of the investigation involved the nonlinear finite element programs Abaqus and Drain-3DX to analyze the response of the model during the earthquake simulations. Implications of the experimental results on the adequacy of seismic design provisions are discussed. In addition, the ability of analytical software to predict inelastic torsional response is discussed for both a model tuned to the measured dynamic properties of the actual structure and a model based on common modeling assumptions. Further, the effects on prediction accuracy of different analytical modeling parameters and assumptions is discussed.
DTIC
Asymmetry; Nonlinear Systems; Nonlinearity; Structural Engineering

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*.

20040053507 NASA Glenn Research Center, Cleveland, OH, USA
Solid Inflammability Boundary At Low-Speed (SIBAL)
T'ien, J.; Sacksteder, K.; Ferkul, P.; Pettegrew, R.; Street, K.; Kumar, A.; Tolejko, K.; Kleinhenz, J.; Piltch, N.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 121-124; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

This research program is concerned with the effect of low-speed flow on the spreading and extinction processes over solid fuels. The project has passed the Science Concept Review and the experiment is currently scheduled to be performed in the ISS Combustion Integrated Rack. We present an overview of recent and ongoing experimental and theoretical efforts.
Author
Evaluation; Radiation Measurement; Fuels; Infrared Imagery; Flame Propagation; Low Speed

20040053648 Lawrence Livermore National Lab., Livermore, CA
Device Assembly Facility (DAF) Glovebox Radioactive Waste Characterization
Dominick, J. L.; Dec. 18, 2001; 26 pp.; In English
Report No.(s): DE2004-15005934; UCRL-ID-146615; No Copyright; Avail: Department of Energy Information Bridge

The Device Assembly Facility (DAF) at the Nevada Test Site (NTS) provides programmatic support to the Joint Actinide Shock Physics Experimental Research (JASPER) Facility in the form of target assembly. The target assembly activities are performed in a glovebox at DAF and include Special Nuclear Material (SNM). The portion of the facility where the radioactive material is handled in the glove box is maintained as a clean work environment, i.e. no loose contamination in areas outside of the glovebox or in the occupied areas. Several routine procedures are performed to ensure that the facility is maintained as a clean work area

NTIS

Contamination; Radioactive Wastes; Research Facilities

20040053651 Princeton Univ., NJ

Control System for the NSTX Lithium Pellet Injector

Sichta, P.; Dong, J.; Gernhardt, R.; Gettelfinger, G.; Kugel, H.; Oct. 2003; 12 pp.; In English

Report No.(s): DE2004-820118; PPPL-3894; No Copyright; Avail: Department of Energy Information Bridge

The Lithium Pellet Injector (LPI) is being developed for the National Spherical Torus Experiment (NSTX). The LPI will inject 'pellets' of various composition into the plasma in order to study wall conditioning, edge impurity transport, liquid limiter simulations, and other areas of research. The control system for the NSTX LPI has incorporated widely used advanced technologies to create a low-cost control system which is fully integrated into the NSTX computing environment. This paper will present the hardware and software design of the computer control system for the LPI

NTIS

Lithium; Pellets; Injectors; Computer Programs

20040053663 Lawrence Livermore National Lab., Livermore, CA

Gamma-Gamma Interaction Region Design Issues

Gronberg, J.; Jan. 12, 2001; 10 pp.; In English

Report No.(s): DE2004-15006132; UCRL-JC-142080; No Copyright; Avail: Department of Energy Information Bridge

An initial design of the optics required for producing gamma-gamma collisions was produced for the NLC Zeroth Order Design Report (ZDR) submitted to the 1996 Snowmass workshop. The design incorporated only loose constraints from the interaction region requirements. In this paper we report progress on a design of a gamma-gamma interaction region which incorporates all constraints.

NTIS

Gamma Ray Beams; Interactions

20040053676 Lawrence Livermore National Lab., Livermore, CA

Pulse Height Spectrum Measurement Experiment for Code Benchmarking: First Results

Sale, K. E.; Hall, J. M.; Brown, C. M.; Oct. 27, 2000; 12 pp.; In English

Report No.(s): DE2004-15006140; UCRL-JC-141142; No Copyright; Avail: Department of Energy Information Bridge

Monte Carlo radiation transport codes are in wide use in research and industry throughout the world. Although the codes have been well tested in some specific applications the tests have generally been against integral data, e.g. dose, total energy deposit or activation. In this paper we present the first results for a photon transport benchmark experiment testing the capability to predict absolute differential results, specifically pulse height counting rate spectra in a high purity germanium detector. There is no scaling employed to help the predictions match the experimental data.

NTIS

Deposits; Dosage; Pulse Amplitude; Radiation Transport

20040055269 Brookhaven National Lab., Upton, NY, USA

Collective Flow and QGP Properties

Bass, S.; Esumi, S.; Heinz, U.; Kolb, P.; Shuryak, E.; 2003; 230 pp.; In English

Report No.(s): DE2004-15006426; BNL-71898-2003; No Copyright; Avail: Department of Energy Information Bridge

The RIKEN BNL Research Center (RBRC) was established in April 1997 at Brookhaven National Laboratory. It is funded by the 'Rikagaku Kenkyusho' (RIKEN, The Institute of Physical and Chemical Research) of Japan. The Center is dedicated

to the study of strong interactions, including spin physics, lattice QCD, and RHIC physics. This document is a summary of a workshop.
NTIS
Flow Characteristics; Physics; Gas-Ion Interactions

20040055270 Brookhaven National Lab., Upton, NY, USA
RHIC Spin Collaboration Meeting XX
Bland, L.; 2003; 204 pp.; In English
Report No.(s): DE2004-15006427; BNL-71900-2004; No Copyright; Avail: Department of Energy Information Bridge
The RIKEN BNL Research Center (RBRC) was established in April 1997 at Brookhaven National Laboratory. It is funded by the 'Rikagaku Kenkyusho' (RIKEN, The Institute of Physical and Chemical Research) of Japan. The Center is dedicated to the study of strong interactions, including spin physics, lattice QCD, and RHIC physics. This document contains copies of selected slides accompanied by one page of explanation from each presenter.
NTIS
Physics; Quantum Chromodynamics

20040055271 Brookhaven National Lab., Upton, NY
RFOFO Cooling Ring: Simulation Results
Berg, J. S.; Fernow, R. C.; Gallardo, J. C.; Palmer, R. B.; Oct. 2003; 12 pp.; In English
Report No.(s): DE2004-15006429; BNL-CAP-379-NUFACT-03C; No Copyright; Avail: Department of Energy Information Bridge
Designs for neutrino factories and muon colliders use ionization cooling to reduce the emittance of the muon beam prior to acceleration. Current baseline designs make use of linear channels that only cool the beam in transverse phase space. However, there has been considerable progress over the past two years in achieving 6-dimensional ionization cooling in cooling rings. At present the most realistic modeling has been done for the RFOFO ring. Alternating polarity solenoids provide transverse focusing. The bending field is provided by alternately tipping the axis of the solenoids above and below the orbital midplane. A short cell length is used to obtain a small beta function with a reasonable value of the solenoid field strength. Wedge-shaped absorbers are placed in the beam path at locations where the solenoidal field changes direction. Most of the lattice cell is filled by RF cavities to restore the energy lost in the absorbers.
NTIS
Muons; Ionization; Neutrinos; Simulation

20040055272 Brookhaven National Lab., Upton, NY
Playing with Sandpiles
Creutz, M.; Jan. 2004; 10 pp.; In English
Report No.(s): DE2004-15006430; BNL-71955-2004-CP; No Copyright; Avail: Department of Energy Information Bridge
The Bak-Tang-Wiesenfeld sandpile model provides a simple and elegant system with which to demonstate self-organized criticality. This model has rather remarkable mathematical properties. Some of these properties are demonstrated graphically with a simple computer simulation.
NTIS
Sands; Simulation

20040055273 Brookhaven National Lab., Upton, NY
Hypernuclear Structure from Gamma-Ray Spectroscopy
Millener, D. J.; Jan. 2004; 14 pp.; In English
Report No.(s): DE2004-15006431; BNL-71965-2004-CP; No Copyright; Avail: Department of Energy Information Bridge
The energies of p-shell hypernuclear(gamma) rays obtained from recent experiments using the Hyperball at BNL and KEK are used to constrain the YN interaction which enters into shell-model calculations which include both(Lambda) and(Sigma) configurations.
NTIS
Spectroscopy; Hypernuclei; X Ray Spectroscopy

20040055277 Princeton Univ., NJ

Effect of Anode Dielectric Coating on Hall Thruster Operation

Dorft, L.; Raitses, Y.; Fisch, N. J.; Semenov, V.; Oct. 2003; 20 pp.; In English

Report No.(s): DE2004-820110; PPPL-3888; No Copyright; Avail: Department of Energy Information Bridge

An interesting phenomenon observed in the near-anode region of a Hall thruster is that the anode fall changes from positive to negative upon removal of the dielectric coating, which is produced on the anode surface during the normal course of Hall thruster operation. The anode fall might affect the thruster lifetime and acceleration efficiency. The effect of the anode coating on the anode fall is studied experimentally using both biased and emissive probes. Measurements of discharge current oscillations indicate that thruster operation is more stable with the coated anode.

NTIS

Hall Thrusters; Anodes; Anodic Coatings

20040055278 Princeton Univ., NJ

Electromagnetic Weible Instability in Intense Charged Particle Beams with Large Energy Anisotropy

Startsev, E. A.; Davidson, R. C.; Oct. 2003; 34 pp.; In English

Report No.(s): DE2004-820112; PPPL-3889; No Copyright; Avail: Department of Energy Information Bridge

In plasmas with strongly anisotropic distribution functions, collective instabilities may develop if there is sufficient coupling between the transverse and longitudinal degrees of freedom. Our previous numerical and theoretical studies of intense charged particle beams with large temperature anisotropy demonstrated that a fast, electrostatic, Harris-like instability develops, and saturates nonlinearly, for sufficiently large temperature anisotropy. The total distribution function after saturation, however, is still far from equipartitioned. In this paper the linearized Vlasov-Maxwell equations are used to investigate detailed properties of the transverse electromagnetic Weibel-type instability for a long charge bunch propagating through a cylindrical pipe of radius r(sub w). The kinetic stability analysis is carried out for azimuthally symmetric perturbations about a two-temperature thermal equilibrium distribution in the smooth-focusing approximation. The most unstable modes are identified, and their eigenfrequencies, radial mode structure and instability thresholds are determined. The stability analysis shows that, although there is free energy available to drive the electromagnetic Weibel instability, the finite transverse geometry of the charged particle beam introduces a large threshold value for the temperature anisotropy below which the instability is absent. Hence, unlike the case of an electrically neutral plasma, the Weibel instability is not expected to play as significant a role in the process of energy isotropization of intense unneutralized charged particle beams as the electrostatic Harris-type instability.

NTIS

Weibel Instability; Electromagnetism; Anisotropy

20040055358 Wheaton Coll., Norton, MA, USA

Hydrothermal Plumes and Heating Europa's Ice Shell from Below

Collins, G. C.; Goodman, J. C.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 18-19; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Chaotic terrain disrupts the icy surface of Europa at a variety of scales, from large chaos areas over 100 km across to an abundance of small features less than 10 km in diameter. Models proposed for the formation of chaotic terrain invoke some type of localized thermally-driven modification of the ice shell. Localization of heat may be caused by themal diapirism within the ice shell, or focusing of heat from Europa's rocky interior, through a liquid layer, to the base of the ice shell. This latter possibility has been previously investigated from the perspective of how heat can be transmitted through the ocean via hydrothermal plumes and from the perspective of how a plume could melt through the ice shell to produce chaotic terrain. In this abstract we address hydrothermal plume behavior and ice shell melting, in an attempt to better understand how these processes may operate on Europa, and ultimately we wish to know if they leave visible evidence in Europa s surface geology. Derived from text

Ice; Plumes; Hydrothermal Systems; Chaos

20040055541 Naval Undersea Warfare Center, Newport, RI

A Reduced-Order Model of a Fluid-Loaded, Elastomeric-Coated Metallic Plate

Hull, Andrew J.; Mar. 2004; 41 pp.; In English

Report No.(s): AD-A421338; NUWC-NPT-TR-11; NUWC-NPT-TR-508; No Copyright; Avail: CASI; A03, Hardcopy

This report derives and analyzes a reduced-order model of a fluid-loaded, elastomeric-coated metallic plate. First, a

full-order model of the system is derived using thick plate theory for both the elastomeric coating and the metallic plate. This results in open-form equations of the displacement and stress fields. Next, a reduced-order model is derived by changing the modeling theory of the metallic plate from plate equations to discrete mass equations, which results in a four- by-four system matrix. This new matrix can be symbolically inverted to yield closed-form solutions at every frequency and wavenumber. This closed-formed model is more desirable than the open-form model because the interaction of the physical constants in the stress and displacement fields is explicit. The reduced-order model is graphically compared to the full- order model, indicating that the reduced-order model is an accurate representation of the full-order model.
DTIC
Coatings; Elastomers; Fluid Mechanics; Metal Plates

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*.

20040053354 Illinois Inst. of Tech., Chicago, IL, USA
Modeling Nonlinear Acoustic Standing Waves in Resonators: Theory and Experiments
Raman, Ganesh; Li, Xiaofan; Finkbeiner, Joshua; February 11, 2004; 9 pp.; In English
Contract(s)/Grant(s): NCC3-798; No Copyright; Avail: CASI; A02, Hardcopy

The overall goal of the cooperative research with NASA Glenn is to fundamentally understand, computationally model, and experimentally validate non-linear acoustic waves in enclosures with the ultimate goal of developing a non-contact acoustic seal. The longer term goal is to transition the Glenn acoustic seal innovation to a prototype sealing device. Lucas and coworkers are credited with pioneering work in Resonant Macrosonic Synthesis (RMS). Several Patents and publications have successfully illustrated the concept of Resonant Macrosonic Synthesis. To utilize this concept in practical application one needs to have an understanding of the details of the phenomenon and a predictive tool that can examine the waveforms produced within resonators of complex shapes. With appropriately shaped resonators one can produce un-shocked waveforms of high amplitude that would result in very high pressures in certain regions. Our goal is to control the waveforms and exploit the high pressures to produce an acoustic seal. Note that shock formation critically limits peak-to-peak pressure amplitudes and also causes excessive energy dissipation. Proper shaping of the resonator is thus critical to the use of this innovation.
Author
Models; Nonlinearity; Acoustics; Resonators; Sound Waves

20040053590 Washington State Univ., Pullman, WA, USA
Some Responses Of Small Diffusion Flames To Ultrasonic Radiation
Thiessen, David B.; Wei, Wei; Marston, Philip L.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 321-324; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

As an extension to our NASA supported research on the stabilization of liquid bridges with acoustic radiation pressure, we examined some aspects of the response of gaseous flames to the radiation pressure of ultrasound. The radiation pressure is the result of the time-averaged (2nd order) stresses of ultrasound. Radiation pressure has been widely used to manipulate liquid drops in air .and to a lesser extent liquid bridges in air. Our observations show that flames have significant responses to ultrasonic radiation pressure and this is supported by approximations for the radiation pressure. Ultrasound is expected to alter some aspects of the dynamics of flames in reduced gravity because the radiation force-per-volume on the flame may be made to be similar in magnitude to the buoyant force-per-volume on flames in normal gravity. Thus it may prove possible to use ultrasound to reintroduce some aspects of buoyancy on nonpremixed (diffusion) flames in reduced gravity. Aspects of the radiation pressure on flames are also relevant to understanding the acoustic control of hot fluid objects. We observed in normal gravity the responses of small diffusion flames to standing ultrasonic waves. The direction of the response was found to agree with calculations of the radiation pressure on flames. In agreement with our predictions of the distribution of ultrasonic radiation stress on the flame, the flame is attracted to an acoustic pressure antinode and becomes slightly elliptical with the major axis in the plane of the antinode. The radiation pressure distribution and the direction of the radiation force follows from

the dominance of the dipole scattering of sound by a small flame. We also observed that steady or modulated ultrasonic traveling waves modified the flicker of small diffusion flames.
Derived from text
Diffusion Flames; Microgravity; Sound Pressure; Ultrasonic Radiation; Ultrasonics; Flames

20040055447 Ohio State Univ., Columbus, OH
Computational Auditory Scene Analysis Based Perceptual and Neural Principles
Wang, DeLiang; Mar. 2004; 13 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0027
Report No.(s): AD-A421188; 740381/868490; AFRL-SR-AR-TR-04-0162; No Copyright; Avail: CASI; A03, Hardcopy

A remarkable feat of the auditory system is its ability to disentangle the acoustic mixture and group the acoustic energy from the same event. This fundamental process of auditory perception is called auditory scene analysis. of particular importance in auditory scene analysis is the separation of speech from interfering sounds, or speech segregation. Consistent with specified objectives, this project made major advances along the following three directions. First, the problem of multipitch tracking was investigated in the context of multiple sound sources, and a robust algorithm for multipitch tracking of noisy speech was developed. The second advance is in monaural separation of voiced speech, where a new system was proposed that employs different strategies in the low- and the high-frequency range. A key element of the system is amplitude modulation analysis in the high-frequency range. Third, the problem of location- based separation was studied in the joint feature space of interaural time difference and interaural intensity difference, and a novel classification approach was introduced to optimally determine whether a target sound dominates in local time-frequency units. All of the three models were comprehensively evaluated and shown to be substantially superior to existing approaches.
DTIC
Analysis (Mathematics); Auditory Perception; Scene Analysis; Sound Generators; Sound Waves

20040055464 Mississippi Univ., University, MS
Acoustic Technology for Landmine Detection
Sabatier, James M.; Petculescu, Andi G.; Mar. 31, 2004; 40 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0346
Report No.(s): AD-A421235; JMS0304-2; No Copyright; Avail: CASI; A03, Hardcopy

The Office of Naval Research issued Grant N00014- 02-1-0346 for Optical Measurements of Ground Vibrations to the National Center for Physical Acoustics at the University of Mississippi. The University of Mississippi is involved in an applied research program to develop an acoustic technique to detect buried landmines. In this technique, the ground is excited using acoustic or seismic sources which elicit resonance in buried mines. This resonance causes increased amplitude in the ground vibration over the buried object. The primary methods of measuring ground vibration involve laser Doppler vibrometry and tend to limit operational tempo due to long scanning times and be adversely affected by loose ground cover. Research has been performed to develop a Doppler acoustic technique for the measurement of ground vibration. Initial laboratory and field tests indicate this device has significant promise for overcoming the current limitations.
DTIC
Mine Detectors; Sound Detecting and Ranging

20040055641 British Columbia Univ., Vancouver, British Columbia
A Study on the Relationships Between Anthropogenic Sounds, Whale Sounds and Behavior and Physiology of Free-Swimming Whales
Goodyear, Jeffrey; Jan. 1995; 13 pp.; In English
Contract(s)/Grant(s): N00014-95-1-1181
Report No.(s): AD-A421718; No Copyright; Avail: CASI; A03, Hardcopy

To study the relationships of anthropogenic sounds to specific aspects of whale behavior and physiology. Further, how low frequency sounds might negatively affect these parameters and habitat- use patterns. Refine and apply multi- sensor radio/satellite telemetry/data logging tags (MST-VHF and MST-SAT tags developed under a previous ONR grant) to free-swimming whales and use them as the key tools to test for and evaluate specific affects of anthropogenic sound sources. The MST-VHF and MST-SAT tags record one or several of the following parameters which are then downloaded directly by serial cable or via telemetry: heart rate, speed, roll, yaw, depth, sound, temperature, and others. Extent and rate of change in one or more of these parameters of a tagged whale were to be compared under 'control'--no anthropogenic sounds, and 'test'

conditions--anthropogenic noise present e.g. from ships, research sources, fisheries, and others. Repeatable- measured patterns of change in response to characterized sounds simultaneously recorded using gear aboard independent platforms nearby would provide evidence that whales are affected by certain anthropogenic sounds. Negative affects would be interpreted as directly observed departures from associated sound stimuli and/or statistically significant shifts in the activity budget of animals compared with the normal or control condition.
DTIC
Swimming; Underwater Acoustics; Whales

20040056016 NASA Langley Research Center, Hampton, VA, USA
Full Scale Rotor Aeroacoustic Predictions and the Link to Model Scale Rotor Data
Boyd, D. Douglas, Jr.; Burley, Casey L.; Conner, David A.; [2004]; 16 pp.; In English; American Helicopter Society 4th Decennial Specialists Conference on Aeromechanics, 21-23 Jan. 2004, San Francisco, CA, USA
Contract(s)/Grant(s): 745-60-RD; No Copyright; Avail: CASI; A03, Hardcopy

The NASA Aeroacoustic Prediction System (NAPS) is used to establish a link between model-scale and full-scale rotor predictions and is partially validated against measured wind tunnel and flight aeroacoustic data. The prediction approach of NAPS couples a comprehensive rotorcraft analysis with acoustic source noise and propagation codes. The comprehensive analysis selected for this study is CAMRAD-II, which provides the performance/trim/wake solution for a given rotor or flight condition. The post-trim capabilities of CAMRAD-II are used to compute high-resolution sectional airloads for the acoustic tone noise analysis, WOPMOD. The tone noise is propagated to observers on the ground with the propagation code, RNM (Rotor Noise Model). Aeroacoustic predictions are made with NAPS for an isolated rotor and compared to results of the second Harmonic Aeroacoustic Rotor Test (HART-II) program, which tested a 40% dynamically and Mach-scaled BO-105 main rotor at the DNW. The NAPS is validated with comparisons for three rotor conditions: a baseline condition and two Higher Harmonic Control (HHC) conditions. To establish a link between model and full-scale rotor predictions, a full-scale BO-105 main rotor input deck for NAPS is created from the 40% scale rotor input deck. The full-scale isolated rotor predictions are then compared to the model predictions. The comparisons include aerodynamic loading, acoustic levels, and acoustic pressure time histories for each of the three conditions. With this link established, full-scale predictions are made for a range of descent flight conditions and compared with measured trends from the recent Rotorcraft Operational Noise Abatement Procedures (RONAP) flight test conducted by DLR and ONERA. Additionally, the effectiveness of two HHC conditions from the HART-II program is demonstrated for the full-scale rotor in flight.
Author
Aeroacoustics; Rotor Aerodynamics; Acoustic Measurement; Aerodynamic Noise; Noise Reduction; Prediction Analysis Techniques

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*.

20040053329 NASA Ames Research Center, Moffett Field, CA, USA
Ab Initio Calculations of Water Line Strengths
Schwenke, David W.; Partridge, Harry; [1998]; 1 pp.; In English; Water in the Gas Phase, 21-24 Jun. 1998, Paris, France
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Other Sources; Abstract Only

We report on the determination of a high quality ab initiu potential energy surface (PES) and dipole moment function for water. This PES is empirically adjusted to improve the agreement between the computed line positions and those from the HITRAN 92 data base with J less than 6 for H2O. The changes in the PES are small, nonetheless including an estimate of core (oxygen 1s) electron correlation greatly improves the agreement with experiment. Using this adjusted PES, we can match 30,092 of the 30,117 transitions in the HITRAN 96 data base for H2O with theoretical lines. The 10,25,50,75, and 90 percentiles of the difference between the calculated and tabulated line positions are -0.11, -0.04, -0.01, 0.02, and 0.07 l/cm. Non-adiabatic effects are not explicitly included. About 3% of the tabulated line positions appear to be incorrect. Similar agreement using this adjusted PES is obtained for the oxygen 17 and oxygen 18 isotopes. For HDO, the agreement is not as good, with root-mean-square error of 0.25 l/cm for lines with J less than 6. This error is reduced to 0.02 l/cm by including a small asymmetric correction to the PES, which is parameterized by simultaneously fitting to HDO md D2O data. Scaling this correction by mass factors yields good results for T2O and HTO. The intensities summed over vibrational bands are

usually in good agreement between the calculations and the tabulated results, but individual lines strengths can differ greatly. A high temperature list consisting of 307,721,352 lines is generated for H2O using our PES and dipole moment function. Author

Dipole Moments; Potential Energy; Water; Line Spectra

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*.

20040052862 NASA Marshall Space Flight Center, Huntsville, AL, USA

Magnetized Plasma Expansion and its Interaction with a Plasma Stream

Singh, Nagendra; Saha, S.; Craven, P. D.; Gallagher, D.; Jones, J.; [2003]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Expansion of magnetized plasma in the magnetic field of a solenoid is studied by means of simulations using a 3-dimensional hybrid code. The plasma expands against a high- density and slow plasma stream (PS). The expansion causes inflation of the magnetic field; near the solenoid the magnetic field variation with increasing distance (r) remains as B(alpha)r(sup -3), but at farther distances B(alpha)r(sup -p), where the exponent p is found in the range 0.5 approx. less than p approx. less than 1.2 forming a plateau in the magnetic field distribution B(r). At the start of injection of plasma from the ends of the solenoid, the PS interacts with the solenoid magnetic field and creates a bow shock at a distance where the Larmor radius (r(sub il)) of the PS ions in the solenoid magnetic field nearly equals the scale length (L) of B(r), that is, r(sub il) approx. L = (B(sup -1)dB L /dr)(sup -1). As the injected plasma accumulates in the solenoid magnetic field, it expands inflating the magnetic field and the bow shock moves outward. The speed of the expansion front and the shock progressively decreases and eventually a stand-off occurs when the PS dynamic pressure is eventually balanced by the magnetic and kinetic pressures of the expanding plasma and the inflating magnetic field. The inflating field shows wave-like behavior, with considerable structures in the field and current distributions.

Author

Exponents; Magnetic Fields; Plasma Dynamics; Solenoids; Gas Expansion; Dynamic Pressure

20040053621 Princeton Univ., NJ

First Decommissioning of a Fusion Reactor Fueled by Deuterium-Tritium

Gentile, C. A.; Perry, E.; Rule, K.; Williams, M.; Parsells, R.; Oct. 2003; 12 pp.; In English

Report No.(s): DE2004-820120; PPPL-3896; No Copyright; Avail: Department of Energy Information Bridge

The Tokamak Fusion Test Reactor (TFTR), at The Plasma Physics Laboratory of Princeton University (PPPL) was the first fusion reactor fueled by a mixture of deuterium and tritium (D-T) to be decommissioned in the world. The decommissioning was performed over a period of three years and was completed safely, on schedule and under budget. Provided is an overview of the project and detail of various factors which led to the success of the project. Discussion will cover management of the project, engineering planning before the project started and during the field work was being performed, training of workers in the field, the novel adaptation of tools from other industry, and the development of an innovative process for the use of diamond wire to segment the activated/contaminated vacuum vessel. The success of the TFTR decommissioning provides a viable model for the decommissioning of D-T burning fusion devices in the future.

NTIS

Tokamak Devices; Fusion Reactors; Deuterium; Tritium

20040055917 California Univ., Los Angeles, CA, USA

Structure of the Outer Cusp and Sources of the Cusp Precipitation during Intervals of a Horizontal IMF

Berchem, Jean; Nemecek, Z.; Safrankova, J.; Prech, L.; Simunek, J.; Sauvaud, J.-A.; Fedorov, A.; Stenuit, H.; Fuselier, S. A.; Savin, S.; Zelenyi, L., et al.; [2003]; ISSN 0148-0227; 24 pp.; In English

Contract(s)/Grant(s): 205/02/0947; 191/02; NAG5-9071; MSM-113200004; Copyright; Avail: CASI; A03, Hardcopy

The cusp represents a place where the magnetosheath plasma can directly penetrate into the magnetosphere. Since the main transport processes are connected with merging of the interplanetary and magnetospheric field lines: the interplanetary magnetic field (IMF) Orientation plays a decisive role in the formation of the high-altitude cusp. The importance of the sign

of the IMF B(sub Z) component for this process was suggested about 40 years ago and later it was documented by many experimental investigations. However, situations when IMF Bz is the major IMF component are rather rare. The structure of the cusp during periods of a small IMF B(sub Z) is generally unknown, probably due to the fully 3-D nature of the interaction. The present case study reveals the importance of horizontal IMF components on the global magnetospheric configuration as well as on small-scale processes at the cusp-magnetosheath interface. We have used simultaneous measurements of several spacecraft (ISTP program) operating in different regions of interplanetary space and two closely spaced satellites (INTERBALL-1/MAGION-4) crossing the cusp-magnetosheath boundary to show the connection between the short- and large-scale phenomena. In the northern hemisphere, observations suggest a presence of two spots of cusp-like precipitation supplied by reconnection occurring simultaneously in both hemispheres. A source of this bifurcation is the positive IMF B(sub y) component further enhanced by the field draping in the magnetosheath. This magnetic field component shifts the entry point far away from the local noon but in opposite sense in either hemisphere. The cusp represents a place where the magnetosheath plasma can directly

Author

Interplanetary Magnetic Fields; Interplanetary Space; Penetration; Cusps (Landforms)

74
OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20040051108 Communications Research Lab., Tokyo, Japan

Solar and Solar Wind: Optical and Radio Solar Observation for Space Weather

Akioka, Maki; Sagawa, Eiichi; Iwai, Hironori; Kondo, Tetsuro; Kubo, Yuuki; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 3-11; In English; See also 20040051097; Copyright; Avail: Other Sources

Researches on solar observation technique and data uiiiization are important issues of space weather forecasting program. Hiraiso Solar Observatory is a facility for R & D for solar observation and routine solar observation for CRL's space environment information service. High definition H alpha solar telescope is an optical telescope with very narrow pass-band filter for high resolution full-disk imaging and doppler mapping of upper atmosphere dynamics. Hiraiso RAdio-Spectrograph (HiRAS) provides information on coronal shock wave and particle acceleration in the soar atmosphere. These information are impor- tant for daily space weather forecasting and alert. In this article, high definition H alpha solar telescope and radio spectrograph system are briefly introduced.

Author

Solar Observatories; Space Weather; Telescopes; Visual Observation; Optical Equipment

20040053389 NASA Ames Research Center, Moffett Field, CA, USA

Localization of Virtual Objects in the Near Visual Field (Operator Interaction with Simple Virtual Objects)

Ellis, Stephen R.; Menges, Brian M.; July 20, 1998; 25 pp.; In English; MMM'98 Conference, 12-14 Oct. 1998

Contract(s)/Grant(s): RTOP 199-06-12; Copyright; Avail: CASI; A03, Hardcopy

Errors in the localization of nearby virtual objects presented via see-through, helmet mounted displays are examined as a function of viewing conditions and scene content in four experiments using a total of 38 subjects. Monocular, biocular or stereoscopic presentation of the virtual objects, accommodation (required focus), subjects' age, and the position of physical surfaces are examined. Nearby physical surfaces are found to introduce localization errors that differ depending upon the other experimental factors. These errors apparently arise from the occlusion of the physical background by the optically superimposed virtual objects. But they are modified by subjects' accommodative competence and specific viewing conditions. The apparent physical size and transparency of the virtual objects and physical surfaces respectively are influenced by their relative position when superimposed. The design implications of the findings are discussed in a concluding section.

Author

Virtual Properties; Errors; Helmet Mounted Displays; Visual Accommodation

20040053433 NASA Ames Research Center, Moffett Field, CA, USA

Dramatic Improvements to Feature Based Stereo

Smelyansky, V. N.; Morris, R. D.; Kuehnel, F. O.; Maluf, D. A.; Cheeseman, P.; [2004]; 15 pp.; In English; European Conference on Computer Vision, 29-31 May 2002, Copenhagen, Denmark; No Copyright; Avail: CASI; A03, Hardcopy

The camera registration extracted from feature based stereo is usually considered sufficient to accurately localize the 3D points. However, for natural scenes the feature localization is not as precise as in man-made environments. This results in small camera registration errors. We show that even very small registration errors result in large errors in dense surface reconstruction. We describe a method for registering entire images to the inaccurate surface model. This gives small, but crucially important improvements to the camera parameters. The new registration gives dramatically better dense surface reconstruction.

Author

Cameras; Errors; Improvement; Image Enhancement

20040053683 Lawrence Livermore National Lab., Livermore, CA

Distributed Feedback Fiber Laser. The Heart of the National Ignition Facility

Browning, D. F.; Erbert, G. V.; Dec. 01, 2003; 14 pp.; In English

Report No.(s): DE2004-15006276; UCRL-ID-155446; No Copyright; Avail: Department of Energy Information Bridge

The National Ignition Facility (NIF) is a world-class laser fusion machine that is currently under construction at Lawrence Livermore National Laboratory (LLNL). The 192 laser beams that converge on the target at the output of the NIF laser system originate from a low power fiber laser in the Master Oscillator Room (MOR). The MOR is responsible for generating the single pulse that seeds the entire NIF laser system. This single pulse is phase-modulated to add bandwidth, and then amplified and split into 48 separate beam lines all in single-mode polarizing fiber. Before leaving the MOR, each of the 48 output beams are temporally sculpted into high contrast shapes using Arbitrary Waveform Generators. The 48 output beams of the MOR are amplified in the Preamplifier Modules (PAMs), split and amplified again to generate 192 laser beams. The 192 laser beams are frequency converted to the third harmonic and then focused at the center of a 10-meter diameter target chamber. The MOR is an all fiberbased system utilizing highly reliable Telecom-Industry type hardware. The nearly 2,000,000 joules of energy at the output of the NIF laser system starts from a single fiber oscillator that fits in the palm of your hand. This paper describes the design and performance of the laser source that provides the precision light to the National Ignition Facility.

NTIS

Distributed Feedback Lasers; Laser Fusion; Laser Outputs; Optical Fibers

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20040053620 Princeton Univ., NJ

Decommissioning of the Tokamak Fusion Test Reactor

Perry, E.; Chrzanowski, J.; Gentile, C.; Parsells, R.; Rule, K.; Oct. 2003; 12 pp.; In English

Report No.(s): DE2004-820119; PPPL-3895; No Copyright; Avail: Department of Energy Information Bridge

The Tokamak Fusion Test Reactor (TFTR) at the Princeton Plasma Physics Laboratory was operated from 1982 until 1997. The last several years included operations with mixtures of deuterium and tritium. In September 2002, the three year Decontamination and Decommissioning (D&D) Project for TFTR was successfully completed. The need to deal with tritium contamination as well as activated materials led to the adaptation of many techniques from the maintenance work during TFTR operations to the D&D effort. In addition, techniques from the decommissioning of fission reactors were adapted to the D&D of TFTR and several new technologies, most notably the development of a diamond wire cutting process for complex metal structures, were developed. These techniques, along with a project management system that closely linked the field crews to the engineering staff which developed the techniques and procedures, via a Work Control Center, resulted in a project which was completed safely, on time and well below budget.

NTIS

Fusion Reactors; Contamination; Project Management; Tokamak Devices

20040055276 Princeton Univ., NJ

Compact Quasi-Axisymmetric Stellarator Reactor

Ku, L. P.; Oct. 2003; 12 pp.; In English

Report No.(s): DE2004-820108; PPPL-3886; No Copyright; Avail: Department of Energy Information Bridge

We report the progress made in assessing the potential of compact, quasi-axisymmetric stellarators as powerproducing reactors. Using an aspect ratio A=4.5 configuration derived from NCSX and optimized with respect to the quasiaxisymmetry and MHD stability in the linear regime as an example, we show that a reactor of 1 GW(e) maybe realizable with a major radius .8 m. This is significantly smaller than the designs of stellarator reactors attempted before. We further show the design of modular coils and discuss the optimization of coil aspect ratios in order to accommodate the blanket for tritium breeding and radiation shielding for coil protection. In addition, we discuss the effects of coil aspect ratio on the peak magnetic field in the coils.

NTIS

Stellarators; Axisymmetric Flow; Coils; Magnetohydrodynamic Stability; Radiation Shielding

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*.

20040053633 Helsinki Univ. of Technology, Espoo, Finland

Activity Report 2002. Laboratory of Physics and COMP

2003; In English

Report No.(s): PB2004-102759; Copyright; Avail: National Technical Information Service (NTIS)

The Laboratory of Physics has a strong commitment in basic and applied physics, with an emphasis on condensed matter and materials research, both experimental, theoretical and computational. Areas of current activity include semiconductor materials, structures and processing, surface sciences, nanomaterials and confined quantum structures, magnetism, statistical physics and complex systems, and biophysics. The Laboratory is host to COMP, the research unit in computational condensed matter and complex materials. COMP has been designated a National Center of Excellence in Research by the Academy of Finland for the years 2000-2005.

NTIS

Biophysics; Complex Systems; Condensed Matter Physics; Statistical Mechanics; Theoretical Physics

20040055394 Colorado Univ., Boulder, CO, USA

Structure and Dynamics of Freely Suspended Liquid Crystals

Clark, Noel A.; April 12, 2004; 14 pp.; In English

Contract(s)/Grant(s): NAG3-2457; No Copyright; Avail: CASI; A03, Hardcopy

Smectic liquid crystals are phases of rod shaped molecules organized into one dimensionally (1 D) periodic arrays of layers, each layer being between one and two molecular lengths thick. In the least ordered smectic phases, the smectics A and C, each layer is a two dimensional (2D) liquid. Additionally there are a variety of more ordered smectic phases having hexatic short range translational order or 2D crystalline or quasi long range translational order within the layers. The inherent fluid-layer structure and low vapor pressure of smectic liquid crystals enables the long term stabilization of freely suspended, single component, layered fluid films as thin as 30A, a single molecular layer. The layering forces the films to be an integral number of smectic layers thick, quantizing their thickness in layer units and forcing a film of a particular number of layers to be physically homogeneous with respect to its layer structure over its entire area. Optical reflectivity enables the precise determination of the number of layers. These ultrathin freely suspended liquid crystal films are structures of fundamental interest in condensed matter and fluid physics. They are the thinnest known stable fluid structures and have the largest surface-to-volume ratio of any stable fluid preparation, making them ideal for the study of the effects of reduced dimensionality on phase behavior and on fluctuation and interface phenomena. Their low vapor pressure and quantized thickness enable the effective use of microgravity to extend the study of basic capillary phenomena to ultrathin fluid films. Freely suspended films have been a wellspring of new LC physics. They have been used to provide unique experimental conditions for the study of condensed phase transitions in two dimensions. They are the only system in which the hexatic has been unambiguously identified as a phase of matter, and the only physical system in which fluctuations of a 2D XY system and Kosterlitz Thouless phase transition has been observed and 2D XY quasi long range order verified. Smectic films have

enabled the precise determination of smectic layer electron density and positional fluctuation profiles and have been used to show that the interlayer interactions in antiferroelectric tilted smectics do not extend significantly beyond nearest neighbors. Freely suspended films played a pivotal role in the recent discovery of macroscopic chiral-polar ordering in fluids of achiral molecules. The interactions which are operative in liquid crystals are generally weak in comparison to those in crystalline phases, leading to the facile manipulation of the order in liquid crystals by external agents such as applied fields and surfaces. Effects arising from weak ordering are significantly enhanced in ultrathin free films and filaments, in which the intermolecular coupling is effectively further reduced by loss of neighbors. Over the past four years this research, which we now detail, has produced a host of exciting new discoveries and unexpected results, maintaining the study of freely suspended liquid crystal structures as one of most exciting and fruitful areas of complex fluid physics. In addition, a class of experiments on the behavior of 1D interfaces in 2D films have been pursued with results that point to potentially quite interesting effects in microgravity.
Derived from text
Crystal Structure; Liquid Crystals; Fluid Dynamics; Fluid Films; Stabilization

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*.

20040055628 Defence Science and Technology Organisation, Salisbury
A Thermodynamically Complete Model for Simulation of One-Dimensional Multi-Phase Flows
Resnyansky, A. D.; Oct. 2003; 36 pp.; In English
Report No.(s): AD-A421652; DSTO-TR-1510; DODA-AR-012-922; No Copyright; Avail: CASI; A03, Hardcopy

The publication describes a convenient form of one- dimensional equations describing the multi- phase flows associated with the initiation of novel warheads. The model, which has been proposed earlier for the case of two phases, is extended to the case of multi-phase flows. The generalized pressure and energy, which are used in the theory of mixtures, are linked through a thermodynamic potential within the present formulation.
DTIC
Multiphase Flow; Simulation; Thermodynamics; Warheads

20040055875 Department of the Navy, Washington, DC
System and Method for Estimating Performance of a Closed Cycle Thermal Propulsion System
Girouard, William A., Inventor; Jun. 19, 2002; 27 pp.; In English
Patent Info.: Filed 19 Jun. 2002; US-Patent-Appl-SN-10175536
Report No.(s): AD-D020130; No Copyright; Avail: Defense Technical Information Center (DTIC)

The present invent ion permits determination of steady-state off-design performance characteristics of a vehicle, such as a torpedo, powered by a closed cycle thermal propulsion system. The method may be utilized to determine propellant consumption for a torpedo resulting from various off-design kinematic maneuvers. Total run time may be calculated in response to a plurality of torpedo speed changes and/or torpedo configurations of variable torpedo length or torpedo diameter. The present invention may be,utilized to define weapon design options for existing or future underwater weapons with mission requirements different from those for which the weapons were originally designed.
DTIC
Closed Cycles; Estimating; Patent Applications; Propulsion; Propulsion System Configurations; Propulsion System Performance

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20040053383 NASA Goddard Space Flight Center, Greenbelt, MD, USA
What GOES Around, Comes Around
Obenschain, Rick; ASK Magazine, No. 16; February 2004, pp. 10-16; In English; See also 20040053380; No Copyright; Avail: CASI; A02, Hardcopy

Contents include the following: An uphill battle. Taking responsibility. Getting the right people. Instruments. Problem solving. Team player.
CASI
NASA Space Programs; Goes Satellites; Problem Solving

20040055893 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Education Programs Demonstrations
March 19, 2004; In English; See also 20040055894 - 20040055901
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI Contribution No. 1197; Copyright; Avail: CASI; C01, CD-ROM

Reports from the session on Education Programs Demonstration include:Hands-On Activities for Exploring the Solar System in K-14; Formal Education and Informal Settings;Making Earth and Space Science and Exploration Accessible; New Thematic Solar System Exploration Products for Scientists and Educators Engaging Students of All Ages with Research-related Activities: Using the Levers of Museum Reach and Media Attention to Current Events; Astronomy Village: Use of Planetary Images in Educational Multimedia; ACUMEN: Astronomy Classes Unleashed: Meaningful Experiences for Neophytes; Unusual Guidebook to Terrestrial Field Work Studies: Microenvironmental Studies by Landers on Planetary Surfaces (New Atlas in the Series of the Solar System Notebooks on E tv s University, Hungary); and The NASA ADS: Searching, Linking and More.
Derived from text
Education; Solar System; Astronomy

20040055897 National Optical Astronomy Observatories, Tucson, AZ, USA
Astronomy Village: Use of Planetary Images in Educational Multimedia
Croft, S. K.; Pompea, S. M.; McGee, S. M.; Lunar and Planetary Science XXXV: Education Programs Demonstations; March 19, 2004; 1 pp.; In English; See also 20040055893; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The effective use of planetary images and data in the classroom has been a challenge from the beginning of the space program. The tendency has been to flood classrooms with gee whiz PR images, or to provide access to enormous archives of satellite images or data assuming that classroom teachers will easily incorporate such information into their classroom presentations. Experience has shown that most teachers generally have neither the time nor the expertise to make effective educational use of masses of images, and that the best use of images is in the context of a carefully designed curriculum. Two products have been developed in recently at the Center for Educational Technology that provide an inquiry-based scientific context to a selected set of planetary images: 'Astronomy Village: Investigating the Universe' (AVIU), and 'Astronomy Village: Investigating the Solar System' (AV-ISS). Following content guidelines in the NRC s National Science Standards, AVIU is designed for high school students and deals with topics mostly in stellar and galactic astronomy, while AVISS is designed for middle school students and deals with topics in astrobiology and planetary geology.
Derived from text
Education; Schools; Space Programs; Satellite Imagery; Educational Resources

20040055899 Lunar and Planetary Inst., Houston, TX, USA
Making Earth and Space Science and Exploration Accessible
Runyon, C. J.; Guimond, K. A.; Hurd, D.; Heinrich, G.; Lunar and Planetary Science XXXV: Education Programs Demonstations; March 19, 2004; 2 pp.; In English; See also 20040055893; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are currently 28 million hard of hearing and deaf Americans, approximately 10 to 11 million blind and visually impaired people in North America, and more than 50 million Americans with disabilities, approximately half of whom are students. The majority of students with disabilities in the US are required to achieve the same academic levels as their non-impaired peers. Unfortunately, there are few specialized materials to help these exceptional students in the formal and informal settings. To assist educators in meeting their goals and engage the students, we have been working with NASA product developers, scientists and education and outreach personnel in concert with teachers from exceptional classrooms to identify the types of materials they need and which mediums work best for the different student capabilities. Our goal is to make the wonders of earth and space science and exploration accessible to all. We present a list of suggested best practices

and example activities that can help engage and encourage a person with special needs to study the sciences, technology, engineering, and mathematics.
Derived from text
Disabilities; Education; Instructors; Personnel

20040055900 Lockheed Martin Corp., Houston, TX, USA
Hands-On Activities for Exploring the Solar System in K-14 Formal Education and Informal Settings
Allen, J. S.; Tobola, K. W.; Stocco, K.; Lunar and Planetary Science XXXV: Education Programs Demonstations; March 19, 2004; 1 pp.; In English; See also 20040055893; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Activities developed by NASA scientists and teachers focus on integrating Planetary Science activities with existing Earth science, math, and language arts curriculum. Educators may choose activities that fit a particular concept or theme within their curriculum from activities that highlight missions and research pertaining to exploring the solar system. Most of the activities use simple, inexpensive techniques that help students understand the how and why of what scientists are learning about comets, asteroids, meteorites, moons and planets. The web sites for the activities contain current information so students experience recent mission information such as data from Mars rovers or the status of Stardust sample return.
Author
Education; Solar System

20040055901 National Air and Space Museum, Washington, DC, USA
Engaging Students of All Ages with Research-related Activities: Using the Levers of Museum Reach and Media Attention to Current Events
Williams, S. H.; Zimberlman, J. R.; Lunar and Planetary Science XXXV: Education Programs Demonstations; March 19, 2004; 2 pp.; In English; See also 20040055893; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our mission at the National Air and Space Museum (NASM) is to educate and inspire the next generation of planetary scientists with engaging activities linked to our fabulous collection of aviation and Space artifacts and/or the research conducted by our Center for Earth and Planetary Studies. NASM is the most visited museum in the world (over 10 million visits last year and that many hits monthly on the NASM website), and we enjoy extremely high name recognition and public approval, so we can be a powerful 'lever ' in the 'marketing' of such activities to a large number of students of all ages. Our activities can gain even broader reach if we use two additional tactics: partnering with organizations that augment our content expertise, and exploiting the attention various media outlets give to current events in order to promote our programming activities.
Derived from text
Education; Museums

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20040051179 Old Dominion Univ., VA, USA
Plausible Explanations for Trends in Project Programmatic Findings
Parsons, Vickie S.; [2003]; 4 pp.; In English; American Society for Engineering Management 24th Conference, 15-18 Oct. 2003, Saint Louis, MO, USA; No Copyright; Avail: CASI; A01, Hardcopy

This paper investigates several published hypotheses to determine which might explain the observed cyclic pattern in programmatic findings by independent review teams over a ten-year period. The data does not neatly support any of the intra-project theories considered; however, something is obviously triggering these findings. A closer examination of the narratives associated with the programmatic findings did reveal consistency. The recurring themes that appeared with more numerous findings were unclear roles and staffing problems. Other explanations, external to the project teams, were also explored and the data supported a distributed political influence on project performance.
Author
Project Management; Data Bases; NASA Programs; Technology Assessment; Trend Analysis

20040053382 Department of the Air Force, Eglin AFB, FL, USA
Say What You Mean
Rutledge, Lynda; ASK Magazine, No. 16; February 2004, pp. 34-37; In English; See also 20040053380; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

An article is presented on source selections and the value of communications between contractors and the government. CASI

Contract Management; Contract Negotiation

20040053385 Starsys Research Corp., Boulder, CO, USA
Fly Away
Tibbitts, Scott; ASK Magazine, No. 16; February 2004, pp. 25-27; In English; See also 20040053380; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Kurt was one of the lead engineers/project managers at our company, Starsys, in Boulder, Colorado. I had hired Kurt six years ago and found him to be a man of few words but huge actions. Kurt had single-handedly created two new business areas in the company and made a significant contribution to the upcoming Mars Exploration. While running in the mountains, Kurt had a fatal heart attack. An avid back country skier and climber, he was 45 years old and appeared in great health. I spoke honestly from my heart, and from my own experience as a father. That day people started to ask what they could do to help the family. Over the next couple days we set up a fund where people could contribute dollars or vacation time or comp time, and Starsya would translate that into equivalent dollars and provide a matching contribution.
Derived from text

Mars Exploration; Teams; Death

20040053386 Morgan Aircraft and Consulting, USA
Coming of Age
Morgan, Ray; ASK Magazine, No. 16; February 2004, pp. 28-31; In English; See also 20040053380; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

One of the great perks I looked forward to when I turned sixteen was being able to give up my paper route and get a regular job. Paper routes are okay, but for a young, timid kid who was afraid to ask for money, it often proved to be a non-profit operation. At age sixteen, I could get a social security number, which meant that I could go get myself a real job. In my early days of running a division and having my own employees, I m sad to say that I emulated that behavior more than once. At the time, I rationalized it. Now, I know how wrong I was, and how I may have ruined the morale of employees who only wanted to do good work. I recognize that almost every time I didn't get what I wanted from an employee, it was because they didn't understand what I really expected from them, they didn't understand how to provide it, or there were constraints placed on them that stopped them from doing a good job. I'am sure OJ. is long dead and gone. He wasn't young when I worked for him. I think he would have been amazed to learn what a long-lasting effect his behavior that week in 1963 had on me.
Derived from text

Morale; Personnel

20040053387 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Going Up
Douglas, Freddie, III; ASK Magazine, No. 16; February 2004, pp. 32-33; In English; See also 20040053380; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The accelerated Leadership Option (ALO) combines business management and systems engineering studies at the Massachusetts Institute of Technology (MIT) culminating in a Master of Science degree, with a one year developmental assignment. The program accelerates the development process of exceptionally promising project leaders to positions of increased responsibility. Participants are selected because of technical expertise and proven leadership abilities.
Derived from text

Education; NASA Programs; Project Management

20040053678 Lawrence Livermore National Lab., Livermore, CA
Nuclear Material Management in Russia and New Federal Nuclear Material Control and Accounting Regulations
Martyanov, A. A.; Pitel, V. A.; Babcock, R. A.; Heinberg, C. L.; Tynan, D. M.; Jun. 25, 2001; 16 pp.; In English
Report No.(s): DE2004-15006261; UCRL-JC-144269; No Copyright; Avail: Department of Energy Information Bridge

The Russian Federation Ministry of Atomic Energy (Minatom) is the federal authority empowered with the management of state-owned nuclear materials, with the exception of military applications. The Russian Federal Nuclear Materials Control and Accounting Information System (FIS) is a key component in establishing an effective nuclear materials management system in the Russian Federation. In December 2000, the Russian government issued the decree to enter into force the regulation on the accounting and control of nuclear materials and directed the State System of Accounting and Control (SSAC) of nuclear materials should begin October 2001. This regulation establishes the basic accounting documents and the requirement to report them to the FIS to launch the State Nuclear Material Registry of nuclear materials. The Nuclear Material Registry contains information on agencies and operating organizations that use nuclear material, along with the kinds, quantity and other characteristics of nuclear material. . This paper discusses the role and the place of the FIS in nuclear material management, describes the goals and challenges facing the FIS based on Russian Federation regulations, and provides a brief description of the Nuclear Material Registry and the procedures used in its creation.
NTIS
Information Systems; Regulations; Management Systems; Nuclear Electric Power Generation

20040055439 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
Timber Management of NASA's John C. Stennis Space Station
Carr, Hugh; Johnson, Gary; Smoot, James; Cohan, Tyrus; O'Connor, Tina; May 07, 2001; 5 pp.; In English
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2001-07-00036-SSC; No Copyright; Avail: CASI; A01, Hardcopy

John C. Stennis Space Center occupies over 48560 hectares or just over 120000 acres in southwestern Mississippi and southeastern Louisiana near border of the two states. This area includes the Stennis Fee Area, which is the Center itself and the Acoustic Buffer Zone (ABZ) surrounding the Center. The ABZ is owned by several government, public and private entities and managed accordingly. The Fee Area and ABZ include wetlands, pine woodlands and areas of mixed floral species. The included maps detail the delineation of land in and around the Stennis Space Center. Areas owned by the federal government are divided into three stands to facilitate timber management. The stands are classified by species, density and average size to determine several timber in management issues including the schedule for controlled burns, economic viability of stands, and the creation of low impact recreational areas such as scenic trails or bike paths.
Author
Research Facilities; Management Systems; Space Stations; Economics; Land Management; Environment Management

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*.

20040051099 Communications Research Lab., Tokyo, Japan
Ionospheric Observation and Observation Information Processing System
Kato, Hisao; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 135-142; In English; See also 20040051097; Copyright; Avail: Other Sources

The CRL has been making ionospheric observations for about 70 years. Recently, we have updated the ionospheric sounder and have expanded the observation information processing system. The new ionospheric sounder gathers various observational data by automatic control / remote control. The new observation information processing system ensures the reliability / safety of data. The system also provides the data service quickly and conveniently to users.
Author
Earth Ionosphere; Data Processing; Data Systems

20040053685 Lawrence Livermore National Lab., Livermore, CA
After Globalization Future Security in a Technology Rich World
Gilmartin, T. J.; Feb. 12, 2000; 92 pp.; In English
Report No.(s): DE2004-15006286; UCRL-JC-141358; No Copyright; Avail: Department of Energy Information Bridge

Over the course of the year 2000, five one-day workshops were conducted by the Center for Global Security Research at the Lawrence Livermore National Laboratory on threats that might come against the US and its allies in the 2015 to 2020

timeframe due to the global availability of advanced technology. These workshops focused on threats that are enabled by nuclear, missile, and space technology; military technology; information technology; bio technology; and geo systems technology. In December, an Integration Workshop and Senior Review before national leaders and experts were held. For each workshop the process of analysis involved identification and prioritization of the participants' perceived most severe threat scenarios (worst nightmares) , discussion of the technologies which enabled those threats, and ranking of the technologies' threat potentials. We were not concerned in this exercise with defining responses, although our assessment of each threat's severity included consideration of the ease or difficulty with which it might be countered. At the concluding Integration Workshop and Senior Panel Review, we brought the various workshops' participants together, added senior participant/reviewers with broad experience and responsibility, and discussed the workshop findings to determine what is most certain, and uncertain, and what might be needed to resolve our uncertainties. This document reports the consensus and important variations of both the reviewers and the participants.
NTIS
Information Systems; Military Technology; Security

20040053691
National Network for FP/Primary Care Research Continuation
Hickner, J. M.; 2003; 26 pp.; In English
Report No.(s): PB2004-104524; No Copyright; Avail: CASI; A03, Hardcopy
The Agency for Healthcare Research and Quality (AHRQ) awarded a cooperative agreement (U01 HS11182-02) in September 2001 to the American Academy of Family Physicians National Network for Family Practice and Primary Care Research to: (1) Collaborate with AHRQ and other PBRNs to design and conduct the Primary Care Network Survey (PRINS) among clinicians within the National Research Network; (2) Test two methods of data collection and management-paper vs. handheld computer (PDAs)-among selected network practices in a study of Pnemococcal Immunization in Older Adults. PRINS: Based on a two-phase protocol for PRINS, Network staff collected 128 PRINS(underline)1 surveys of NRN physicians and 2068 PRINS(underline)2 surveys of patient visits from 67 physicians. Pneumococcal Study: Based on a randomized clinical (cross-over) trial, interview data with older patients were collected by designated study coordinators in 19 NRN practices using both handheld computers and traditional paper surveys.
NTIS
Physicians; Procedures; Patients

20040055461 Veterans Administration Healthcare System, Prescott, AZ
HIPAA Privacy and Security Standards: A Gap Analysis for the Compliance Challenge at the Northern Arizona VA Health Care System (NAVAHCS)
Millican, Sharon M.; Jun. 7, 2002; 116 pp.; In English
Report No.(s): AD-A421231; No Copyright; Avail: CASI; A06, Hardcopy
There is a difficult and notable challenge facing the healthcare industry in the USA that will profoundly change the way business is conducted. Congress recognized the need for national patient record privacy standards in 1996 when it enacted the Health Insurance Portability and Accountability Act (HIPAA). The law required new safeguards to protect the security and confidentiality of personal health information and mandated implementation within a strict timetable. Industry experts and professionals who have been working on the privacy and proposed security standards say that covered entities need to begin the process of inventorying their organization immediately. The purpose of this project is twofold: (a) to conduct a baseline assessment inventory on the current environment of NAVAHCS policies, processes, and technology with respect to the HIPAA privacy and security standards and (b) to use the information gathered from the baseline assessment to conduct a gap analysis to determine vulnerabilities and enable NAVAHCS to identify necessary process changes and system remediations.
DTIC
Arizona; Health; Management Systems; Medical Services; Privacy; Security

20040055502 Moncrief Army Community Hospital, Fort Jackson, SC
Defense Medical Logistics Standard Support (DMLSS) System: A Case Study of the Deployment of DMLSS Release 3.0 at Moncrief Army Community Hospital
Galuszka, Douglas H.; Jul. 2003; 64 pp.; In English
Report No.(s): AD-A421285; HCA-16-03; No Copyright; Avail: CASI; A04, Hardcopy
In 2001, the Defense Medical Logistics Standard Support System (DMLSS) release 3.0 was deployed to Moncrief Army

Community Hospital, the Armys test site. The goal of this project was to examine whether the deployment was done in an effective manner. Through a literature review, examination of organizational documents, and interviews with personnel at the USA Army Medical Information System Support Agency (USAMISSA) in San Antonio, Texas, the DMLSS program Office in Falls Church, Virginia, the Joint Medical Logistics Functional Development Center (JMLFDC) in Fort Dietrick, Maryland, and Moncrief Army Community Hospital (MACH) in Fort Jackson, South Carolina, I was able to show that the deployment process for Release 3.0 was well conducted. The MACH logistical staff was mentally prepared for the change in computer systems. The staff received briefings from MACH leadership, senior Medical Command representatives, and JMLFDC staff prior to the actual deployment. Since the staff understood the system and its capabilities, the implementation of was DMLSS rapid and thorough. The training did have areas that could have been improved. There were problems during the classroom week with class scheduling and training computer capabilities, but the on-the-job training conducted by the deployment staff paid great dividends and enabled MACH to fully utilize DMLSS when the old systems were turned off. Implementation of DMLSS was well planned and executed but needed some refinement. The site visit made by that the JMLFDC staff enabled the system s hardware requirements to be identified and equipment to be ordered. The majority of the data conversion of old files was accurate but some adjusting of the new database had to be done during the deployment. Although MACH was the Army s test site for the deployment, the DMLSS system was up and running at the end of the three week deployment. Wdeployments even better.
DTIC

Deployment; Hospitals; Information Systems; Logistics; Logistics Management; Management Systems; Medical Services; Military Operations

20040055616 Uniformed Services Univ. of the Health Sciences, Bethesda, MD

Moortality During U.S. Armed Forces Basic Training: A 25-Year Review (1977-2001)

Scoville, Stephanie L.; Aug. 2002; 156 pp.; In English

Report No.(s): AD-A421540; No Copyright; Avail: CASI; A08, Hardcopy

Efforts to understand and prevent the rare, but tragic, occurrence of death among healthy, young military recruits trying to serve their country depend upon medical surveillance data and accurate determination of mortality rates by specific cause. The purpose of this study was to create a Recruit Mortality Registry that includes deaths that have occurred during Air Force, Navy, Marine Corps, and Army basic military training from 1977 through 2001, and to describe the epidemiology of recruit mortality due to traumatic and nontraumatic deaths. Methods: Recruit deaths were identified and confirmed through redundant sources. Attempts were made to obtain a complete file on each death including all available medical and personnel records. Demographic, circumstantial, and medical information was recorded on an abstraction form developed for this study. Mortality rates per 100,000 recruit-years were calculated using recruit accession data from the Defense Manpower Data Center. Results: There were 276 recruit deaths from 1977 through 2001 identified through the Recruit Mortality Registry. Age-specific recruit mortality rates were less than half of same-age U.S. civilian mortality rates. Between Services, the age-adjusted mortality rates were highest in the Army and lowest in the Air Force and Navy, with the Marine Corps in between. The majority (71%) of recruit deaths were classified as nontraumatic and 69% (136/196) of these were exercise- related. Of the exercise-related deaths, 42% (57/136) were cardiac deaths and at least one-third (45/136) were related to heat stress. Infectious agents accounted for 24% (48/196) of the nontraumatic deaths. Only 29% (80/276) of recruit deaths were classified as traumatic. Of these, the majority (58%) were due to suicide, followed by unintentional injuries (37%), and homicide (5%).
DTIC

Armed Forces; Epidemiology; Infectious Diseases; Medical Services; Military Operations; Mortality

20040055617 Madigan Army Medical Center, Takoma, WA

Case Study of Cardiovascular Risk Reduction in the Northwest Region and TRICARE Region 11

Murphy, Rosemary A.; Nov. 2003; 68 pp.; In English; Original contains color illustrations

Report No.(s): AD-A421542; HCA-7-03; No Copyright; Avail: CASI; A04, Hardcopy

The outcomes management team at Madigan Army Medical Center was tasked by the Commanding General to develop and implement a cardiovascular risk reduction program for the Western Region Medical Command and TRICARE Lead Agent Region 11. The outcomes management team developed a cardiovascular risk reduction scorecard and metrics in which to evaluate the care being given to the TRICARE prime enrollees with a cardiovascular disease diagnosis. The program developed metrics to evaluate and monitor the compliance of standards of care for these patients. It was determined that each of the metrics, the region needs to improve the care being provided; however, some metrics have greater progress to achieve the outcome goals. The overall goal of the program is to decrease the beneficiaries risk or risks for cardiovascular disease,

thereby decreasing the amount of costly treatment to the medical treatment facility, and improving the overall quality of life for the beneficiaries.
DTIC
Cardiovascular System; Health; Heart Diseases; Medical Services; Risk; Social Factors

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20040053675 Lawrence Livermore National Lab., Livermore, CA
Progress in Accident Analysis of the HYLIFE-II Inertial Fusion Energy Power Plant Design
Reyes, S.; Latkowski, J. F.; Gomez del Rio, J.; Sanz, J.; Oct. 11, 2000; 12 pp.; In English
Report No.(s): DE2004-15006138; UCRL-JR-140978; No Copyright; Avail: Department of Energy Information Bridge

The present work continues our effort to perform an integrated safety analysis for the HYLIFE-I1 inertial fusion energy (IFE) power plant design. Recently we developed a base case for a severe accident scenario in order to calculate accident doses for HYLIFE-11. It consisted of a total loss of coolant accident (LOCA) in which all the liquid flibe was lost at the beginning of the accident. Results showed that the off-site dose was below the limit given by the DOE Fusion Safety Standards for public protection in case of accident, and That this dose was dominated by the tritium released during the accident.
NTIS
Accident Investigation; Safety; Plant Design

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20040051147 Massachusetts Inst. of Tech., Cambridge, MA, USA
Participation in the Mars Orbiting Laser Altimeter Experiment
Pettengil, Gordon H.; Ford, Peter; [2004]; 14 pp.; In English
Contract(s)/Grant(s): NAG5-11575; No Copyright; Avail: CASI; A03, Hardcopy

The Mars Orbiting Laser Altimeter (MOLA) instrument [1,2] carried aboard the Mars Global Surveyor (MGS) spacecraft, has observed strong echoes from cloud tops at 1.064 microns on 61% of its orbital passes over the winter north pole (235deg L(sub S), < 315deg) and on 58% of the passes over the winter south pole (45deg < L(sub S), < 135deg). The clouds are unlikely to be composed of water ice since the vapor pressure of H2O is very low at the Martian nighttime polar temperatures measured by the Thermal Emission Spectrometer (TES) [3], and by an analysis of MGS radio occultations [4]. Dust clouds can also be ruled out since no correlation is seen between clouds and global dust storms. The virtually certain composition for the winter polar clouds is CO2 ice.
Derived from text
Clouds; Mars Global Surveyor; Carbon Dioxide; Ice; Dust Storms; Mars Environment

20040055314 Raytheon Technical Services Co., Greenbelt, MD, USA
Remote Sensing of Europa Surface Composition with Ions, Neutral Atoms, and X-Rays in the Local Space Environment
Cooper, J. F.; Johnson, R. E.; Waite, J. H.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 20-21; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The surface chemistry of Europa is a mixture of material in unknown proportions from multiple sources: (1) early accretion from the protoplanetary nebula, (2) accretion from comet impacts during heavy and later bombardment, (3) emergence of subsurface (e.g., oceanic, hydrothermal) materials during resurfacing events related to tidal heating, (4) implantation of ions from the magnetospheric plasma, and (5) molecular evolution from radiolysis driven by magnetospheric particle irradiation energy. Observations of the oxygen exosphere and surface trace components including H2O2 and CO2 can easily be attributed to products of magnetospheric interactions with little if any input from Europa's interior. However, whether the observed sulfate hydrates are from endogenic or exogenic sources is related also to the uncertainties about the

existence of a liquid water ocean within Europa. The challenge of future compositional measurements, e.g. by in-situ and remote sensing instruments on the planned Jupiter Icy Moons Orbiter (JIMO), is to separate the intrinsic elemental composition of Europa's surface and subsurface regions from the background components induced by magnetospheric interactions. Remote sensing observations from Earth suggest a net Na source at Europa, based on comparison of Na/K abundance ratios in neutral clouds around Io and Europa, and Na2SO4 hydrate is a candidate component for Europa's non-ice materials. Since MgSO4 and H2SO4 are also candidates, identification of Europa's non-ice sulfates will require at minimum the separate in-situ and/or remote sensing measurements of abundances for Na, K, Mg, S, and other elemental species in the magnetospheric and surface environments.
Derived from text
Remote Sensing; Europa; Surface Reactions; Environmental Chemistry; Carbon Dioxide; Sulfuric Acid; Magnesium Sulfates; Sulfates

20040055318 Atmospheric and Environmental Research, Inc., Lexington, MA, USA
Assessing Porosity Structure in Europa's Crust
Eluszkiewicz, J.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 27; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Knowledge of the density structure (i.e., porosity) in Europa s outer shell is very important in evaluating the prospects of a sounding radar in detecting a subsurface ocean and in studies of the origin of geological structures. Density structure is also likely to affect the rate at which minor constituents, including those that affect the radar signal, as well as possible biological markers, diffuse from the interior to the surface. The primary process affecting the density structure (and the closely-coupled thermal structure) of Europa s subsurface layers is self- gravitational compaction. The depth of a porous regolith on an Europa-size icy satellite has previously been estimated to exceed 1 km. In view of the critical importance of the density structure in the design and interpretation of upcoming JIMO/Europa mission (especially a radar instrument), the time has come to re-examine that estimate, including an assessment of the associated error budget.
Derived from text
Europa; Crusts; Porosity; Trace Elements; Oceans

20040055350 Arizona State Univ., Tempe, AZ, USA
Geological Constraints on Tidal and Rotational Deformation on Europa
Figuerdo, P. H.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 28-29; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Orbital resonances with Io and Ganymede maintain a permanent eccentricity in Europa's orbit around Jupiter. This situation produces a) 'diurnal' variations in the tidal figure of Europa during its 85 hr orbit, leading to dissipative heating as well as surface stresses, and b) a non-zero average tidal torque, which can drive nonsynchronous rotation (NSR) of the satellite. In addition, any mass concentration away from the equator could trigger episodes of polar wander of the outer cryosphere, if detached from the interior by a liquid layer. Over the past few years, researchers have modeled the stress fields associated with these processes and their variation with space and time, from which they predicted specific orientations and trends in the lineament record of Europa. In this review, I summarize the geological evidence for tidal and rotational processes on Europa as reflected in Voyager and (especially) Galileo images of the satellite. I address the constraints they place in the conditions and rates of deformation, the ongoing discrepancies in the interpretation of the data and their implications, and some ways of resolving outstanding issues.
Derived from text
Europa; Deformation; Tides; Structural Properties (Geology); Eccentricity

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20040051180 Colorado Univ., Boulder, CO, USA
A Search for Coronal Emission at the Bottom of the Main-Sequence: Stars and Brown Dwarf Candidates with Spectral Types Later than M7 and the Rotation-Activity Relation
Stringfellow, Guy; January 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-7223; No Copyright; Avail: CASI; A01, Hardcopy

This program intended to test whether the lowest mass stars at the bottom end of the main sequence and the lower mass brown dwarfs have coronae. If they have coronae, what are the coronal characteristics and what drives them? In the classical dynamo picture, the closed magnetic loop structure is generated near the boundary of the convective envelope and the radiative core. Stars with mass below 0.30 Msun however are fully convective, and the nature of the dynamo responsible for the generation of the coronae in this regime is poorly understood. Previous results from the ROSAT mission (e.g., Fleming et al. 1993, 1995; Schmitt et al. 1995) had confirmed three very important characteristics of M-star coronae: (1) a very high percentage of all M dwarfs have coronae (of order 85% in the local 7 pc sample), (2) those M dwarfs showing high chromospheric activity, such as having the Balmer series in emission or large/numerous optical flaring, indeed exhibit the highest coronal activity, and (3) that the maximum saturation boundary in X-ray luminosity, which amounts to 0.0001-0.001 for Lx/Lbol for the dMe stars, extends down to the current detection limit, through spectral types M7. It was likely that the incompleteness noted for result (1) above was simply a detection limit problem; for more distant sources, the X-ray fainter dM stars will drop below detection thresholds before the more X-ray luminous dMe stars. The latest stars for which direct detection of the corona had been successful were of spectral type dM7 (e.g., VB8, LHS 3003). This program proposed to obtain ROSAT HRI observations for a large number of the coolest known (at that time) stars at the bottom of the main-sequence, which had spectral types of M9 or later. Three stars were approved for observations with ROSAT-HRI totaling 180 ksec. The goal was to obtain X-ray detections or low upper limits for the three approved stars.
Author
Stellar Mass; Main Sequence Stars; Coronas; Brown Dwarf Stars; Magnetic Field Configurations

20040052871 Ohio State Univ., Columbus, OH, USA
Echo Mapping of Active Galactic Nuclei
Peterson, B. M.; Horne, K.; Astron. Nachr.; 2004; Volume 325, No. 3, pp. 248-251; In English
Contract(s)/Grant(s): NAG5-8397; NSF AST-02-05964; Copyright; Avail: Other Sources

Echo mapping makes use of the intrinsic variability of the continuum source in active galactic nuclei to map out the distribution and kinematics of line-emitting gas from its light travel time-delayed response to continuum changes. Echo mapping experiments have yielded sizes for the broad line-emitting region in about three dozen AGNs. The dynamics of the line-emitting gas seem to be dominated by the gravity of the central black hole, enabling measurement of the black-hole masses in AGNs. We discuss requirements for future echo-mapping experiments that will yield the high quality velocity-delay maps of the broad-line region that are needed to determine its physical nature.
Author
Active Galactic Nuclei; Maps; Velocity Distribution

20040053262 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Kronos: A Multiwavelength Observatory for Mapping Accretion-Driven Sources
Peterson, Bradley M.; Polidan, Ronald S.; Robinson, Edward L.; [2002]; 8 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: CASI; A02, Hardcopy

Kronos is a multiwavelength observatory proposed as a NASA Medium Explorer. Kronos is designed to make use of the natural variability of accreting sources to create microarcsecond-resolution maps of the environments of supermassive black holes in active galaxies and stella-size black holes in binary systems and to characterize accretion processes in Galactic compact binaries. Kronos will obtain broad energy range spectroscopic data with co-aligned X-ray, ultraviolet, and optical spectrometers. The high-Earth orbit of Kronos enables well-sampled, high time-resolution observations, critical for the innovative and sophisticated methods that are used to understand the accretion flows, mass outflows, jets, and other phenomena found in accreting sources. By utilizing reverberation mapping analysis techniques, Kronos produces advanced high-resolution maps of unprecedented resolution of the extreme environment in the inner cores of active galaxies. Similarly, Doppler tomography and eclipse mapping techniques characterize and map Galactic binary systems, revealing the details of the physics of accretion processes in black hole, neutron star, and white dwarf binary systems. The Kronos instrument complement, sensitivity, and orbital environment make it suitable to aggressively address time variable phenomena in a wide range of astronomical objects from nearby flare stars to distant galaxies.
Author
Black Holes (Astronomy); Supermassive Stars; Ultraviolet Spectroscopy; Astronomical Observatories; Telescopes; Tomography; Active Galactic Nuclei

20040053264 Ohio State Univ., Columbus, OH, USA
Black Hole Masses in Three Seyfert Galaxies
Onken, C. A.; Peterson, B. M.; Dietrich, M.; Robinson, A.; Salamanca, I. M.; The Astrophysical Journal; 1 March 2003; Volume 585, pp. 121-127; In English
Contract(s)/Grant(s): NAG5-8397; Copyright; Avail: Other Sources

We analyze published reverberation mapping data for three Seyfert galaxies (NGC 3227, NGC 3516, and NGC 4593) to refine the mass estimate for the supermassive black hole in the center of each object. Treatment of the data in a manner more consistent with other large compilations of such masses allows us to more securely compare our results to wider samples of data, e.g., in the investigation of the M(sub bh-sigma*) relationship for active and quiescent galaxies.
Author
Black Holes (Astronomy); Seyfert Galaxies; Astrophysics; Supermassive Stars; Galactic Mass

20040053310 Ohio State Univ., Columbus, OH, USA
Multiwavelength Monitoring of Active Galactic Nuclei
Peterson, Bradley M.; Probing the Physics of Active Galactic Nuclei by Multiwavelength Monitoring; 2001; Volume 224, pp. 1-10; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: CASI; A03, Hardcopy

By intensive monitoring of AGN variability over a large range in wavelength, we can probe the structure and physics of active galactic nuclei on microarcsecond angular scales. For example, multi-wavelength variability data allow us (a) to establish causal relationships between variations in different wavebands, and thus determine which physical processes are primary and which spectral changes are induced by variations at other wavelengths, and (b) through reverberation mapping of the UV/optical emission lines, to determine the structure and kinematics of the line-emitting region, and thus accurately determine the central masses in AGNs. Multiwavelength monitoring is resource-intensive, and is difficult to implement with general-purpose facilities. As a result, virtually all programs undertaken to date have been either sparsely sampled, or short in duration, or both. The potentially high return on this type of investigation, however, argues for dedicated facilities for multiwavelength monitoring programs.
Author
Active Galactic Nuclei; Emission Spectra; Astronomy; Wavelengths

20040053344 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Gravitational Lenses and the Structure and Evolution of Galaxies
Oliversen, Ronald J., Technical Monitor; Kochanek, Christopher; April 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG5-9265; No Copyright; Avail: CASI; A01, Hardcopy

During the first year of the project we completed five papers, each of which represents a new direction in the theory and interpretation of gravitational lenses. In the first paper, The Importance of Einstein Rings, we developed the first theory for the formation and structure of the Einstein rings formed by lensing extended sources like the host galaxies of quasar and radio sources. In the second paper, Cusped Mass Models Of Gravitational Lenses, we introduced a new class of lens models. In the third paper, Global Probes of the Impact of Baryons on Dark Matter Halos, we made the first globally consistent models for the separation distribution of gravitational lenses including both galaxy and cluster lenses. The last two papers explore the properties of two lenses in detail. During the second year we have focused more closely on the relationship of baryons and dark matter. In the third year we have been further examining the relationship between baryons and dark matter. In the present year we extended our statistical analysis of lens mass distributions using a self-similar model for the halo mass distribution as compared to the luminous galaxy.
Derived from text
Galactic Structure; Galactic Evolution; Dark Matter; Statistical Analysis

20040053402 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Infrared Spectroscopy of Star Formation in Galactic and Extragalactic Regions
Frogel, Jay, Technical Monitor; Smith, Howard A.; March 2004; 59 pp.; In English; See also 20040053403 - 20040053405
Contract(s)/Grant(s): NAG5-10659; No Copyright; Avail: CASI; A04, Hardcopy

In this program we proposed to perform a series of spectroscopic studies, including data analysis and modeling, of star formation regions using an ensemble of archival space-based data from the Infrared Space Observatory's Long Wavelength Spectrometer and Short Wavelength Spectrometer, and to take advantage of other spectroscopic databases including the first

results from SIRTF. Our empha- sis has been on star formation in external, bright IR galaxies, but other areas of research have in- cluded young, low or high mass pre-main sequence stars in star formation regions, and the galactic center. The OH lines in the far infrared were proposed as one key focus of this inquiry because the Principal Investigator (H. Smith) had a full set of OH IR lines from IS0 observations. It was planned that during the proposed 2-1/2 year timeframe of the proposal other data (including perhaps from SIRTF) would become available, and we intended to be responsive to these and other such spectroscopic data sets. Three papers are included:The Infrared Lines of OH: Diagnostics of Molecular Cloud Conditions in Infrared Bright Galaxies; The Far-Infrared Spectrum of Arp 220; andThe Far-Infrared Emission Line and Continuum Spectrum of the Seyfert Galaxy NGC 1068.
Author
Star Formation; Far Infrared Radiation

20040053403 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA
The Infrared Lines of OH: Diagnostics of Molecular Cloud Conditions in Infrared Bright Galaxies
Smith, Howard A.; Gonzalez-Alfonso, Eduardo; Fischer, Jackie; Ashby, Matthew L. N.; Dudley, Chris; Spinoglio, Luigi; Infrared Spectroscopy of Star Formation in Galactic and Extragalactic Regions; March 2004; 2 pp.; In English; See also 20040053402; No Copyright; Avail: CASI; A01, Hardcopy

IS0 detected 9 of the 15 far-IR lines of OH that arise be- tween the molecule's lowest 8 rotational levels. The lines were seen, some- times in emission and sometimes in absorption, in a wide variety of galac- tic and extragalactic objects ranging from AGB stars to molecular clouds in AGN and LIRGs. This set of OH lines provides an important diagnos- tic for many reasons: they span a wide wavelength range (from 28.9pm to 163.2pm); the transitions have fast radiative rates; the abundance of OH is relatively high; the IR continuum plays an important role as a pump; the contribution from shocks is relatively minor; and, not least, the strong cm-wave radiation from OH allows comparison with VLBI datasets. OH plays a key role in the chemistry of the ISM. We have used montecarlo and non-local radiative transfer codes to analyze the spectra of a number of LIRGs with excellent success., Other detected lines in the IS0 spec- tra, including those from H20, CH, '3, CO, [CII] and [OI], are also modeled by the codes, as is the continuum.
Author
Far Infrared Radiation; Galaxies; Hydroxyl Emission

20040053404 Alcala de Henares Univ., Madrid, Spain
The Far-Infrared Spectrum of Arp 220
Gonzalez-Alfonso, Eduardo; Smith, Howard A.; Fischer, Jacqueline; Cernicharo, Jose; Infrared Spectroscopy of Star Formation in Galactic and Extragalactic Regions; March 2004; 21 pp.; In English; See also 20040053402
Contract(s)/Grant(s): NAG5-10659; SEEU Proj. PR2003-0057; No Copyright; Avail: CASI; A03, Hardcopy

ISO/LWS grating observations of the ultraluminous infrared galaxy Arp 220 shows absorption in molecular lines of OH, H 2 0 , CH, NH, and '3, well as in the [0 I] 63 pm line and emission in the [C 111 158 pm line. We have modeled the continuum and the emission/absorption of all observed features by means of a non-local radiative transfer code. The continuum from 25 to 1300 pm is modeled AS A WARM (106 K) NUCLEAR REGION THAT IS OPTICALLY THICK IN the FAR-INFRARED, attenuated by an extended region (size 2') that is heated mainly through absorption of nuclear infrared radiation. The molecular absorption in the nuclear region is characterized by high excitation due to the high infrared radiation density. The OH column densities are high toward the nucleus and the extended region (about 2 x 10 sup 17 cm sup-2). The H2O column density is also high toward the nucleus (2 - 10 x 1017 cm-2) and lower in the extended region. The column densities in a halo that accounts for the absorption by the lowest lying levels are similar to what are found in the diffuse clouds toward the star forming regions in the Sgr B2 molecular cloud complex near the Galactic Center. Most notable are the high column densities found for NH and NH3 toward the nucleus, with values of about 1.5 x 10supl6 cmsup-2 and about 3 x 10supl6 cmsup-2, respectively, whereas the NH2 column density is lower than about 2 x 10sup15 cmsup-2. A combination of PDRs in the extended region and hot cores with enhanced H20 photodissociation and a possible shock contribution in the nuclei may explain the relative column densities of OH and H20, whereas the nitrogen chemistry may be strongly affected by cosmic ray ionization. The [C II] 158 pm line is well reproduced by our models and its 'deficit' relative to the CII/FIR ratio in normal and starburst galaxies is suggested to be mainly a consequence of the dominant non-PDR component of far- infrared radiation, ALTHOUGH OUR MODELS ALONE CANNOT RULE OUT EXTINCTION EFFECTS IN the NUCLEI.
Author
Far Infrared Radiation; Galaxies

20040053405 Consiglio Nazionale delle Ricerche, Rome, Italy

The Far-Infrared Emission Line and Continuum Spectrum of the Seyfert Galaxy NGC 1068

Spinoglio, Luigi; Malkan, Matthew A.; Smith, Howard A.; Fischer, Jacqueline; Infrared Spectroscopy of Star Formation in Galactic and Extragalactic Regions; March 2004; 27 pp.; In English; See also 20040053402

Contract(s)/Grant(s): NAG5-10659; No Copyright; Avail: CASI; A03, Hardcopy

The prototypical Seyfert type 2 galaxy NGC 1068 has been observed with the Long Wavelength Spectrometer (LWS) onboard the Infrared Space Observatory (ISO, ESA). This provides the first complete far-infrared spectrum from 43 to 197um. In addition to the 7 expected ionic fine structure emission lines, we also detect OH rotational lines at 79, 119 and 163um. Unlike any other galaxy yet observed, NGC 1068 shows all these lines in emission. To increase the information on the strong ionic emission lines powered either by the Seyfert nucleus and the starburst, we have included in our analysis measurements in the 2-35um spectral range from the IS0 Short Wavelength Spectrometer (SWS), as well as optical and ultraviolet lines from the literature.

Author

Seyfert Galaxies; Infrared Spectra

20040053667 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Multi-Wavelength Luminosity Functions of Galaxies

Gardner, Jonathan P.; [2002]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Multivariate or multi-wavelength luminosity functions will reveal the interplay between star formation, chemical evolution, and ab- sorption and re-emission of dust within evolving galaxy populations. By using principal component analysis to reduce the dimensionality of the problem, I optimally extract the relevant photometric information from large galaxy catalogs. As a demonstration of the technique, I derive the multi-wavelength luminosity function for the galaxies in the released SDSS catalog, and compare the results with those obtained by traditional methods. This technique will be applicable to catalogs of galaxies from datasets obtained by 2MASS, and the SIRTF and GALEX missions.

Author

Multivariate Statistical Analysis; Galaxies; Luminosity; Star Formation; Chemical Evolution

20040055359 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Empirical Determination of Radiolytic Products in Simulated Europan Ices

Hand, P.; Carlson, R. W.; Chyba, C. F.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 33; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The chemical composition of Europa's surface is strongly influenced by energetic charge particle bombardment from Jupiter's magnetosphere. Here we report on progress in experimental work designed to address: 1) The production of radiolytic products in thermodynamic disequilibrium that could be utilized by known terrestrial microorganisms, and 2) The modification of complex organic molecules and degradation of biological material by the simulated Europan surface radiation environment.

Derived from text

Europa; Radiolysis; Computerized Simulation; Exobiology; Icy Satellites; Satellite Surfaces

20040055397 Ohio State Univ., Columbus, OH, USA

Probing the Physics of Active Galactic Nuclei

Peterson, Bradley M.; April 19, 2004; 3 pp.; In English

Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: CASI; A01, Hardcopy

As a result of a number of large multiwavelength monitoring campaigns that have taken place since the late 1980s, there are now several very large data sets on bright variable active galactic nuclei (AGNs) that are well-sampled in time and can be used to probe the physics of the AGN continuum source and the broad-line emitting region. Most of these data sets have been underutilized, as the emphasis thus far has been primarily on reverberation-mapping issues alone. Broader attempts at analysis have been made on some of the earlier IUE data sets (e.g., data from the 1989 campaign on NGC5 548) , but much of this analysis needs to be revisited now that improved versions of the data are now available from final archive processing. We propose to use the multiwavelength monitoring data that have been accumulated to undertake more thorough investigations of the AGN continuum and broad emission lines, including a more detailed study of line-profile variability, making use of constraints imposed by the reverberation results.

Author

Active Galactic Nuclei; Reverberation; Accumulations; Emission Spectra

20040055399 Nevada Univ., Las Vegas, NV, USA

Looking Closely at 'Medusa': Star Forming Regions in NGC 4194

Weistrop, D.; Eggers, D.; Nelson, C. H.; Kaiser, M. E.; [2004]; 1 pp.; In English

Contract(s)/Grant(s): NAS5-31231; NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

The 'Medusa' (NGC 4194, Mrk 201) is a blue compact galaxy, with strong far infrared and radio emission. Ground-based observations exhibit a distorted image with a tidal tail and regions of strong star formation. A population of massive O and early B stars is evident from the IUE spectra HST survey of Seyfert and starburst galaxies notes NCG 4194 is an HII galaxy with lumpy HII regions and knots. The central starburst is apparently produced by a galaxy merger. As part of an investigation of star formation in interacting galaxies, we have obtained ultraviolet and visible images of the central regions of NGC 4194 with the Space Telescope Imaging Spectrograph on HST. Imaging was obtained in two ultraviolet (FUV-MAMA+F25QTZ, NUV-MAMA+F25CN182) and one visible (CCD+F28X50LP) band. Individual star forming knots (at HST resolution) have been identified. We present sized and luminosities for the individual knots, and the knot luminosity function. We compare our data to current starburst models to constrain stellar ages and populations. Knot characteristics as a function of location in the galaxy will also be discussed.

Author

H Ii Regions; Interacting Galaxies; Star Formation; Radio Emission; Imaging Techniques

20040055400 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Hard X-Ray Emission and the Ionizing Source in LINERs

Terashima, Y.; Ho, L. C.; Ptak, A. F.; [2004]; 1 pp.; In English

Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

We report X-ray luminosities of 21 LINERs (low-ionization nuclear emission-line regions) and 17 low-luminosity Seyferts obtained with ASCA and discuss the ionizing source in LINERs. Most LINERs with broad H-alpha emission in their optical spectra (LINER 1s) have a compact hard X-ray source and their 2-10 keV X-ray luminosities (LX) are proportional to their H alpha luminosities (L-H-alpha). This correlation strongly supports the hypothesis that the dominant ionizing source in LINER 1s is photoionization by hard photons from low-luminosity AGNs. Although some LINERs without broad H-alpha emission (LINER 2s) have X-ray properties similar to LINER 1s, the X-ray luminosities of many LINER 2s in our sample are lower than LINER 1s at a given H-alpha luminosity. The observed X-ray luminosities in these objects are insufficient to power their H-alpha luminosities, suggesting that their primary ionizing source is something other than an AGN, or that an AGN, if present, is obscured even at energies above 2 keV. LINER 2s having small LX/LH-alpha occupy a localized region with small [OI]/H-alpha on the excitation diagram. Such LINER spectra can be reproduced by photoionization by very hot stars.

Author

Active Galactic Nuclei; Ionization; Luminosity; X Ray Sources; Emission Spectra; Seyfert Galaxies

20040055401 Ohio State Univ., OH, USA

NGC 4051 and the Nature of Narrow-Line Seyfert I Galaxies

Peterson, B. M.; McHardy, I. M.; Wilkes, B. J.; [2004]; 1 pp.; In English

Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

We report on the results of a three-year program of coordinated X-ray and optical monitoring of the narrow-line Seyfert 1 galaxy NGC 4051. The principal results of this program are: (1) The H-beta emission line time lag and Doppler width yield a virial mass estimate of about 1.1 mission solar masses, at the extreme low end of AGN masses. A plausible adjustment for inclination effects increases this mass slightly to about 1.4 mission solar masses. (2) During the third year of this campaign, both the X-ray continuum and the He II 4686 line went into extremely low states, although the optical continuum and the H-beta broad line were both still present and variable. We suggest that the inner part of the accretion disk may have gone into an advection-dominated state, yielding little radiation from the hotter inner disk. (3) The He II 4686 line is almost five times as broad as H-beta, and it is strongly blueward asymmetric, as are the high-ionization UV lines recorded in archive spectra of NGC 4051. The data are consistent with the Balmer lines arising in a low-inclination disk-like configuration, and the high-ionization lines arising in an outflowing wind, of which we observe preferentially the near side.

Author

Seyfert Galaxies; X Ray Astronomy; Light (Visible Radiation); Line Spectra

20040055405 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Variable Intrinsic UV Absorption in the Seyfert 1.5 Galaxy NGC 3516
Kraemer, S. B.; Crenshaw, D. M.; George, I. M.; Netzer, H.; Turner, T. J.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

We have examined the physical conditions in the intrinsic UV absorbing gas in the Seyfert 1.5 galaxy NGC 3516, using echelle spectra obtained with the Space Telescope Imaging Spectrograph aboard the Hubble Space Telescope on 2000 October 1. We confirm the presence of the 4 kinematic components detected in earlier Goddard High Resolution Spectrograph (GHRS) spectra, as well as 4 new absorption features with radial velocities ranging from -692 to -1372 kilometers per second. The C IV column densities of components 3 and 4 appear to have increased significantly compared to the GHRS epoch. Based on photoionization modeling and our analysis of contemporaneous Chandra X-ray Observatory spectra, we argue that these changes are in response to the drop in ionizing flux.
Author
Cosmic Gases; Seyfert Galaxies; Ultraviolet Absorption; Imaging Techniques; Spectrographs

20040055407 Georgia State Univ., Atlanta, GA, USA
Intrinsic Absorption and Reddening in Seyfert 1 Galaxies
Crenshaw, D. M.; Kraemer, S. B.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

We discuss the origin of the ″dusty lukewarm absorber'', which we previously identified in the reddened Seyfert 1 galaxies NGC 3227 and Akn 564. This absorber is characterized by saturated UV absorption lines (C IV, N V) near the systemic velocity of the host galaxy, and is likely responsible for reddening both the continuum and the emission lines (including those from the narrow-line region) from these Seyferts. From a large sample of Seyfert 1 galaxies, we find that continuum reddening (as measured by UV color) tends to increase with inclination of the host galaxy. Furthermore, reddened, inclined Seyfert galaxies observed at moderate to high spectral resolution all show evidence for dusty lukewarm absorbers. We suggest that these absorbers lie in the plane of the host galaxy at distances greater than about 100 pc from the nucleus, and are physically distinct from the majority of intrinsic absorbers that are outflowing from the nucleus.
Author
Seyfert Galaxies; Emission Spectra; Ultraviolet Absorption

20040055408 North Carolina Univ., Chapel Hill, NC, USA
Imaging Spectrophotometry of the Jet/ISM Interaction in IC5063
Cecil, G.; Schuft, B.; Morse, J.; Bland-Hawthorn, J.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

IC5063 is a somewhat dusty z=0.0110 S0 galaxy with a Seyfert 2 nucleus. It has a triple radio source that spans 3 arcsec, mostly blueshifted H I absorption that spans 700 km/s, and ionization cones that extend for more than 2 arcmins. We obtained fully sampled [O III]\lambda5007 grids at 0.'9 and 70 km/s FWHM resolution using the Rutgers Fabry-Perot system on the Blanco 4m telescope. Complementary long-slit spectra using the RC spectrograph on the Blanco, and Taurus Tunable Filter spectral images in H\alpha and [N II]\lambda6583, were also obtained to assess gaseous ionization conditions. We present the results of our analysis, and correlate spectral structures to those visible in archival WFPC2 images. We find that, in the region near the radio triple, gaseous ionization and line velocity width is tightly correlated, in excellent quantitative agreement with the high-velocity shock regime in the diagnostic emission-line ratio diagrams of Dopita & Sutherland. We separate kinematically gas in normal disk rotation that is illuminated by the AGN in the ionization cones from that agitated mechanically by the jet, and assess the energy input from both processes.
Author
Imaging Techniques; Galaxies

20040055426 Rutgers Univ., NJ, USA
Supermassive Black Holes and Galaxy Evolution
Merritt, D.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

Supermassive black holes appear to be generic components of galactic nuclei. The formation and growth of black holes is intimately connected with the evolution of galaxies on a wide range of scales. For instance, mergers between galaxies containing nuclear black holes would produce supermassive binaries which eventually coalesce via the emission of

gravitational radiation. The formation and decay of these binaries is expected to produce a number of observable signatures in the stellar distribution. Black holes can also affect the large-scale structure of galaxies by perturbing the orbits of stars that pass through the nucleus. Large-scale N-body simulations are beginning to generate testable predictions about these processes which will allow us to draw inferences about the formation history of supermassive black holes.
Author
Galactic Evolution; Black Holes (Astronomy); Supermassive Stars; Galactic Structure

20040055432 Ohio State Univ., OH, USA
A Supermassive Black Hole in the Seyfert 1 Galaxy NGC 3783
Onken, C. A.; Peterson, B. M.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

Updated analysis techniques and recalibrated archival monitoring data for the Seyfert 1 galaxy NGC 3783 indicated the presence of a supermassive black hole in this galaxy. Using UV data from the International Ultraviolet Explorer satellite and ground-based optical spectra, we have measured more precise emission line reverberation in response to continuum variations. The stratification of the broad line region (BLR) suggested by our results, combined with estimates of the line velocity widths, is consistent with a gravitationally-dominated BLR and allows us to derive a mass for the central black hole.
Author
Black Holes (Astronomy); Seyfert Galaxies; Supermassive Stars; Emission Spectra

20040055433 Pennsylvania State Univ., PA, USA
An [OIII] Study of the Narrow Line Regions of Seyfert Galaxies: Testing the Unified Model
Donley, J.; Schmitt, H. R.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

We present the results of an HST [OIII] study of the narrow line regions (NLRs) of Seyfert galaxies. Our sample consists of Seyfert galaxies selected from nearly isotropic properties, their far-infrared fluxes and warm infrared colors. We discuss the luminosities, projected linear extents, and morphologies of the NLRs of these galaxies as well as the agreement of these properties with the Unified Model. We find that while the Unified Model accurately predicts many of the observed characteristics of the NLRs, certain observed morphologies can not be explained by simple models and require a more careful examination.
Author
Seyfert Galaxies; Unified Field Theory; Line Spectra; Morphology

20040055436 Space Telescope Science Inst., USA
Black Holes Masses in Seyfert Galaxies
Macchetto, F. D.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

There is increasing evidence for the existence of supermassive black holes at the centers of all galaxies, and much work is being devoted to understand the process that lead to their formation, the duty cycle for the active phase of these black holes and the relevant fueling mechanisms. Seyfert galaxies determined by HST high spatial resolution observations of the kinematics of the central regions. The study of the gas kinematics provides a unique tool to probe the gravitational potential of the nuclear regions of Seyfert galaxies down to a limit radius of a few parsecs. This is particularly important to detect and measure the mass associated with any central massive black hole. We have obtained high spatial resolution spectra of a number of Seyfert galaxies, with the STIS G430M and G750M gratings, and we have been able to separate the emission line components associated with different velocity systems. We have derived two-dimensional velocity fields and determined the mass of the central black hole with good precision for each of the galaxies.
Author
Black Holes (Astronomy); Seyfert Galaxies; Stellar Mass; Galactic Evolution

20040055437 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Higher Resolution Observatories of the Accretion Disk in NGC 4261
Jones, D. L.; Wehrle, A. E.; Piner, B. G.; Meier, D. L.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

The physical conditions in the inner parsec of accretion disks believed to orbit the central black holes in active galactic

nuclei can be probed by imaging the absorption of background radio emission by ionized gas in the disk. We will present high angular resolution observations of the nearby galaxy NGC 4261 that show evidence for free-free absorption by a thin, nearly edge-on disk at several frequencies. Because free-free absorption is much larger at lower frequencies, the longest possible baselines are needed to provide adequate angular resolution; observing at higher frequencies to improve resolution does not help. We used trans-Pacific baselines and the HALCA satellite to obtain higher resolution than was previously available at 1.6 and 4.9 GHz. The angular width and the depth of the absorption appears to increase with decreasing frequency, as expected. Author

Accretion Disks; Active Galactic Nuclei; High Resolution; Black Holes (Astronomy); Angular Resolution

20040055898 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA

The NASA ADS: Searching, Linking and More

Thompson, D. M.; Eichhorn, G.; Accomazzi, A.; Bohlen, E.; Grant, C. S.; Henneken, E.; Kurtz, M.; Murray, S.; Lunar and Planetary Science XXXV: Education Programs Demonstrations; 2004; 2 pp.; In English; See also 20040055893

Contract(s)/Grant(s): NCC5-189; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

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Derived from text

World Wide Web; Data Bases; Abstracts

20040055957 Arizona Univ., Tucson, AZ, USA

Accretion of the Outer Planets: Oligarchy or Monarchy?

Weidenschilling, S. J.; Marzari, F.; Davis, D. R.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A persistent problem with the formation of the outer planets is the timescale of their formation. Jupiter and Saturn must have formed within the lifetime of the solar nebula. One model for their formation is nucleated instability, in which a rock/ice core of approx. 10 solar mass must accrete before capture a gaseous envelope from the nebula. Accretion timescales increase with heliocentric distance, exacerbating the problem for Uranus and Neptune. These planets consist largely of rock and ice, but have captured some gas from the nebula, and so may have approached their present masses on timescales approx. 10(exp 7) y or less. The standard model for their formation assumes formation of embryos of mass approx.solar mass, followed by merger into the present planets. However, simulations of late-stage accretion show that gravitational scattering excites large eccentricities and inclinations; the decrease in collisional cross section effectively stops accretion, and Uranus and Neptune do not form within the age of the solar system. Thommes et al. suggested that Uranus and Neptune accreted between Jupiter and Saturn, and were ejected to the outer solar system by their perturbations after those planets gained mass by gas accretion. Their orbits were then circularized by dynamical friction due to the population of small planetesimals in the outer nebula. While this approach is more promising than in situ accretion, it would cause strong stirring of the smaller population, which may be inconsistent with the dynamically cold component of the Kuiper Belt.

Derived from text

Gas Giant Planets; Ice; Planetary Evolution; Solar Nebula; Stirring

20040055997 NASA Johnson Space Center, Houston, TX, USA

Insight into Primordial Solar System Oxygen Reservoirs from Returned Cometary Samples

Brownlee, D. E.; Messenger, S.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 1 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The recent successful rendezvous of the Stardust spacecraft with comet Wild-2 will be followed by its return of cometary dust to Earth in January 2006. Results from two separate dust impact detectors suggest that the spacecraft collected approximately the nominal fluence of at least 1,000 particles larger than 15 micrometers in size. While constituting only about

one microgram total, these samples will be sufficient to answer many outstanding questions about the nature of cometary materials. More than two decades of laboratory studies of stratospherically collected interplanetary dust particles (IDPs) of similar size have established the necessary microparticle handling and analytical techniques necessary to study them. It is likely that some IDPs are in fact derived from comets, although complex orbital histories of individual particles have made these assignments difficult to prove. Analysis of bona fide cometary samples will be essential for answering some fundamental outstanding questions in cosmochemistry, such as (1) the proportion of interstellar and processed materials that comprise comets and (2) whether the Solar System had a O-16-rich reservoir. Abundant silicate stardust grains have recently been discovered in anhydrous IDPs, in far greater abundances (200 5,500 ppm) than those in meteorites (25 ppm). Insight into the more subtle O isotopic variations among chondrites and refractory phases will require significantly higher precision isotopic measurements on micrometer-sized samples than are currently available.
Author
Comets; Oxygen; Solar System; Cosmochemistry; Population Iii Stars

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20040051132 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
A Multi-Wavelength Study of the Hot Component of the Interstellar Medium
Oliversen, Ronald J., Technical Monitor; March 2004; 14 pp.; In English
Contract(s)/Grant(s): NAG5-8483; No Copyright; Avail: CASI; A03, Hardcopy

This research focuses on the kinematics and evolution of the hot phase of the interstellar medium in the Galaxy. The plan was to measure the UV spectra of all hot stars observed with IUE, in order to identify and measure the main component and any high velocity components to the interstellar lines. Collection of data from higher resolution instruments on HST has been proposed for some of the interesting lines of sight. IUE spectra of 240 stars up to 8 kpc in 2 quadrants of the galactic plane have been examined to (1) estimate the total column density per kpc as a function of direction and distance, and (2) to obtain a lower limit to the number of high velocity components to the interstellar lines, thus giving an approximation of the number of conductive interfaces encountered per line of sight. By determining an approximation to the number of components per unit distance we aim to derive statistics on interfaces between hot and cold gas in the Galaxy. We find that 20% of the stars in this sample show at least one high velocity component in the C IV interstellar line. Two successful FUSE programs address this research and collected data for several of the lines of sight identified as locations of hot, expanding gas with the IUE data. One FUSE program is complete for the Vela SNR region. Data from another FUSE program to investigate the Cygnus superbubble region are being analyzed.
Derived from text
Wavelet Analysis; Interstellar Gas; Interstellar Matter; Stellar Spectra; Hot Stars; High Temperature Gases; Evolution (Development)

20040052873 Ohio State Univ., Columbus, OH, USA
Evidence for Supermassive Black Holes in Active Galactic Nuclei from Emission-Line Reverberation
Peterson, Bradley M.; Wandel, Amri; The Astrophysical Journal; September 1, 2000; Volume 540, pp. L13-L16; In English
Contract(s)/Grant(s): NAG5-8397; NSF AST-94-20080; Copyright; Avail: Other Sources

Emission-line variability data for Seyfert 1 galaxies provide strong evidence for the existence of supermassive black holes in the nuclei of these galaxies and that the line-emitting gas is moving in the gravitational potential of that black hole. The time-delayed response of the emission lines to continuum variations is used to infer the size of the line-emitting region, which is then combined with measurements of the Doppler widths of the variable line components to estimate a virial mass. la the case of the best-studied galaxy, NGC 5548, various emission lines spanning an order of magnitude in distance from the central source show the expected V proportional to r(sup -l/2) correlation between distance and line width and are thus consistent with a single value for the mass. Two other Seyfert galaxies, NGC 7469 and 3C 390.3, show a similar relationship. We compute the ratio of luminosity to mass for these three objects and the narrow-line Seyfert I galaxy NGC 4051 and find that the gravitational force on the line-emitting gas is much stronger than radiation pressure. These results strongly support the paradigm of gravitationally bound broad emission line region clouds.
Author
Black Holes (Astronomy); Active Galactic Nuclei; Emission Spectra; Spectral Line Width; Reverberation

20040052874 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Origin of the X-Ray and Ultraviolet Emission in NGC 7469

Nandra, K.; Le, T.; George, I. M.; Edelson, R. A.; Mushotzky, R. F.; Peterson, B. M.; Turner, T. J.; The Astrophysical Journal; December 1, 2000; Volume 544, pp. 734-746; In English

Contract(s)/Grant(s): NAG5-8397; NAG5-7067; Copyright; Avail: Other Sources

We present a spectral analysis of a approx 30 day, near-continuous observation of the Seyfert 1 galaxy NGC 7469 with RXTE. Daily integrations show strong spectral changes during the observation. Our main result is that we find the X-ray spectral index to be correlated with the UV flux. Furthermore, the broadband X-ray photon flux is also correlated with the UV continuum. These correlations point toward a model in which the X-rays originate via thermal Comptonization of UV seed photons. Furthermore, the UV is also correlated with the extrapolation of the X-ray power law into the soft X-ray/EUV region. Our data analysis therefore reopens the possibility that the UV photons and their variability arise from reprocessing, as long as the primary source of heating is photoelectric absorption in the re-processor, rather than Compton down-scattering. A coherent picture of the X-ray/UV variability can therefore be constructed whereby absorption and reprocessing of EUV/soft X-rays in a standard accretion disk produce a variable seed photon distribution, which is in turn up-scattered into the X-ray band. We also find a significant correlation between the 2-10 keV flux and the 6.4 keV iron K-alpha line, suggesting that at least some portion of the line originates within approx. 1 light day of the X-ray continuum source. Neither the power-law photon index nor the Compton reflection component are correlated with the 2-10 keV flux. The latter is not correlated with the iron K-alpha line flux either. We do find an apparent correlation between the X-ray spectral index and the strength of the Compton reflection component. In an Appendix we show, however, that this can be produced by a combination of statistical and systematic errors. We conclude that the apparent variations in the Compton reflection component may be an artifact of these effects.

Author

Spectrum Analysis; Galaxies; Observation; Ultraviolet Emission

20040052875 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A High Signal-To-Noise Ultraviolet Spectrum of NGC 7469: New Support for Reprocessing of Continuum Radiation

Kriss, Gerard A.; Peterson, Bradley M.; Crenshaw, D. Michael; Zheng, Wei; The Astrophysical Journal; May 20, 2000; Volume 535, pp. 58-72; In English

Contract(s)/Grant(s): NAS5-26555; NAG5-8397; GO-06747.01-95A; NAGW-4443; Copyright; Avail: Other Sources

From 1996 June 10 to 1996 July 29, the International AGN Watch monitored the Seyfert 1 galaxy NGC 7469 using the International Ultraviolet Explorer, the Rossi X-Ray Timing Explorer, and a network of ground-based observatories. On 1996 June 18, in the midst of this intensive monitoring period, we obtained a high signal-to-noise snapshot of the UV spectrum from 1150 to 3300 A, using the Faint Object Spectrograph (FOS) on the Hubble Space Telescope. This spectrum allows us to disentangle the UV continuum more accurately from the broad wings of the emission lines, to identify clean continuum windows free of contaminating emission and absorption, and to deblend line complexes such as Ly(alpha) + N V, C IV + He II + O III], Si III] + C III], and Mg II + Fe II. Using the FOS spectrum as a template, we have fitted and extracted line and continuum fluxes from the IUE monitoring data. The cleaner continuum extractions c o n h the discovery of time delays between the different UV continuum bands by Wanders et al. Our new measurements show delays increasing with wavelength for continuum bands centered at 1485, 1740, and 1825 A, relative to 1315 A with delays of 0.09, 0.28, and 0.36 days, respectively. Like many other Seyfert I galaxies, the UV spectrum of NGC 7469 shows intrinsic, blue-shifted absorption in Ly(alpha), N V, and C IV. Soft X-ray absorption is also visible in archival ASCA X-ray spectra. The strength of the UV absorption, however, is not compatible with a single-zone model in which the same material absorbs both the UV and X-ray light. Similar to other Seyfert galaxies, such as NGC 3516, the UV-absorbing gas in NGC 7469 has a lower ionization parameter and column density than the X-ray-absorbing material. While the UV and X-ray absorption does not arise in the same material, the frequent occurrence of both associated UV absorption and X-ray warm absorbers in the same galaxies suggests that the gas supply for each has a common origin.

Author

Signal to Noise Ratios; Ultraviolet Spectra; Galaxies; Continuous Spectra; Line Spectra

20040052876 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Intensive HST, RXTE, and ASCA Monitoring of NGC 3516: Evidence against Thermal Reprocessing

Edelson, Rick; Koratkar, Anuradha; Nandra, Kirpal; Goad, Michael; Peterson, Bradley M.; Collier, Stefan; Krolik, Julian; Malkan, Matthew; Maoz, Dan; OBrien, Paul, et al.; The Astrophysical Journal; May 1, 2000; Volume 534, pp. 180-188; In English

Contract(s)/Grant(s): NAG5-8397; GO-07355; NAG5-7315; Copyright; Avail: Other Sources

During 1998 April 1316, the bright, strongly variable Seyfert 1 galaxy NGC 3516 was monitored almost continuously with HST for 10.3 hr at ultraviolet wavelengths and 2.8 days at optical wavelengths, and simultaneous RXTE and ASCA monitoring covered the same period. The X-ray fluxes were strongly variable with the soft (0.5-2 keV) X-rays showing stronger variations (approx. 65% peak to peak) than the hard (2-10 keV) X-rays (approx. 50% peak to peak). The optical continuum showed much smaller but still highly significant variations: a slow approx. 2.5% rise followed by a faster approx. 3.5% decline. The short ultraviolet observation did not show significant variability. The soft and hard X-ray light curves were strongly correlated, with no evidence for a significant interband lag. Likewise, the optical continuum bands (3590 and 5510 A) were also strongly correlated, with no measurable lag, to 3(sigma) limits of approx. less than 0.15 day. However, the optical and X-ray light curves showed very different behavior, and no significant correlation or simple relationship could be found. These results appear difficult to reconcile with previous reports of correlations between X-ray and optical variations and of measurable lags within the optical band for some other Seyfert 1 galaxies. These results also present serious problems for 'reprocessing' models in which the X-ray source heats a stratified accretion disk, which then reemits in the optical/ultraviolet : the synchronous variations within the optical would suggest that the emitting region is approx. less than 0.3 It-day across, while the lack of correlation between X-ray and optical variations would indicate, in the context of this model, that any reprocessing region must be approx. greater than 1 It-day in size. It may be possible to resolve this conflict by invoking anisotropic emission or special geometry, but the most natural explanation appears to be that the bulk of the optical luminosity is generated by some mechanism other than reprocessing.
Author
Active Galaxies; Correlation; Luminosity; Seyfert Galaxies; Ultraviolet Radiation; X Ray Sources

20040053263 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Kronos: A Satellite for Astrotomography
Peterson, B. M.; Polidan, R. S.; Horne, K.; Astron. Nachr.; 2004; Volume 325, No. 3, pp. 257; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

Kronos, a Medium Explorer concept, is designed to initiate a new era in astrophysics, fully opening the domain of time by enabling extended simultaneous multiwavelength (X-ray, UV, and optical) spectroscopic monitoring of variable accretion-driven sources. The primary design goal of the mission is to obtain high-fidelity velocity-delay maps of the broad-line region in active galactic nuclei (AGNs) and thus determine the geometry and structure of AGNs on microarcsecond scales. Doppler tomography and eclipse mapping techniques will be used to characterize and map Galactic binary systems, revealing the details of the physics of accretion processes in black hole, neutron star, and white dwarf binary systems. The high-Earth orbit of Kronos enables well-sampled, high time-resolution observations, critical for the innovative and sophisticated methods that are used to understand the accretion flows, mass outflows, jets, and other phenomena found in accreting sources.
Author
Astronomical Satellites; Tomography; Astronomical Spectroscopy

20040053265 Ohio State Univ., Columbus, OH, USA
Steps Toward Determination of the Size and Structure of the Broad-Line Region in Active Galactic Nuclei XVI: A 13 Year Study of Spectral Variability in NGC 5548
Peterson, B. M.; Berlind, P.; Bertram, R.; Bischoff, K.; Bochkarev, N. G.; Burenkov, A. N.; Calkins, M.; Carrasco, L.; Chavushyan, V. H., et al.; The Astrophysical Journal; December 10, 2002; Volume 581, pp. 197-204; In English
Contract(s)/Grant(s): NAG5-8397; NSF AST-99-87438; NAG5-3234; RBRF-N97-02-17625; RBRF-N00-02-16272a; INTAS-N96-0328; Copyright; Avail: Other Sources

We present the final installment of an intensive 13 year study of variations of the optical continuum and broad H beta emission line in the Seyfert 1 galaxy NGC 5548. The database consists of 1530 optical continuum measurements and 1248 H beta measurements. The H beta variations follow the continuum variations closely, with a typical time delay of about 20 days. However, a year-by-year analysis shows that the magnitude of emission-line time delay is correlated with the mean continuum flux. We argue that the data are consistent with the simple model prediction between the size of the broad-line region and the ionizing luminosity, r is proportional to L(sup 1/2)(sub ion). Moreover, the apparently linear nature of the correlation between the H beta response time and the nonstellar optical continuum F(sub opt) arises as a consequence of the changing shape of the continuum as it varies, specifically F(sub opt) is proportional to F(sup 0.56)(sub UV).
Author
Active Galactic Nuclei; H Beta Line; Emission Spectra; Seyfert Galaxies

20040053266 Ohio State Univ., Columbus, OH, USA

The Mass of the Central Black Hole in the Seyfert Galaxy NGC 3783

Onken, Christopher A.; Peterson, Bradley M.; Astrophysical Journal; June 20, 2004; Volume 572, pp. 746-752; In English

Contract(s)/Grant(s): NAG5-8397; Copyright; Avail: Other Sources

Improved analysis of ultraviolet and optical monitoring data on the Seyfert 1 galaxy NGC 3783 provides evidence for the existence of a supermassive, (8.7 +/- 1.1) x 10(exp 6) solar mass, black hole in this galaxy. By using recalibrated spectra from the International Ultraviolet Explorer satellite and ground-based optical data, as well as refined techniques of reverberation mapping analysis, we have reduced the statistical uncertainties in the response of the emission lines to variations in the ionizing continuum. The different time lags in the emission-line responses indicate a stratification in the ionization structure of the broad-line region and are consistent with the virial relationship suggested by the analysis of similar active galaxies. Author

Black Holes (Astronomy); Seyfert Galaxies; Stellar Mass; Stratification

20040053267 Ohio State Univ., Columbus, OH, USA

Keplerian Motion of Broad-Line Region Gas as Evidence for Supermassive Black Holes in Active Galactic Nuclei

Peterson, Bradley M.; Wandel, Amri; Astrophysical Journal; Aug. 20, 1999; Volume 521, pp. L95-L98; In English

Contract(s)/Grant(s): NAG5-8397; NSF AST-94-20080; Copyright; Avail: Other Sources

Emission-line variability data on NGC 5548 argue strongly for the existence of a mass of order 7 x l0(exp 7) solar mass, within the inner few light-days of the nucleus in the Seyfert 1 galaxy NGC 5548. The time-delayed response of the emission lines to continuum variations is used to infer the size of the line-emitting region, and these determinations are combined with measurements of the Doppler widths of the variable line components to estimate a virial mass. The data for several different emission lines spanning an order of magnitude in distance from the central source show the expected V proportional to r(sup -1/2) correlation and are consistent with a single value for the mass.

Author

Kepler Laws; Seyfert Galaxies; Black Holes (Astronomy); Emission Spectra; Active Galactic Nuclei

20040053289 NASA Ames Research Center, Moffett Field, CA, USA

Silicate Mineralogy of the Dust in the Inner Coma of Comet C/1995 01 (Hale-Bopp) Pre- and Post-Perihelion

Wooden, Diane H.; Harker, David E.; Woodward, Charles E.; Butner, Harold M.; Koike, Chiyoe; Witteborn, Fred C.; McMurtry, Craig M.; [1998]; 2 pp.; In English

Contract(s)/Grant(s): RTOP 274-52-71-46; No Copyright; Avail: Other Sources; Abstract Only

We present 7.6 - 13.3 microns infrared (IR) spectrophotometry (R approx. = 180 - 350) of the 10 microns silicate emission from dust in the inner coma (i.e., within a diameter of 3in.) of comet C/1995 O1 (Hale-Bopp) at four temporal epochs from 1996 October through 1997 June during Hale-Bopp s approach to, arrival at, and recession from perihelion. The HIFOGS spectra at large heliocentric distances exhibit strong emission peaks from 9.9 - 10.1 microns and at 11.2 microns. The HIFOGS spectra of Hale-Bopp taken 1996 October 07 - 14 UT are identical in shape to the ISO SWS spectrum at 2.8 AU obtained on 1996 October 06 UT. Magnesium-rich olivine was unambiguously identified due to presence of the expected 11.2 microns peak along with the matching far-IR 18 microns, 23 microns, and 33 microns peaks in the ISO SWS spectrum. In contrast, to large heliocentric distances, we find that the silicate feature at small heliocentric distances (tau(sub lambda) less than or = 1.7 AU) exhibits strong peaks at 9.3 microns, 9.9 - 10.1 microns, and 11.2 microns, and weak at 10.5 microns and 11.8 microns. We will show that the dramatic increase of the 9.3 microns and 10.0 microns peaks close to perihelion leads to the hypothesis that there are two crystalline grain components with significantly different temperatures. The hotter mineral species (including olivines) radiate over a large range of heliocentric distances at detectable leve!s. The cooler mineral species (pyroxenes) radiate on the Wien side of the blackbody, too faint to detect in the mid-infrared spectra, until close to the sun when this species radiates on the Reyleigh-Jeans tail and becomes apparent. Decomposition of the observed silicate emission features into mineral components through comparison of the height and shape of the silicate feature ('Flux/cont') derived from the cometary spectra, to optical extinctions (Qext) derived from laboratory measurements of terrestrial silicate minerals and interplanetary dust particles (IDPs) is successful for a combination of warm grains (consisting of olivines, amorphous olivines, amorphous pyroxenes, and layer-lattice silicates) and cool grains (crystalline pyroxenes).

Author (revised)

Silicates; Mineralogy; Minerals; Perihelions; Interplanetary Dust; Hale-Bopp Comet

20040053308 Ohio State Univ., Columbus, OH, USA
Masses of Black Holes in Active Galactic Nuclei
Peterson, Bradley M.; Active Galactic Nuclei: From Central Engine to Host Galaxy; 2003; Volume 30, pp. 1-4; In English
Contract(s)/Grant(s): NAG5-8397; NSF AST-02-05964; UIBSF-1999336; Copyright; Avail: CASI; A01, Hardcopy

We present a progress report on a project whose goal is to improve both the precision and accuracy of reverberation-based black-hole masses. Reverberation masses appear to be accurate to a factor of about three, and the black-hole mass/bulge velocity dispersion (M-sigma) relationship appears to be the same in active and quiescent galaxies.
Author
Black Holes (Astronomy); Mass; Reverberation; Active Galactic Nuclei

20040053309 Ohio State Univ., Columbus, OH, USA
An Intrinsic Baldwin Effect in the H Beta Broad Emission Line in the Spectrum of NGC 5548
Gilbert, Karoline M.; Peterson, Bradley M.; The Astrophysical Journal; April 09, 2003; Volume 587, pp. 123-127; In English
Contract(s)/Grant(s): NAG5-8397; Copyright; Avail: Other Sources

We investigate the possibility of an intrinsic Baldwin effect (i.e., nonlinear emission-line response to continuum variations) in the broad HP emission line of the active galaxy NGC 5548 using crosscorrelation techniques to remove light-travel time effects from the data. We find a nonlinear relationship between the HP emission line and continuum fluxes that is in good agreement with theoretical predictions. We suggest that similar analysis of multiple lines might provide a useful diagnostic of physical conditions in the broad-line region.
Author
Emission Spectra; Seyfert Galaxies; H Beta Line

20040053334 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Telescope Scientist on the Advanced X-ray Astrophysics Observatory
Smith, Carl M., Technical Monitor; VanSpeybroeck, Leon; Tananbaum, Harvey D.; April 2004; 21 pp.; In English
Contract(s)/Grant(s): NAG8-1607; No Copyright; Avail: CASI; A03, Hardcopy

In this period, the Chandra X-ray Observatory continued to perform exceptionally well, with many scientific observations and spectacular results. The HRMA performance continues to be essentially identical to that predicted from ground calibration data. The Telescope Scientist Team has improved the mirror model to provide a more accurate description to the Chandra observers, enabling them to reduce the systematic errors and uncertainties in their data reduction. There also has been good progress in the scientific program. Using the Telescope Scientist GTO time, we carried out an extensive Chandra program to observe distant clusters of galaxies. The goals of this program were to use clusters to derive cosmological constraints and to investigate the physics and evolution of clusters. A total of 71 clusters were observed with ACIS-I; the last observations were completed in December 2003.
Derived from text
Astrophysics; X Ray Astrophysics Facility; Astronomical Observatories; Cosmology

20040053359 Ohio State Univ., Columbus, OH, USA
Characteristic Ultraviolet/Optical Timescales in Active Galactic Nuclei
Collier, Stefan; Peterson, Bradley M.; The Astrophysical Journal; July 10, 2001; Volume 555, pp. 775-785; In English
Contract(s)/Grant(s): NAG5-8397; Copyright; Avail: Other Sources

The UV/optical light curves of active galactic nuclei (AGNs) may be roughly characterized by a periodic fractional flux variations of approx. 10% on timescales of 1 month. The physical mechanism(s) responsible remain ill defined. We present a structure function analysis, i.e., measure the power distribution over a range of timescales tau, of 13 AGNs to constrain the origin of UV/optical emission. On timescales tau approx. 5- 60 days, the mean UV and optical power density spectra (PDS) are equivalent. This may suggest that the underlying energy generating mechanism is identical. The combined W/optical PDS is P(f) proportional to f(sup -alpha)- with alpha = 2.13(sup +0.22, sub -0.06). For sources with measured X-ray PDS indices, we find they are indistinguishable from their UV/optical counterparts. This supports scenarios whereby X-rays are generated via Compton upscattering of UV photons, to later radiatively drive optical variations. At the same time, we present evidence for characteristic variability timescales tau(sub char) of approx. 5-100 days in 10 sources. These variability timescales combined with reverberation based masses M suggest a M - tau(sub char) relationship; higher mass systems have larger characteristic timescales. The UV tau(sub char) may possibly reflect dynamical or accretion disk thermal timescales. We find suggestive evidence for a dichotomy, at tau approx. 30 days and M approx. l0(exp 7) solar mass, between short- and long-time

scale optical variations. These optical variations may be attributable to dynamical and accretion disk thermal or starburst activity timescales, respectively.
Author
Ultraviolet Emission; Time Dependence; Active Galactic Nuclei; Stellar Mass

20040053457 Ohio State Univ., Columbus, OH, USA
Observational Definition of Future AGN Echo-Mapping Experiments
Collier, Stefan; Peterson, Bradley M.; Horne, Keith; Probing the Physics of Active Galactic Nuclei by Multiwavelength Monitoring; 2001; Volume 224, pp. 457-477; In English
Contract(s)/Grant(s): NAG5-8397; Copyright; Avail: CASI; A03, Hardcopy

We describe numerical simulations we have begun in order to determine the observational requirements for future echo-apping experiments. We focus on two particular problems: (1) determination of the structure and kinematics of the broad-line region through emission- line reverberation mapping, and (2) detection of interband continuum lags that may be used as a probe of the continuum source, presumably a temperature-stratified accretion disk. Our preliminary results suggest the broad-line region can be reverberation-mapped to good precision with spectra of signal-to-noise ratio per pixel S/N approx. = 30, time resolution (Delta)t approx. = 0.1 day, and duration of about 60 days (which is a factor of three larger than the longest time scale in the input models); data that meet these requirements do not yet exist. We also find that interband continuum lags of approx. greater than 0.5 days can be detected at approx. greater than 95% confidence with at least daily observations for about 6 weeks, or rather more easily and definitively with shorter programs undertaken with satellite-based observatories. The results of these simulations show that significant steps forward in multiwavelength monitoring will almost certainly require dedicated facilities.
Author
Numerical Analysis; Mapping; Echoes; Signal to Noise Ratios; Emission Spectra; Galactic Nuclei

20040053636 Helsinki Univ. of Technology, Kylmaelae
Metsaehovi Radio Observatory
Urpo, S.; Mujunen, A.; 2003; In English
Report No.(s): PB2004-102801; HUT-KURP-26; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introduction; Research Activities: Radio Astronomical Instrumentation; Extragalactic Radio Sources; Planck Science; Observations with Other Facilities; VLBI Observational Activities; Solar Research; Publications: Visits to Foreign Institutions; Visiting Scientists; Thesis; Teaching; Other Activities; Personnel in 2002.
NTIS
Radio Astronomy; Observatories; Extragalactic Radio Sources

20040055311 Ohio State Univ., Columbus, OH, USA
Zero-Point Calibration for AGN Black-Hole Mass Estimates
Peterson, B. M.; Onken, C. A.; 2004; 4 pp.; In English
Contract(s)/Grant(s): NAG5-8397; NSF AST-02-05964; No Copyright; Avail: CASI; A01, Hardcopy

We discuss the measurement and associated uncertainties of AGN reverberation-based black-hole masses, since these provide the zero-point calibration for scaling relationships that allow black-hole mass estimates for quasars. We find that reverberation-based mass estimates appear to be accurate to within a factor of about 3.
Author
Black Holes (Astronomy); Calibrating; Active Galactic Nuclei; Zero Point Energy; Astrophysics

20040055368 Saint Andrew's Univ., UK
Observational Requirements for High-Fidelity Reverberation Mapping
Horne, Keith; Peterson, Bradley M.; Collier, Stefan J.; Netzer, Hagai; January 2004; 23 pp.; In English
Contract(s)/Grant(s): NAG5-8397; Copyright; Avail: CASI; A03, Hardcopy

We present a series of simulations to demonstrate that high-fidelity velocity-delay maps of the emission-line regions in active galactic nuclei can be obtained from time-resolved spectrophotometric data sets like those that will arise from the proposed Kronos satellite. While previous reverberation-mapping experiments have established the size scale R of the broad emission-line regions from the mean time delay tau = R/c between the line and continuum variations and have provided strong evidence for supermassive black holes, the detailed structure and kinematics of the broad-line region remain ambiguous and

poorly constrained. Here we outline the technical improvements that will be required to successfully map broad-line regions by reverberation techniques. For typical AGN continuum light curves, characterized by power-law power spectra P (f) is proportional to f(exp -alpha) with a = -1.5 +/- 0.5, our simulations show that a small UV/optical spectrometer like Kronos will clearly distinguish between currently viable alternative kinematic models. From spectra sampled at time intervals Delta t and sustained for a total duration T(sub dur), we can reconstruct high-fidelity velocity-delay maps with velocity resolution comparable to that of the spectra, and delay resolution Delta tau approx. 2 Delta t, provided T(sub dur) exceeds the broad-line region light crossing time by at least a factor of three. Even very complicated kinematical models, such as a Keplerian flow with superimposed spiral wave pattern, are resolved in maps from our simulated Kronos datasets. Reverberation mapping with Kronos data is therefore likely deliver the first clear maps of the geometry and kinematics in the broad emission-line regions 1-100 microarcseconds from supermassive black holes.
Author
Active Galactic Nuclei; Line Spectra; Spectrophotometry; Velocity Distribution; Reverberation

20040055385 NASA Ames Research Center, Moffett Field, CA, USA
NICMOS Narrow-band Images of OMC-1
Schultz, Angela S. B.; Colgan, Sean W. J.; Erickson, E. F.; Kaufman, M. J.; Hollenbach, D. J.; O'Dell, C. R.; Young, E. T.; Chen, H.; [1998]; 20 pp.; In English
Contract(s)/Grant(s): RTOP 459-10-65; No Copyright; Avail: CASI; A03, Hardcopy

We present images of a 90in. x 90in. field centered on BN in OMC-1, taken with the Near-Infrared Camera and MultiObject Spectrograph (NICMOS) aboard the Hubble Space Telescope. The observed lines are H2 1-0 S(l), Pa, [FeII] 1.64 pm, and the adjacent continua. The region is rich in interesting structures. The most remarkable are the streamers or 'fingers' of H2 emission which extend from 15in. to 50in. from IRc2, seen here in unprecedented detail. Unlike the northern H2 fingers, the inner fingers do not exhibit significant [FeII] emission at theirdips, which we suggest is due to lower excitation. These observations also show that the general morphology of the Pa and [FeII] emission (both imaged for the first time in this region) bears a striking resemblance to that of the Ha and [SII] emission previously observed with WFPC2. This implies that these IR and optical lines are produced by radiative excitation on the surface of the molecular cloud. The Pa morphology of HH 202 is also very similar to its H a and [OIII] emission, again suggesting that the Pa in this object is photo-excited by the Trapezium, as has been suggested for the optical emission. We find evidence of shock-excited [FeII] in HH 208, where it again closely follows the morphology of [SII]. There is also H2 coincident with the [SII] and [FeII] emission, which may be associated with HH 208. Finally, we note some interesting continuum features: diffuse 'tails' trailing from IRc3 and IRc4, more extensive observations of the 'crescent' found by Stolovy, et al. (1998), and new observations of a similar oval object nearby. We also find a 'V'-shaped region which may be the boundary of a cavity being cleared by IRc2.
Author
Molecular Clouds; Light Emission; Narrowband; Excitation; Fingers

20040055389 Massachusetts Inst. of Tech., Cambridge, MA, USA
XMM-Newton Spectroscopy of the Galactic Microquasar GRS 1758-258 in the Peculiar Off/Soft State
Miller, J. M.; Wunands, R.; Rodriguez-Pascual, P. M.; Ferrando, P.; Gaensler, B. M.; Goldwurm, A.; Lewin, W. H. G.; Pooley, D.; The Astrophysical Journal; February 10, 2002; Volume 566, pp. 358-364; In English
Contract(s)/Grant(s): PF9-10010; NAS8-39073; HST-HF-01107.01-A; NAS5-26555; NAG5-11683; Copyright; Avail: Other Sources

We report on an XMM-Newton Reflection Grating Spectrometer observation of the black hole candidate and Galactic microquasar GRS 1758-258. The source entered a peculiar 'off/soft' state in 2001 late February in which the spectrum softened while the X-ray flux-and the inferred mass accretion rate-steadily decreased. We find no clear evidence for emission or absorption lines in the dispersed spectra, indicating that most of the observed soft flux is likely from an accretion disk and not from a cool plasma. The accretion disk strongly dominates the spectrum in this lower luminosity state and is only mildly recessed from the marginally stable orbit. These findings may be di8licult to explain in terms of advection-dominated accretion flow (ADAF) models. We discuss these results within the context of ADAF models, simultaneous two-flow models, and observed correlations between hard X-ray flux and jet production.
Author
Accretion Disks; Black Holes (Astronomy); Relativity; Quasars; Astronomical Models; Emission Spectra

20040055402 Liverpool John Moores Univ., Liverpool, UK

Nuclear Gas Dynamics of NGC2110: A Black Hole Offset from the Host Galaxy Mass Center?

Mundell, C. G.; Ferruit, P.; Nagar, N.; Wilson, A. S.; [2004]; 1 pp.; In English

Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

It has been suggested that the central regions of many galaxies are unlikely to be in a static steady state, with instabilities caused by sinking satellites, the influence of a supermassive black hole or residuals of galaxy formation, resulting in the nuclear black hole orbiting the galaxy center. The observational signature of such an orbiting black hole is an offset of the active nucleus (AGN) from the kinematic center defined by the galaxy rotation curve. This orbital motion may provide fuel for the AGN, as the hole 'grazes' on the ISM, and bent radio jets, due to the motion of their source. The early type (E/SO) Seyfert galaxy, NGC2210, with its striking twin, 'S'-shaped radio jets, is a unique and valuable test case for the offset-nucleus phenomenon since, despite its remarkably normal rotation curve, its kinematically-measured mass center is displaced both spatially (260 pc) and kinematically (170 km/s) from the active nucleus located in optical and radio studies. However, the central kinematics, where the rotation curve rises most steeply, have been inaccessible with ground-based resolutions. We present new, high resolution WFPC2 imaging and long-slit STIS spectroscopy of the central 300 pc of NGC2110. We discuss the structure and kinematics of gas moving in the galactic potential on subarcsecond scales and the reality of the offset between the black hole and the galaxy mass center.

Author

Gas Dynamics; Black Holes (Astronomy); Galactic Nuclei

20040055404 Space Telescope Science Inst., USA

Black Hole Demographics in and Nuclear Properties of Nearby Low Luminosity Radio Galaxies; Connections to Radio Activity?

Baum, S. A.; Kleijn, G. A. Verdoes; Xu, C.; ODea, C. P.; deZeeuw, P. T.; [2004]; 1 pp.; In English

Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

We combine the results of an HST STIS and WFPC study of a complete sample of 21 nearby UGC low luminosity radio galaxies with the results of a radio VLA and VLBA study of the same sample. We examine the relationship between the stellar and gaseous properties of the galaxies on tens to hundreds of parsec scale with the properties of the radio jets on the same scale. From the VLA and VLBA data we constrain the physics of the outflowing radio plasma from the tens of parsecs to hundreds of kiloparsec scales. From the WFPC2 H alpha and dust images and the STIS kinematics of the near nuclear gas we obtain constraints on the orientation of near nuclear disks of gas and measures of the nuclear stellar, continuum point source, and line emission fluxes. Under the statistically supported assumption that the radio jet issues perpendicular to the disk, we use the orientation of the optical (large scale accretion?) disks to constrain the three-dimensional orientation of the radio ejection. From HST/STIS spectroscopy of the near-nuclear emission line gas we obtain measures/limits on the black hole masses. We examine correlations between the VLBA and VLA-scale radio emission, the nuclear line emission, and the nuclear optical and radio continuum emission. Though our sample is relatively small, it is uniquely well defined, spans a narrow range in redshift and we have a consistent set of high resolution data with which to carefully examine these relationships. We use the combined radio and optical data to: 1) Constrain the orientation, physics, and bulk outflow speed of the radio plasma; 2) Put limits on the mass accretion rate and study the relationship between black hole mass, radio luminosity, and near nuclear gaseous content; 3) Provide insight into the relationship between BL Lac objects and low luminosity radio galaxies.

Author

Black Holes (Astronomy); Radio Galaxies

20040055434 Texas Univ., TX, USA

The M Solar Mass - L(sub bulge) Correlation

Kormendy, J.; Gebhardt, K.; Richstone, D.; [2004]; 1 pp.; In English

Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

New detections of supermassive black hole (BH) candidates are used to update the observed correlation between BH mass M and the luminosity L(sub bulge) of the bulge component of the host galaxy. Our main purpose is to test whether the correlation is real or just the upper envelope of a distribution that extends to smaller Solar Mass. We also illustrate the following conclusions: 1 -- BH mass correlates much better with bulge luminosity than with the total luminosity of the galaxy. 2 -- BH mass correlates with the luminosity of the high-density central component in disk galaxies independent of whether that component is a classical bulge (essentially a mini-elliptical) or a pseudobulge (believed to form via inward transport of disk material). This conclusion is based on only three pseudobulges, so it needs to be checked. 3 -- The BH mass correlates with the velocity dispersion of the bulge component outside the region influenced by the BH. That is, it correlates with the

depth of the potential well in which it lives. Our conclusions are consistent with the hypothesis that (pseudo)bulge formation and BH feeding are closely connected. To first order, present data do not show any dependence of M\bullet on the details of whether BH feeding happens rapidly during a collapse or slowly via secular evolution of the disk.
Author
Black Holes (Astronomy); Galactic Bulge

20040055435 Ohio State Univ., OH, USA
AGN Black Hole Masses from Reverberation Mapping
Peterson, B. M.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-8397; No Copyright; Avail: Other Sources; Abstract Only

Emission-line variability data on bright AGNs indicates that the central objects in these sources have masses in the million to few-hundred million solar mass range. The time-delayed response of the emission lines to continuum variations can be used to infer the size of the line-emitting region via light travel-time arguments. By combining these sizes with the Doppler widths of the variable part of the emission lines, a virial mass estimate can be obtained. For three especially well-studied sources, NGC 5548, NGC 7469, and 3C 390.3, data on multiple emission lines can be used to test the virial hypothesis. In each of these cases, the response time of the various emission lines is anticorrelated with the line width, with the dependence as expected for gravitationally bound motion of the line-emitting clouds, i.e., that the square of the Doppler line width is inversely proportional to the emission-line time delay. Virial masses based on the Balmer lines have now been measured for about three dozen AGNs. Systematic effects currently limit the accuracy of these masses to a factor of several, but characteristics of the radius-luminosity and mass-luminosity relationships for AGNs are beginning to emerge.
Author
Active Galactic Nuclei; Black Holes (Astronomy); Virial Theorem; Mass

20040055956 Arizona State Univ., Tempe, AZ, USA
Late Injection of Radionuclides into Solar Nebula Analogs in Orion
Ouellette, N.; Desch, S. J.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent evidence for live Fe-60 in the early solar system clearly indicates that the solar system formed near a supernova, in a region of high-mass star formation. Except for Be-10, which has a separate, unique origin in galactic cosmic rays, it appears likely that many of the other short-lived radionuclides could be produced in their correct proportions in a type II supernova explosion. It is natural, then, to study proplyds (photoevaporating disks approx. 10(exp 3) AU across) and the smaller protoplanetary disks observed in the Orion Nebula as analogs to our own solar system. These disks and proplyds tend to reside at small distances, approx. a few x 10(exp 17) cm from the central stars of the Orion Nebula, especially the O6 star theta(sup 1)O(sub ri)C. This approx. 40 solar mass star will supernova in the next few Myr, and when it does, the solar nebula analogs in the Orion Nebula will lie in the path of the ejecta. This ejecta is sure to contain many of the short-lived radionuclides known to have been extant in the early solar system, including Al-26, Fe-60, Ca-41, and 36Cl. In this abstract we assess the likelihood that protoplanetary disks in the Orion nebula could intercept and incorporate short-lived radionuclides from a nearby supernova. We consider the physical form in which the radionuclides exist, the trajectories taken by the ejecta, and the timing of their injection. We then compare our predictions to our own solar system to assess whether the solar system formed in an Orion-like setting.
Derived from text
Injection; Orion Nebula; Solar Nebula; Radioactive Isotopes; Iron Isotopes; Solar System

20040055994 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I
2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040055995 - 20040056006
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

The Special Session: Oxygen in the Solar System, I, included the following reports:Oxygen in the Solar System: Origins of Isotopic and Redox Complexity; The Origin of Oxygen Isotope Variations in the Early Solar System; Solar and Solar-Wind Oxygen Isotopes and the Genesis Mission; Solar 18O/17O and the Setting for Solar Birth; Oxygen Isotopes in Early Solar

System Materials: A Perspective Based on Microbeam Analyses of Chondrules from CV Carbonaceous Chondrites; Insight into Primordial Solar System Oxygen Reservoirs from Returned Cometary Samples; Tracing Meteorites to Their Sources Through Asteroid Spectroscopy; Redox Conditions Among the Terrestrial Planets; Redox Complexity in Martian Meteorites: Implications for Oxygen in the Terrestrial Planets; Implications of Sulfur Isotopes for the Evolution of Atmospheric Oxygen; Oxygen in the Outer Solar System; and On the Oxidation States of the Galilean Satellites: Implications for Internal Structures.
Derived from text
Solar System; Oxygen Isotopes

20040056007 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Stardust Mission
2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040056008 - 20040056015
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

The Stardust Mission session included the following reports:The Stardust:A Successful Encounter with the Remarkable Comet Wild 2; Stardust Imaging of Comet Wild 2: First Look; Preliminary Results from the Dust Flux Monitoring Instrument During the Encounter of Stardust Spacecraft with Wild-2 Comet; Streaming Clumps Ejection Model and the Heterogeneous Inner Coma of Comet Wild 2; Stardust: First Results from the Cometary and Interstellar Dust Analyzer; STARDUST Sample Collection at Wild 2 and Its Preliminary Examination; Stardust Dynamic Science at Wild 2: First Look; and Preliminary Sample Analysis Plan for the Cometary and Interstellar Samples Being Returned by the Stardust Spacecraft.
Derived from text
Stardust Mission; Wild 2 Comet

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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*.

20040051165 Washington Univ., Seattle, WA, USA
Aqueous Chemical Modeling of Sedimentation on Early Mars with Application to Surface-Atmosphere Evolution
Catling, David C.; [2004]; 9 pp.; In English
Contract(s)/Grant(s): NAG5-11499; No Copyright; Avail: CASI; A02, Hardcopy

This project was to investigate models for aqueous sedimentation on early Mars from fluid evaporation. Results focused on three specific areas: (1) First, a fluid evaporation model incorporating iron minerals was developed to compute the evaporation of a likely solution on early Mars derived from the weathering of mafic rock. (2) Second, the fluid evaporation model was applied to salts within Martian meteorites, specifically salts in the nakhlites and ALH84001. Evaporation models were found to be consistent with the mineralogy of salt assemblages-anhydrite, gypsum, Fe-Mg-Ca carbonates, halite, clays--and the concentric chemical fractionation of Ca-to Mg-rich carbonate rosettes in ALH84001. We made progress in further developing our models of fluid concentration by contributing to updating the FREZCHEM model. (3) Third, theoretical investigation was done to determine the thermodynamics and kinetics involved in the formation of gray, crystalline hematite. This mineral, of probable ancient aqueous origin, has been observed in several areas on the surface of Mars by the Thermal Emission Spectrometer on Mars Global Surveyor. The 'Opportunity' Mars Exploration Rover has also detected gray hematite at its landing site in Meridiani Planum. We investigated how gray hematite can be formed via atmospheric oxidation, aqueous precipitation and subsequent diagenesis, or hydrothermal processes. We also studied the geomorphology of the Aram Chaos hematite region using Mars Orbiter Camera (MOC) images.
Author
Mars Surface; Sediments; Aqueous Solutions; Evaporation; Planetary Evolution; Mineralogy; Geomorphology

20040052834 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Plentiful Water Detected in Mars Northern Hemisphere
June 26, 2003; In English; 6 min., 56 sec. playing time, in color, with sound
Report No.(s): G03-043; No Copyright; Avail: CASI; V01, Videotape-VHS; B01, Videotape-Beta

NASA's Mars Odyssey Spacecraft is revealing new details about a changeable array of frozen layers on Northern Mars.

Odyssey's neutron and gamma-ray sensors have tracked seasonal changes as layers of 'dry ice' carbon dioxide frost or snow accumulated during northern Mars' winter and then dissipate in the spring to expose a permafrost soil layer rich in water ice. The research is presented in a paper in the June 27, 2003 issue of the Journal Science. This video contains a slide show interspersed with computer generated graphics of seasonal ice distribution and thickness on Mars. The graphics utilize Viking and Mars Orbiter Laser Altimeter (MOLA) data as well as Odyssey data.
Author (revised)
2001 Mars Odyssey; Mars Surface; Northern Hemisphere; Ice

20040052857 Atmospheric and Environmental Research, Inc., Lexington, MA, USA
Studies for the Europagenic Plasma Source in Jupiter's Inner Magnetosphere during the Galileo Europa Mission
Smyth, William H.; April 07, 2004; 28 pp.; In English
Contract(s)/Grant(s): NASW-02003
Report No.(s): AER-P-880; No Copyright; Avail: CASI; A03, Hardcopy

Progress in research to understand the three-dimensional nature of the Europagenic plasma torus is summarized. Efforts to improve the plasma torus description near Europa's orbit have included a better understanding of Europa's orbit and an improved description of the planetary magnetic field. New plasma torus chemistry for molecular and atomic species has been introduced and implemented in Europa neutral cloud models. Preliminary three-dimensional model calculations for Europa's neutral clouds and their plasma sources are presented.
Author
Jupiter (Planet); Planetary Magnetospheres; Europa; Space Plasmas

20040053325 NASA Ames Research Center, Moffett Field, CA, USA
Line Assignments and Position Measurements in Several Weak CO2 Bands between 4590 /cm and 7930/ cm
Giver, L. P.; Kshirsagar, R. J.; Freedman, R. C.; Chackerian, C.; Wattson, R. B.; [1998]; 1 pp.; In English; Molecular Spectroscopy Symposium, 15-19 Jun. 1998, OH, USA
Contract(s)/Grant(s): 344-33-50-43; No Copyright; Avail: Other Sources; Abstract Only

A substantial set of CO2 spectra from 4500 to 12000 /cm has been obtained at Ames with 1500 m path length using a Bomem DA8 FTS. The signal/noise was improved compared to prior spectra obtained in this laboratory by including a filter wheel limiting the band-pass of each spectrum to several hundred/cm. We have measured positions of lines in several weak bands not previously resolved in laboratory spectra. Using our positions and assignments of lines of the Q branch of the 31103-00001 vibrational band at 4591/cm, we have re-determined the rotational constants for the 31103f levels. Q-branch lines of this band were previously observed, but misassigned, in Venus spectra by Mandin. The current HITRAN values of the rotational constants for this level are incorrect due to the Q-branch misassignments. Our prior measurements of the 21122-00001 vibrational band at 7901/cm were limited to Q- and R-branch lines; with the improved signal/noise of these new spectra we have now measured lines in the weaker P branch.
Derived from text
Carbon Dioxide; Line Spectra; Venus (Planet)

20040053450 California Inst. of Tech., Pasadena, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Evidence of Nebula Processes from Primitive Meteorites
Cassen, Patrick; [2004]; 1 pp.; In English; Paul Pellas Symposium, 23-24 Jul. 1998, Paris, France
Contract(s)/Grant(s): RTOP 344-30-51-01; No Copyright; Avail: Other Sources; Abstract Only

Astronomical observations of T Tauri stars provide information about the masses, sizes, temperatures, and lifetimes of the solar-nebula-like disks surrounding these stars. Theoretical interpretations of these observations can be used to construct models of the evolution of the solar nebula, and to derive implications for the properties of meteoritic material. The consequences of nebular thermal history might have been retained in patterns of elemental fractionation, presolar grains abundances, and oxygen isotopes, among other meteorite properties. Thus, such data may be used in conjunction with models to constrain the parameters that describe the overall evolution of the solar nebula. On the other hand, major meteoritic components such as chondrules and CAIs apparently reflect localized processes that are not readily related to global thermal evolution. In several cases, the theoretical tools required for the evaluation of proposals for their mode of formation exist, but have yet to be applied. Proposals that meteoritic material was thermally and radiatively processed very close to the young Sun, based on the emerging picture of the interactions between young stars and their disks, have radical consequences for the distribution of solid material in the solar system and the formation of chondritic meteorites. Tests of these models may be

provided by their predictions for irradiated material and the physical characteristics of primitive meteorites.
Author
Astronomical Models; Meteorites; Solar Nebula; T Tauri Stars

20040055013 NASA Ames Research Center, Moffett Field, CA, USA
Morning Turbulence Observed Near Mars' Surface with Mars Pathfinder
Mihalov, John D.; Haberle, R. M.; Murphy, J. R.; Seiff, A.; Wilson, G. R.; [1998]; 1 pp.; In English; American Geophysical Union Meeting, 26-29 May 1998, Boston, MA, USA
Contract(s)/Grant(s): RTOP 624-04-01; No Copyright; Avail: Other Sources; Abstract Only

For several hours as Mars' surface warmed each morning, prominent atmospheric thermal fluctuations were measured by Mars Pathfinder with thin-wire thermocouples at three heights on the 1.1 m long meteorology mast. A major component of these fluctuations appears to be not completely random in nature, but rather may be due to the movement past the mast of distinct atmospheric parcels that belong to several different families. The time scales associated with these parcels range from approx. 200 s down to a 4 s limit of experimental resolution. Some data were acquired with higher time resolution. Distinct atmospheric parcels are identified from temperature ratios available from the temperatures measured at different heights, as well as from computed temperature gradients. Different families of atmospheric parcels that have been identified are: 1) Those with a 'normal' daytime gradient, which increased with time from 0 (neutrally stable) to approx. 9 deg K/m, as the mornings progressed; 2) Those during the morning but with positive temperature gradients, up to several deg K/m, characteristic of nighttime conditions; 3) Those with abnormally steep negative gradients, up to twice 'normal' values. The incidence of these various atmospheric surface layer microstates was found to change between Sols 25 and 69; during this time the maximum sun angles decreased and the days became shorter.
Author
Mars Atmosphere; Atmospheric Turbulence; Atmospheric Temperature; Atmospheric Stratification; Morning

20040055312 Lunar and Planetary Inst., Houston, TX, USA
Workshop on Europa's Icy Shell: Past, Present, and Future
2004; ISSN 0161-5297; 109 pp.; In English; Workshop on Europa's Icy Shell: Past, Present, and Future, 6-8 Feb. 2004, Houston, TX, USA; See also 20040055313 - 20040055367
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1195; No Copyright; Avail: CASI; A06, Hardcopy

This volume contains abstracts that have been accepted for presentation at the workshop on Europa's Icy Shell: Past, Present, and Future, February 6-8,2004, Houston, Texas. Administration and publications support for this meeting were provided by the staff of the Publications and Program Services Department at the Lunar and Planetary Institute.
Author
Europa; Satellite Surfaces

20040055320 Planetary Science Inst., Wunthop, WA, USA
Hydrated Materials on Europa's Surface: Review of Current Knowledge and Latest Results
McCord, T. B.; Orlando, T. M.; Hansen, G. B.; Hibbitts, C. A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 51-52; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The reflectance spectra of Europa, returned by the Galileo Mission's Near Infrared Mapping Spectrometer (NIMS), very early in the investigation, due to hydrated minerals. McCord et al. showed that these absorptions were associated with material that is concentrated in the liniments and chaotic terrain, later confirmed by Fanale et al, and proposed that these were due to hydrated salt minerals, mostly MgSO4 hydrate, probably associated with the ocean below. They proceeded to demonstrate that MgSO4 hydrate is stable over the age of the solar system on Europa's surface and showed that rapidly frozen brines, as might occur when liquid is exposed on Europe or be simulated by radiation damage to crystalline material, even more closely resembled the optical properties of the Europa material. MgSO4 is thought to be a reasonable material to be found on Europa, given that it is a common product of low temperature aqueous alteration of carbonaceous chondrite material, such as occurs in the thermal evolution of bodies like the icy Galilean satellites, and is found commonly in primitive meteorites. The disturbed regions on Europa seem likely places for subsurface ocean briny materials to reach the surface. Explanations from Carlson et al. and Clark on the Europa NIMS spectral signatures are presented and discussed.
Derived from text
Europa; Hydrates; Planetary Surfaces; Spectral Reflectance; Planetary Geology

20040055322 Muenster Univ., Germany

Europa's Ice Shell Thickness Derived from Thermal-Orbital Evolution Models

Hussmann, H.; Spohn, T.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 34-35; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Images of Europa obtained by the Galileo spacecraft show a variety of surface features that are generally believed to be related to the thermal state and thickness of Europa's H2O-layer. A substantial part of this layer is expected to be liquid, forming a subsurface ocean of up to about 100 km thickness. This is suggested by the detection of an induced magnetic field at shallow depth, by equilibrium models of the heat production and heat transport rates through the ice shell, and by the interpretation of geological surface features. The latter show evidence for both a thick ice shell of a few tens of kilometers and a thin ice shell with a thickness of only a few km, or even just a few hundreds of meters. The absolute ages of these surface features are unknown. Therefore, we calculated thermal orbital evolution models in order to determine Europa's ice thickness as a function of time. Different phases of ice thickness may be related to different kinds of surface features. Another important question addressed in this study is the following: Can the ocean exist for several Ga? Since the inner three Galilean satellites are locked in the Laplace resonance, the history of Europa cannot be understood without considering the evolutions of its neighboring satellites Io and Ganymede. Due to the resonance, the orbital periods of Io, Europa, and Ganymede are close to the ratio of 1:2:4 and their forced eccentricities are maintained over long periods of time. A part of the orbital energy gained by Io due to tidal interaction with Jupiter is dissipated as heat in Io's and Europa s interior. Ganymede s dissipation rate is negligible during the evolution in the Laplace resonance. It may have been important though during formation of the resonance. The gravitational interactions between Io and Jupiter tend to drive the satellites deeper into resonance and to increase their mean motions. Dissipation in the satellites tends to drive them out of resonance and thereby to decrease their eccentricities and mean motions. Due to these opposing effects oscillations are possible, where the orbital elements and the dissipation rates vary considerably. These variations of Europa's (and Io's) thermal state may serve as an explanation for different kinds of surface features on Europa.

Derived from text

Europa; Mathematical Models; Ice; Satellite Surfaces; Orbital Elements; Io; Thickness

20040055323 Geological Survey, Flagstaff, AZ, USA

Composition and Geochemical Evolution of Europa's Icy Shell

Kargel, J. S.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 36-37; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The Galileo project's discovery of imaging, spectroscopic, and geophysical evidence pointing to the existence of an ice-covered ocean on Europa stands among the most stunning scientific and philosophical achievements of the Space Age. Europa, a geologically dynamic water world, runs even with Mars as a place where life may now or have once existed. In one respect, Europa is a better bet than Mars for current life: Europa presently has an ocean, whereas the longevity of vigorous hydrologic systems on Mars is still subject to debate. However, aside from the fairly certain conclusion that Europa now has an ocean, our knowledge of Europa remains scanty by comparison to what we know of Mars. The floating shell s composition is not reliably known. Each of several geochemical models has vast implications for Europan shell dynamics. I shall review divergent compositional interpretations of spectroscopic/imaging data and models of compositional evolution, and draw logical implications for shell structure and dynamics.

Derived from text

Europa; Geochemistry; Icy Satellites; Extraterrestrial Oceans; Chemical Composition

20040055328 Washington Univ., Saint Louis, MO, USA

Overview of Europa's Icy Shell: Questions of Thickness, Composition, Rheology, Tectonics, and Astrobiological Potential

McKinnon, William B.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 53-54; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Europa possesses an icy shell; this much has been clear since Voyager. That Europa's shell is also floating is now generally accepted as well, thanks to Galileo. Much attention has been focused on determining the thickness of the shell, but as a goal in itself this is not enough! We also need to know what the shell is made of, what its rheological, mechanical, & structural properties are, how these govern and respond to tectonic forces and impacts, how the shell has evolved through geologic time, and what, if any, astrobiological potential the shell and ocean below possess. Some historical perspectives along with the

composition, rheology, tectonics and astrobiological potential of Europa are presented.
Derived from text
Europa; Exobiology; Rheology; Tectonics; General Overviews; Planetary Geology; Ice; Planetary Composition

20040055329 Texas Univ., Austin, TX, USA
Radar Sounding Studies for Quantifying Reflection and Scattering at Terrestrial Air-Ice and Ice-Ocean Interfaces Relevant to Europa's Icy Shell
Peters, M. E.; Blankenship, D. D.; Morse, D. L.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 68-69; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Jupiter's moon Europa is characterized by a pervasive icy mantle underlain by a global ocean. The distribution of free water and brines within Europa's icy/watery shell and the processes within the ice that control the exchange of material both with the surface and the Ocean will determine Europa s suitability for harboring life. On Earth's ice sheets, radar sounding has proven to be a powerful tool for characterizing the ice-ocean interface as well as the overlying ice up to and including the air-ice interface. We present radar sounding techniques and new results from our recent airborne radar studies over ice-ocean environments in Antarctica.
Derived from text
Europa; Icy Satellites; Air Sea Ice Interactions; Shells (Structural Forms); Reflection; Radar Transmission

20040055330 Search for Extraterrestrial Intelligence Inst., Mountain View, CA, USA
Impact Gardening, Sputtering, Mixing, and Surface-Subsurface Exchange on Europa
Phillips, Cynthia B.; Chyba, Christopher F.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 70-71; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Charged-particle interactions with materials at Europa's surface can produce biologically useful oxidants such as molecular oxygen and hydrogen peroxide, which could help sustain a biosphere on Europa. Irradiation of carbon-containing materials at the surface of Europa should also produce simple organics. These oxidants and organics, if trans- ported downward through the ice shell to a liquid water layer, could provide a significant amount of energy to sustain a biosphere. However, irradiation also destroys such materials if they remain exposed on Europa's surface. Sputtering erosion and surface mixing through impact gardening act to change the preservation depth. If sputtering dominates over gardening, then material is created and destroyed at Europa's surface much faster than it can be buried and preserved by gardening. However, if gardening dominates, this means that irradiation products can be buried beneath the surface by gardening, where they are protected from further radiation processing. We are investigating models of gardening on Europa's surface to determine which regime is most appropriate. The results of this work will also provide the expected regolith depth on Europa, of relevance for future Europa landing spacecraft. Once material is preserved from the surface irradiation that would destroy it, it must still work its way down through perhaps a kilometer or more of Europa's icy crust before it could become biologically relevant to a putative ocean biosphere. We begin the investigation of the myriad transport mechanisms that would help bring material from the surface to the potential ocean. These mechanisms will also bring up material from the subsurface to the surface, with relevance for the detection of subsurface composition and potential biosignatures.
Derived from text
Europa; Sputtering; Planetary Geology; Petrology; Biosphere; Satellite Surfaces

20040055331 Instituto Nacional de Tecnica Aeroespacial, Torrejon de Ardoz, Spain
Clathrate Hydrates in Jupiter's Satellite Europa and Their Geological Effects
Prieto-Ballesteros, O.; Kargel, J. S.; Fernandez-Sampedro, M.; Hogenboo, D. L.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 72-73; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The crust of Europa is dominated by water ice, but some contaminants have been detected on the surface. Several hydrates have been mentioned as part of the composition of the mineralogy of the surface of Europa such as sulfuric acid hydrates and salt hydrates. Clathrate hydrates are also minerals to be considered to be formed in the crust and the possible ocean of Europa. Physical chemical properties of the hydrates are sometimes substantially different from water ice, so they could locally regulate the final state of the crust and the ocean. Parameters such as thermal conductivity, density and low melting points of these materials are useful to incorporate in the physical geological models of Europa.
Author
Europa; Clathrates; Hydrates; Planetary Geology

20040055332 Massachusetts Inst. of Tech., Cambridge, MA, USA

Probing Europa's Interior with Natural Sound Sources

Makris, Nicholas C.; Lee, Sunwoong; Pappalardo, Robert T.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 45; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The exploration of Jupiter's icy moon Europa is of paramount interest to astrobiology. Since Europa may harbor a vast liquid ocean below the surface, it is considered one of the most likely places in the solar system for extraterrestrial life to exist. However, there is still no conclusive evidence that a subsurface ocean exists on Europa, and great uncertainties remain on the thickness of the outer ice shell and depth of the potential ocean. Seismo-acoustic surveys are necessary techniques to provide ground truth information on these substantial uncertainties. Our goal is to use both seismo-acoustic echo-sounding and tomographic techniques to determine Europa's interior structure. Echo-sounding reveals the depth and composition of terrestrial seafloor and sub-bottom layers by analysis of the arrival time and amplitude of acoustic reflections from these interfaces. Tomography reveals the temperature structure of terrestrial oceans by the way sound waves are perturbed along forward propagation paths. We plan to exploit natural cracking events on Europa's surfaces as sound sources of opportunity. Recent work shows that cycloidal cracks on the surface of Europa likely form on a daily basis due to stresses induced by Europa's eccentric orbit which has a period of roughly 3.5 days. We estimate that the acoustic waves radiated from these cracks will be in the 0.1 to approx. 100 Hz range with typical wave lengths exceeding 1 km. In contrast to ice-penetrating radar, such long wavelength disturbances suffer minimal attenuation from mechanical relaxation mechanisms in ice an water and are relatively insensitive to anomalies such as ice fractures. Meteor impacts typically occur at a monthly rate and also have potential use as sound sources.

Author (revised)

Europa; Sound Waves; Echo Sounding; Tomography; Seismology; Planetary Geology

20040055333 Idaho Univ., Moscow, ID, USA

Analysis of Europan Cycloid Morphology and Implications for Formation Mechanisms

Marshall, S. T.; Kattenhorn, S. A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 49-50; In English; See also 20040055312

Contract(s)/Grant(s): NAG5-11495; No Copyright; Avail: CASI; A01, Hardcopy

Europa's highly fractured crust has been shown to contain features with a range of differing morphologies. Most lineaments on Europa are believed to have initiated as cracks, although the type of cracking (e.g. tensile vs. shear) remains unclear and may vary for different morphologies. Arcuate lineaments, called cycloids or flexi, have been observed in nearly all imaged regions of Europa and have been modeled as tensile fractures that were initiated in response to diurnal variations in tides. Despite this hypothesis about the formation mechanism, there have been no detailed analyses of the variable morphologies of cycloids. We have examined Galileo images of numerous locations on Europa to develop a catalog of the different morphologies of cycloids. This study focuses on variations in morphology along individual cycloid segments and differences in cusp styles between segments, while illustrating how morphologic evidence can help unravel formation mechanisms. In so doing, we present evidence for cycloid cusps forming due to secondary fracturing during strike-slip sliding on pre-existing cycloid segments.

Derived from text

Cycloids; Europa; Geomorphology; Planetary Crusts; Structural Properties (Geology)

20040055334 Columbia Univ., Palisades, NY, USA

Europan Bands Formed by Stretching the Icy Crust: A Numerical Perspective

Qin, Ran; Buck, W. Roger; Pappalardo, Robert T.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 76-77; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

High-resolution Galileo images of Europa show linear, curved and wedge-shaped bands crossing the ice surface. These bands are most clearly seen within the region southwest of Europa's anti-Jovian point and make up approx. 60% of the terrain. It has generally been inferred that bands have formed in response to extension, although Schulson suggests that at least one wedge-shaped band may have formed under compressive stress, analogous to small-scale 'wing cracks'. We are currently developing a sophisticated numerical model that exists for modeling rifting phenomena on Earth, as developed and first applied to slow-spreading mid-ocean ridge abyssal hill topography by Buck and Poliakov, to quantitatively test the hypothesis of Europan hummocky band formation by stretching its icy crust. The numerical model uses an explicit finite-element method similar to the FLAC (Fast Lagrangian Analysis of Continua) technique of Cundall.

Author

Europa; Satellite Surfaces; Ice; Finite Element Method; Crusts

20040055335 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Formation and Stability of Radiation Products in Europa's Icy Shell

Moore, M. H.; Hudson, R. L.; Carlson, R. W.; Ferrante, R. F.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 55; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Spectra of Europa reveal a surface dominated by water-ice along with hydrated materials and minor amounts of SO2, CO2, and H2O2. Jovian magnetospheric ions (protons, sulfur, and oxygen) and electrons produce significant chemical modifications of the surface on time scales of a few years at micrometer depths. Our laboratory studies examine the formation and stability of radiation products in H2O-rich ices relevant to Europa. Infrared (IR) spectra of ices before and after irradiation reveal the radiation destruction of molecules and the formation of products at 86 - 132 K. In addition, spectra of ices during warming track thermal evolution due to chemical changes and sublimation processes. IR-identified radiation products in 86 - 132 K irradiated H2O + SO2 ices are the bisulfate ion, HSO4(-), sulfate ion, SO4(2-) and the hydronium ion, H3O(+). Warming results in the formation of a residual spectrum similar to liquid sulfuric acid, H2SO4, for H2O:SO2 ratios of 30:1, whereas hydrated sulfuric acid, H2SO4 4 H2O, forms for ratios of 30:1. Radiation products identified for irradiated H2O + H2S ices at 86 K are H2S2 and SO2. When irradiated at 110 and 132 K, ices with H2O:H2S ratios if either 3:1 or 30:1 show the formation of H2SO4 4 H2O on warming to 175 K. We have also examined the radiation stability of H2SO4. Addition of CO2 to H2O + SO2 ices results in the formation of CO3 at 2046 cm (sup -1) (4.89 m). This is the strongest band from a carbon-containing product in the mid-IR spectral region, and it is also seen when either pure CO2 or H2O + CO2 ice is irradiated. Experiments with CH4 added to H2O + SO2 + CO2 ices addressed the question of methane's use as a marker of methanogens in an irradiated ice environment. New results on the near-IR spectrum of pure H2O2 will be included in this presentation. Interpretations of near-IR water bands, with H2O2 present, will be discussed. Irradiations of H2O2 and H2O + H2O2 mixtures, to examine the possibility of O2 and O3 formation, are currently under investigation and new results will be discussed.

Derived from text

Europa; Ice; Irradiation; Planetary Geology; Planetary Surfaces; Stability

20040055336 Honeybee Robotics Ltd., New York, NY, USA

Development of an Inchworm Deep Subsurface Platform for in Situ Investigation of Europa's Icy Shell

Myrick, T.; Frader-Thompson, S.; Wilson, J.; Gorevan, S.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 58-59; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Honeybee Robotics is presently developing a drill system that may be well suited for a landed Europa exploration mission due to its currently estimated penetration depth, size, power requirements, and payload capabilities. The Inchworm Deep Subsurface Platform moves in a locomotive fashion, advancing one section of the drill while the other is anchored to the borehole wall. This system has the potential to drill hundreds of meters to several kilometers below the surface of Europa, depending on whether the system is tethered or untethered. Interesting subsurface targets on Europa such as the liquid ocean below the icy shell and bacteria potentially imbedded within the shell can be studied in situ using an Inchworm Platform. Ice shell thickness estimates range from a few kilometers to tens of kilometers thick and bacteria location estimates range from the bottom of the Europan ocean floor to the near surface. The Inchworm Platform is an ideal candidate for accessing these sites for in situ investigations. The conceptual design of the Inch-worm drilling system is presented.

Derived from text

Europa; Ice; In Situ Measurement; Planetary Geology; Drilling; Technology Utilization

20040055337 California Univ., Los Angeles, CA, USA

What is the Young's Modulus of Ice?

Nimmo, F.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 60-61; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The Young's modulus E of ice is an important parameter in models of tidal deformation and in converting flexural rigidities to ice shell thicknesses. There is a disagreement of an order of magnitude between measurements of E in the laboratory (9 GPa) and from field observations (approximately equal to 1 GPa). Here I use a simple yielding model to address this discrepancy, and conclude that E = 9 GPa is consistent with the field observations. I also show that flexurally-derived shell thicknesses for icy satellites are insensitive to uncertainties in E.

Derived from text

Icy Satellites; Modulus of Elasticity; Mathematical Models; Mechanical Properties

20040055338 Lunar and Planetary Inst., Houston, TX, USA

High-Resolution Mapping of Europa's Impact Craters: Comparison with Ganymede

Schenk, P.; Moore, J. M.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 80-81; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Any examination of Europa's unusual impact morphologies is null and void unless detailed comparison can be made to 'normal' impact craters on large icy bodies without shallow liquid water oceans. Ganymede and Callisto, with similar surface gravity, lack of recent geologic activity, and relatively deep oceans, come to mind. Here we examine the limited data available for Europan craters and begin the task of comparison with Ganymedean craters of similar size. We focus on impact melt, morphology, and topography (derived from stereo and photoclinometric (PC) analyses).

Author

Europa; Ganymede; Craters; Morphology; Planetary Geology

20040055339 Lunar and Planetary Inst., Houston, TX, USA

Sinking to New Lows and Rising to New Heights: The Topography of Europa

Schenk, Paul M.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 82-83; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The perception of a 'flat' Europa dates to Voyager days, when terminator images showed little relief except ridges and a few knobs. While ridges rarely exceed such heights, Galileo has shown that topography on longer scales (kilometers to 100's of km) is decidedly variable. Topographic measurements of selected features have been reported but no systematic description or appraisal of Europa's topography has been attempted, until now. Topography of a planet is one of its most fundamental characteristics (witness the Mars revolution wrought by MOLA), and is a direct expression of the response of the lithosphere to external and internal forces. The resulting topographic expression is in turn directly related to the properties of that lithosphere, and this is especially true in the case of a floating ice shell.

Author

Europa; Topography; Planetary Geology

20040055340 California Univ., Los Angeles, CA, USA

Lateral and Vertical Motions in Europa's Ice Shell

Nimmo, F.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 62-63; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Characterizing the lateral and vertical motions that occur within Europa's ice shell is challenging but important. Vertical motions can transport nutrients and thus have astrobiological importance, while lateral movements can cause thinning of the ice shell. Future mission design will be affected by what we think we know about the characteristics of Europa s ice shell. Models and inferences of vertical and lateral motion will help us to constrain the ice shell thickness, and also to estimate the characteristic strain rates and stresses (ie. the shell dynamics). A discussion on the lateral and vertical motions in Europa's Ice shell is presented

Derived from text

Europa; Ice; Vertical Motion; Planetary Geology; Shells (Structural Forms)

20040055341 Colorado Univ., Boulder, CO, USA

Domes on Europa: The Role of Thermally Induced Compositional Diapirism

Pappalardo, R. T.; Barr, A.C.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 64-65; In English; See also 20040055312

Contract(s)/Grant(s): NCC2-1340; NGT5-50337; No Copyright; Avail: CASI; A01, Hardcopy

The surface of Europa is peppered by topographic domes, interpreted as sites of intrusion and extrusion. Diapirism is consistent with dome morphology, but thermal buoyancy alone cannot produce sufficient driving pressures to create the observed dome elevations. Instead, we suggest that diapirs may initiate by thermal convection that induces compositional segregation within Europa's ice shell. This double-diffusive convection scenario allows sufficient buoyancy for icy plumes to create the observed surface topography, if the ice shell has a very small effective elastic thickness (approximately 0.1 to 0.5 km) and contains low-eutectic-point impurities at the percent level. Thermal buoyancy, compositional buoyancy and double-diffusive convection are discussed.

Derived from text

Europa; Planetary Geology; Domes (Geology); Topography; Folds (Geology); Free Convection

20040055342 Brown Univ., Providence, RI, USA

Numerical Modeling of Plate Motion: Unraveling Europa's Tectonic History

Patterson, G. W.; Head, J. W., III; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 66-67; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Europa is a highly fractured body broken into plates that have rotated with respect to one another. The effect of these rotations can be seen as regions of extension, strike-slip motion, and possibly compression. Various authors have tried to reconstruct a number of these regions in an effort to gain a better understanding of the tectonic history of the icy satellite. The typical approach used to determine a best-fit reconstruction could be described as a 'cut-and-paste' method in which the plates in an image are manually separated and reoriented in an effort to reconstruct preexisting features. Some authors subsequently determined poles of rotation for the regions reconstructed. This step is essential to determining the validity of a reconstruction when the size of a region is such that the curvature of the satellite cannot be ignored. In those cases that have looked for a pole of rotation, a forward approach is typically used. This method can be used to show that the reconstruction produced has a unique solution but it cannot tell whether or not there were other unique solutions that were not considered. Here we report on the development of an inverse method for determining the Euler pole of a region that has undergone rotation. This method can be used to test all possible rotations of the region and therefore determine all unique solutions (if they exist).

Derived from text

Europa; Mathematical Models; Planetary Geology; Plates (Tectonics); Geochronology

20040055343 Nantes Univ., France

Thermal Evolution of Europa's Icy Crust

Sotin, C.; Choblet, G.; Head, J. W.; Mocquet, A.; Tobie, G.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 84-85; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The Galileo mission revealed that Europa is a differentiated body with surface features including domes, faults and chaotic terrains suggesting the presence of an ocean in between the icy surface and the silicate core. The presence of domes suggests some forms of upwelling (thermal or/and chemical) linked to heat transfer by subsolidus convection in Europa's icy crust. This situation makes Europa a very appealing place for exobiology because life may develop at the interface between the deep water and the silicate core. For the last 5 years, we have developed models of Europa's internal structure and have obtained the following results: 1) Tidal forces produce very small amount of heat in the silicate layer and very large amount of heat in an ice shell close to its melting temperature; 2) Tidal heating varies in time, latitude and longitude resulting in strongly time dependent convection; 3) Tidal heating in the ice layer is large enough to prevent a complete freezing of the ocean without invoking the presence of ammonia; 4) Although tidal heating is an internal heating source, hot icy plumes can form at the interface with the ocean due to the strong temperature dependence of ice viscosity; 5) For viscosities in agreement with those measured on terrestrial glaciers, tidal heating may heat up hot plumes leading to partial melting, which may explain the formation of chaotic terrains; 6) Doppler shift measurements on a Europa orbiter should allow us to determine the presence of an ocean and to constrain the thickness of the ice crust.

Author

Europa; Ice; Crusts; Planetary Geology

20040055344 Washington Univ., Seattle, WA, USA

Physical Basis for the Radar Observation of Geological Structure in the Ice Shell on Europa

Winebrenner, D. P.; Blankenship, D. D.; Campbell, B. A.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 94-95; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Radar sounding of Europa has been discussed primarily as a means to measure the depth of a prospective ice/ocean interface. On terrestrial ice sheets, however, radar sounding commonly maps internal structure associated with compositional and structural horizons, i.e., by radar-reflective stratigraphic boundaries (depth variations of which encode information about ice dynamics and climate history). Several types of radar-reflecting horizons other than an ice/ocean interface may occur on Europa. In particular, where temperature varies in the transition between cold, brittle (impure) ice and warm, convecting ice, sharp dielectric contrasts will occur where temperatures pass through eutectic points of the impurities, thus creating a reflecting boundary. Relict diapirs in cold (no-longer-convecting) ice, as well as buried crater floors, would differ sharply from surrounding ice in their bulk density and impurity content, thus also creating dielectric boundaries. Intermittent eruptions of low-viscosity material can create compositional, and thus dielectric, stratification with depth. Finally, faults may be marked by discontinuities in density or crystallographic structure, which also translate to dielectric variations. Understanding the surface expression of geological structure will be improved by tracking stratigraphic boundaries in the near-subsurface. Radar mapping of such boundaries may prove to be as important as the knowledge of ice thickness for understanding any interchange

between the Europan surface and an underlying ocean. These considerations motivate our examination of the dielectric properties of impure ice (Ih) at the low temperatures characteristic of Europa (75 to perhaps 250 K). We examine dielectric properties as function of temperature and of the concentrations of geologically plausible, dielectrically significant impurities. We focus initially on the effective conductivity, both because this property is fundamental to estimating how deeply radar can probe and because terrestrial experience suggests that conductivity variations may be the primary sources of reflection beneath the poorly known annealing depth on Europa.
Author (revised)
Europa; Ice; Structural Properties (Geology); Planetary Geology

20040055345 Washington Univ., Seattle, WA, USA
Subsurface Action in Europa's Ocean
Vance, S. D.; Brown, J. M.; Spohn, T.; Shock, E.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 93; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Subsurface processes may have created observed surface features on Europa's ice. A key question is whether plumes originating from the rocky crust can reach the surface. Kimura and Kurita treat a mechanically created plume while Thompson and Delaney look at buoyancy and circulation after such a plume has formed. In addition to the obvious aspect of mechanical driving forces for fluid motion, the issue is intimately linked to composition, relative salinity, and heat distribution throughout the ocean. Hussman and Spohn have assessed tidal heating and dissipation in a more thorough manner. We tested the accuracy of chemical models in accounting for pressure effects and find supcrt92 sufficient for pressures in Europa's ocean (max 2000 atm) for predicting sulfate volumes at 50 C while FREZCHEM has yet to incorporate pressure effects. The recent discovery of peridotite hydrothermal opens the possibility that a marriage of tidal and compositional effects may bears further activity in Europa's ocean. If peridotite was exposed in Europa's early days, hydrothermal systems certainly existed. Non-synchronous rotation of the europan crust may keep fresh peridotite exposed, leaving the possibility that such activity persists to the current time.
Author
Europa; Extraterrestrial Oceans; Plumes

20040055346 NASA Ames Research Center, Moffett Field, CA, USA
Cratering Rates in the Jovian System
Zahnle, K.; Dons, L.; Levison, H.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 98-99; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

We use several independent constraints on the number of ecliptic comets to estimate impact cratering rates on the Jupiter moons. The impact rate on Jupiter by 1.5-km diameter ecliptic comets is currently NY(d > 1.5km) = 0.005(+0.006)(-0.003) per annum. Asteroids and long period comets are currently unimportant. The size-number distribution of ecliptic comets smaller than 20 km is inferred from size-number distributions of impact craters on Europa, Ganymede, and Triton. For comets bigger than 50 km we use the size-number distribution of Kuiper Belt Objects. The overview of the impact rate at Jupiter in general and at Europa in particular are given. These impact rates imply cratering rates on Europa of 0.5 per Ma per 10(exp 6) sq km for impact craters bigger than 1 km, and of 0.015 per Ma per 10(exp 6) sq km for impact craters bigger than 20 km. The latter corresponds to an average recurrence time of 2.2 Ma for 20 km craters. The best current estimates for the number of 20 km craters on Europa appear to range between about twelve to thirty. This implies that the average age of Europa's surface is between 30 and 70 Ma. The average density of craters with diameter greater than 1 km on well-mapped swaths on Europa is 30 per 10(exp 6) sq km. The corresponding nominal surface age would be 60 Ma. These two estimates are not truly independent because we have used size-number distribution of the Europan craters to help generate the size-number distribution of comets. The uncertainty of the best estimate - call it 42 Ma for specificity - is at least a factor of 3.
Author
Cratering; Jupiter Satellites; Size Distribution; Cometary Collisions; Rates (Per Time)

20040055349 Escuela Politecnica Superior de Alcoy, Alcoy, Spain
Molecules Produced on the Surface of Europa by Ion Implantation in Water Ice
Gomis, O.; Satorre, M. A.; Leto, G.; Strazzulla, G.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 32; In English; See also 20040055312
Contract(s)/Grant(s): MCyT Proj. AYA2001-2385; No Copyright; Avail: CASI; A01, Hardcopy

Europa surface spectra reveal that its main constituents are in the form of ices. Between them frost H2O is dominant

although traces of CO2, SO2, O2 and H2O2 have also been found. Other compounds found mainly in the darker regions are hydrated materials. Europa is located inside the intense magnetosphere of the giant Jupiter. The magnetosphere is populated by protons and ions such as S(n+) and O(n+), and energetic electrons. In fact, one of the mechanisms suggested to be responsible for the formation of the icy molecules present on Europa is the interaction of the magnetospheric plasma with the surface of the satellite. When an energetic ion collides with the icy surface, part of the deposited energy destroys molecular bonds in the target producing radicals that can then react to synthesize new molecules. In the case of a thick satellite surface, in which ions are implanted, the possibility exists that the new produced molecules contain the incident ion. We have carried out implantation experiments of ions relevant to the Jovian system in water ice and mixtures. We focused on studying and characterizing the molecules formed by ion implantation and to analyze if this mechanism can quantitatively account for some of the species found on the surface of the satellite. Also of our interest is the study of likely chemical pathways that could give rise to the new molecules. The used experimental technique has been in-situ infrared spectroscopy. Our results are also relevant to other Galilean satellites and to other places inside the Solar System. In this work we present the results of experiments of ion implantation in pure water ice by using five different types of ions (H(+), C(+), N(+), O(+) and Ar(+). We have first focused on the study of the production of the hydrogen peroxide molecule. The energy of the used ions is 30 keV and the experiments have been carried out at 16 and 77 K. Our experiments show that H2O2 is produced at both temperatures and by all the different ions. We have found that the quantity of produced H2O2 is greater for ions with a higher stopping power, being protons the ions that produce the smallest quantity. We have also observed that oxygen is the ion that at 77 K produces the greatest quantity of H2O2. More precisely, an asymptotic value of about 4% of H2O2 (into respect to H2O) in number of molecules has been found for O(+) implantation. Because this value of H2O2 concentration is much greater than the 0.13% inferred by the NIMS feature on Europa, we suggest that hydrogen peroxide could be, on the surface of the satellite, distributed only in patches. This result could be useful to support the suggested possibility of a radiation-driven ecosystem on Europa based on the availability of organic molecules and oxidants such as hydrogen peroxide. Also of great interest is the possibility that H2O2 could reach the putative subsurface ocean. Findings of C implantation into water ices and future planned experiments are also presented.

Author

Europa; Water; Molecules; Satellite Surfaces; Ion Implantation; Ice

20040055351 Colorado Univ., Boulder, CO, USA

Numerical Implementation of Ice Rheology for Europa's Shell

Barr, A. C.; Pappalardo, R. T.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 7-8; In English; See also 20040055312

Contract(s)/Grant(s): NGT5-50337; NCC2-1340; No Copyright; Avail: CASI; A01, Hardcopy

We present a discussion of approximations to the temperature dependent part of the rheology of ice. We have constructed deformation maps using the superplastic rheology of Goldsby & Kohlstedt and find that the rheologies that control convective flow in the Europa's are likely grain boundary sliding and basal slip for a range of grain sizes 0.1 mm < d < 1 cm. We compare the relative merits of two different approximations to the temperature dependence of viscosity and argue that for temperature ranges appropriate to Europa, implementing the non-Newtonian, lab-derived flow law directly is required to accurately judge the onset of convection in the ice shell and temperature gradient in the near-surface ice.

Author

Europa; Ice; Rheology

20040055353 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Surface Penetrating Radar Simulations for Europa

Markus, T.; Gogineni, S. P.; Green, J. L.; Fung, S. F.; Cooper, J. F.; Taylor, W. W. L.; Garcia, L.; Reinisch, B. W.; Song, P.; Benson, R. F., et al.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 48; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The space environment above the icy surface of Europa is a source of radio noise in this frequency range from natural sources in the Jovian magnetosphere. The ionospheric and magnetospheric plasma environment of Europa affects propagation of transmitted and return signals between the spacecraft and the solid surface in a frequency-dependent manner. The ultimate resolution of the subsurface sounding measurements will be determined, in part, by a capability to mitigate these effects. We discuss an integrated multi-frequency approach to active radio sounding of the Europa ionospheric and local magnetospheric environments, based on operational experience from the Radio Plasma Imaging @PI) experiment on the IMAGE spacecraft in Earth orbit, in support of the subsurface measurement objectives.

Author

Europa; Radar Signatures

20040055354 California Univ., Los Angeles, CA, USA
Tidal Deformation and Tidal Dissipation in Europa
Moore, W. B.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 56-57; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Tidal forces have played a dominant role in the evolution of the inner three Galilean satellites of Jupiter. From the assembly of the Laplace resonance to the volcanic activity of Io, tidal forces orchestrate the dynamics and evolution of Io, Europa, and Ganymede. In Europa's ice shell, tidal deformation may directly drive surface tectonics, while tidal dissipation within the shell may indirectly lead to surface modification. Tidal forces may also lead to non-synchronous rotation of the shell or even true polar wander through torques acting on asymmetries in the shape of the shell. A discussion on the tidal deformation and dissipation of Europa's ice shell is presented.
Derived from text
Deformation; Europa; Tectonics; Tides; Planetary Geology; Energy Dissipation

20040055355 Scripps Institution of Oceanography, La Jolla, CA, USA
Limits on the Strength of Europa's Icy Shell From Topographic Spectra
Sandwell, D. T.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 78-79; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Radio echo sounding on Europa may provide estimates of the depth to the brittle-ductile transition. This information should be consistent with the topography spectrum. Here we derive an upper bound on the amplitude and shape of the topographic spectrum that can be supported by the strength of the lithosphere. Topographic features that exceed this upper bound must be supported by local compensation.
Author
Europa; Lithosphere; Ice; Topography

20040055356 Arizona Univ., Tucson, AZ, USA
What Europa's Impact Craters Reveal: Results of Numerical Simulations
Turtle, E. P.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 91-92; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Europa's surface is only lightly cratered, 28 primary impact structures larger than 4 km in diameter have been identified. Nonetheless, the craters span a wide range of sizes (up to approx. 50 km diameter) and exhibit morphologies similar to those observed on other planets, following a progression generally correlated with crater size. Primary craters less than approx. 5 km in diameter, have the bowl shape typical of simple craters. Craters approx. 5-24 km in diameter have flat floors and several have central peaks, characteristics typical of complex craters, although Europa's craters tend to be shallower. Two larger impact structures, Tegid and Taliesin, appear to have unusual morphologies, but have been imaged only at low resolution and so are poorly understood. The two largest impact structures, Callanish and Tyre, consist of disrupted centers ringed by numerous concentric graben with diameters of up to 100 km. Careful study of craters can reveal much about the nature of Europa's near-surface. One approach to investigating the constraints that the observed crater morphologies put on Europa's near-surface structure is to use numerical methods (e.g., hydrocode and finite-element modeling) to simulate impact cratering under Europan conditions. By reproducing the observed crater morphologies it is possible to constrain the near-surface structure and conditions. Numerical modeling of impact cratering is a powerful tool for constraining the properties of Europa's near-surface. Further modeling to investigate the later stages of cratering, including the formation of rings around Callanish and Tyre, as well as longer term modification due to viscous creep is currently underway and promises to reveal yet more information about Europa's near-surface.
Derived from text
Europa; Craters; Morphology; Planetary Geology; Structural Properties (Geology)

20040055361 California Univ., Berkeley, CA, USA
Wax Models of Europan Tectonics
Manga, Michael; Sinton, Antoine; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 46-47; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

The Europan surface preserves a wide range of features that suggest extension, compression and strike-slip motion. Understanding the origin and dynamics that result in these surface features may ultimately provide insight into the rheological and thermal structure of the Europan ice shell, and its evolution through time. Developing theoretical and numerical models

for Europan tectonics is challenging because they should involve coupled brittle failure and (nonlinear) viscous flow. The mathematical complexity of the problem but geometric simplicity of phenomena on the Earth that involve plates (e.g., plate tectonics, solid crusts on lava lakes) has motivated several studies of transform and microplate dynamics using wax analogues. We thus built an experimental apparatus to simulate Europan ice tectonics, and performed a set of experiments with model parameters appropriate for Europa.
Author
Models; Europa; Ice; Tectonics

20040055362 Johns Hopkins Univ., Laurel, MD, USA
Geological Features and Resurfacing History of Europa
Prockter, L. M.; Figueredo, P. H.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 74-75; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Many different models have been proposed for the formation of Europa's primary surface features: ridges, bands, chaos and lenticulae. We briefly review the models, evaluating their strengths and weaknesses, and their implications for the thickness of Europa's ice shell. We discuss Europa's stratigraphy, and how the surface may have evolved through time.
Derived from text
Europa; Geochronology; Stratigraphy; Geomorphology; Satellite Surfaces

20040055363 Lowell Observatory, Flagstaff, AZ, USA
Thermal Properties of Europa's Ice Shell
Spencer, J. R.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 86; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

I will review our current knowledge of surface and subsurface temperatures on Europa. Daytime and nighttime surface temperatures have been extensively mapped by the Galileo Photopolarimeter-Radiometer (PPR) instrument, and vary between 130 and 80 K at low latitudes. Nighttime temperatures show complex and poorly-understood spatial variations, including a remarkable temperature minimum centered on and parallel to the equator on the leading hemisphere. Comparison with daytime temperatures indicates that these patterns are controlled by spatial variations in thermal inertia rather than by warming of the surface by endogenic heat, but the cause of the thermal inertia variations is not understood. The amplitude of the diurnal temperature variations is matched with a thermal inertia of about 5 x 10(exp 4) erg * cm(exp -2) * s(exp -1/2) * K(exp -1), fifty times lower than the value for solid ice, indicating that much of the uppermost few centimeters of Europa's surface has high porosity and thus low thermal conductivity. Daytime temperatures are high enough that significant sublimation of H2O ice is likely on geological timescales, leading to thermal segregation of ice into high-albedo patches that are colder than the average surface. Less is known about subsurface temperatures in Europa's ice shell, though it is likely that there is an upper conducting layer, with a steep thermal gradient, overlying a lower convecting layer that is almost isothermal at temperatures slightly below the melting temperature of the ice. Localized endogenic resurfacing may produce long-lived passive or active anomalies in surface temperature, providing a promising technique for detecting regions of recent resurfacing from Europa orbit. No such anomalies were definitively identified in the Galileo PPR data, however.
Author
Europa; Ice; Satellite Surfaces; Planetary Geology; Temperature Measurement; Surface Temperature

20040055364 Colorado Univ., Boulder, CO, USA
Constraints on the Opening Rate of Bands on Europa
Stempel, M. M.; Barr, A. C.; Pappalardo, R. T.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 87-88; In English; See also 20040055312
Contract(s)/Grant(s): NAG5-11616; No Copyright; Avail: CASI; A01, Hardcopy

The opening rates of two bands on Europa, inferred to be sites of spreading of the icy lithosphere, are constrained based on a mid-ocean ridge analog model. Estimates of brittle-ductile transition depth combined with a conductive cooling model limit active band lifetimes to 0.24 - 35 Myr and strain rates of 8.1 x 10(exp -13) - 8.2 x 10(exp -15)/s. These values suggest tensile strengths for ice on Europa of 0.46 - 2.3 MPa, consistent with nonsynchronous rotation as the dominant driving mechanism for band opening.
Author
Europa; Ice; Lithosphere; Spreading

20040055365 Arizona Univ., Tucson, AZ, USA

Interaction Between the Convective Sublayer and the Cold Fractured Surface of Europa's Ice Shell

Tobie, G.; Choblet, G.; Lunine, J.; Sotin, C.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 89-90; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

As it travels around Jupiter on a synchronous orbit, Europa is subjected to periodic deformation due to its high orbital eccentricity (e=1%). The tidal response of its ice shell is almost uniquely controlled by the radial displacement of the underlying ocean. At the base of the ice shell, ice, close to its melting point behaves like a viscoelastic medium, whereas the elastic/brittle response progressively dominates when the cold surface is approached.

Author

Europa; Ice; Lithosphere; Convection; Fracture Mechanics

20040055390 Colorado Univ., Boulder, CO, USA

Distribution of Near-Surface Ground Ice on Mars

Mellon, Michael T.; [2004]; 3 pp.; In English

Contract(s)/Grant(s): NAG5-10265; No Copyright; Avail: CASI; A01, Hardcopy

During the course of this grant we made significant progress in our understanding of martian ground ice in areas of theoretical and laboratory research. We recently completed a manuscript comparing a new map of ground-ice stability with leakage neutron data for the southern hemisphere . In this manuscript we incorporated several improvements to a model of ground ice stability. We quantitatively compared measured epithermal-neutron flux with predicted ice-table burial depth and found that the observed distribution of ground ice is consistent with ice in diffusive equilibrium with the atmosphere. In addition to this theoretical study we have adapted an experimental apparatus, designed for measuring ice condensation in antarctic soils , to martian permafrost.

Author

Mars Surface; Permafrost

20040055879 Lunar and Planetary Inst., Houston, TX, USA

Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving

2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040055880 - 20040055892

Contract(s)/Grant(s): NCC5-679

Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

Reports from the conference session entitled Icy Worlds: Moving and Grooving, include:Mass Anomalies on Ganymede; Europan Chaos and Lenticulae: A Synthesis of Size, Spacing, and Areal Density Analyses; Thermal and Topographic Tests of Europa Chaos Formation Models; Flexure of Europa s Lithosphere Due to Ridge-Loading; Ridges on Europa: Origin by Incremental Ice-Wedging ; Convergent Boundaries on Europa: a Numerical Approach to Euler Pole Analysis and Its' Implications for Plate Reconstruction; Numerical Simulations of Subsolidus Convection in the Ice Shell of Europa: Implications for the Thermal Evolution and Present State; Effects of Plasticity on Convection in an Ice Shell: Implications for Europa; Non-Newtonian Convection and Compositional Buoyancy: Advances in Modeling Convection and Dome Formation on Europa; Convective Instability in Ice I: Application to Callisto and Ganymede; Crater Size Distributions on Callisto: A Galileo SSI Summary; Neutron Diffraction Studies of Planetary Ices; and H2O2 Synthesis Induced by Irradiation of H2O with Energetic H+ and Ar+ Ions at Various Temperatures.

Derived from text

Europa; Ganymede; Satellite Surfaces

20040055880 Arizona Univ., Tucson, AZ, USA

Flexure of Europa's Lithosphere Due to Ridge-Loading

Hurford, T. A.; Preblich, B.; Beyer, R. A.; Greenberg, R.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Measurements of topography in the higher resolution Galileo images has allowed us to identify flexure at a variety of locations on Europa's surface. Figure 2 shows a plot of all of the measurements we have made thus far. Measurements span

the surface from about -80 degrees latitude to as far north as 60 degrees latitude. Furthermore we have investigated flexure on a wide variety of terrains.
Derived from text
Europa; Topography; Terrain Analysis

20040055881 Colorado Univ., Boulder, CO, USA
Non-Newtonian Convection and Compositional Buoyancy: Advances in Modeling Convection and Dome Formation on Europa
Pappalardo, R. T.; Barr, A. C.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879
Contract(s)/Grant(s): NCC2-1340; NGT5-50337; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Numerical modeling of non-Newtonian convection in ice shows that convection controlled by grain boundary sliding rheology may occur in Europa. This modeling confirms that thermal convection alone cannot produce significant dome elevations. Domes may instead be produced by diapirs initiated by thermal convection that in turn induces compositional segregation. Exclusion of impurities from warm upwellings would allow sufficient buoyancy for icy plumes to account for the observed approximately 100 m topography of domes, provided the ice shell has a small effective elastic thickness (approximately 0.2 to 0.5 km) and contains low eutectic-point impurities at the few percent level.
Derived from text
Europa; Free Convection; Mathematical Models; Domes (Structural Forms); Nonnewtonian Flow; Topography; Buoyancy

20040055882 Colorado Univ., Boulder, CO, USA
Convective Instability in Ice I: Application to Callisto and Ganymede
Barr, A. C.; Pappalardo, R. T.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879
Contract(s)/Grant(s): NGT5-50337; NCC2-1340; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Laboratory experiments measuring ice rheology suggest that it deforms under the influence of several nonNewtonian creep mechanisms, where the viscosity depends on both strain rate and temperature [Goldsby & Kohlstedt, 2001]. Whether or not a fluid with a purely temperature-dependent viscosity convects can be determined by comparing the Rayleigh number of the system to the critical Rayleigh number (Racr), which depends on rheological, thermal, and physical parameters of the fluid layer. However, in a nonNewtonian fluid where viscosity depends on the strain rate (i.e. velocity), convection can only occur if a temperature or velocity perturbation is issued to the system to lower the viscosity and permit fluid motions. Therefore, whether convection occurs in an ice I layer depends on initial conditions, in addition to rheological, thermal, and physical properties of the layer. We show new results for a scaling between the critical Rayleigh number and perturbation amplitude for grain boundary sliding rheology. This scaling can be used to determine the conditions required to initiate convection in the ice I shell of a generic icy satellite. We use this scaling to judge the convective instability of Ganymede and Callisto's ice shells in the absence of tidal dissipation.
Derived from text
Rheology; Stability; Callisto; Ganymede; Convection; Mathematical Models; Ice

20040055883 Brown Univ., Providence, RI, USA
Convergent Boundaries on Europa: A Numerical Approach to Euler Pole Analysis and Its' Implications for Plate Reconstruction
Patterson, G. W.; Head, J. W.; Pappalardo, R. T.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Europa's surface is highly fractured and broken into plates that have rotated with respect to one another. The effect of these rotations can be seen as regions of extension, strike-slip motion, and possibly compression. Various authors have tried to reconstruct several of these regions in an effort to gain a better understanding of the tectonic history of the icy satellite. This analysis will focus on using numerical methods of determining an Euler pole to test quantitatively the validity of

reconstructions that previously suggested that a set of lineaments in the Castalia Macula region had undergone compression. Derived from text

Europa; Numerical Analysis; Plates (Tectonics); Convergence; Structural Properties (Geology)

20040055884 Arizona Univ., Tucson, AZ, USA

Effects of Plasticity on Convection in an Ice Shell: Implications for Europa

Showman, A. P.; Han, L.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Europa's icy surface displays numerous pits, uplifts, and disrupted terrains that have been suggested to result from convection in the ice shell. In stagnant-lid convection, the topography is minimal, because the ascending and descending plumes below the stagnant lid have insufficient buoyancy to produce surface deformation. However, recent studies imply that Europa s ice shell is extremely weak, raising the possibility that brittle deformation plays a role in the convection (thereby pushing the convection away from the stagnant-lid mode). Here we present numerical simulations of convection in Europa's ice-shell including the effects of plasticity, which provides a continuum representation for deformation along fractures. The simulations show that multiple modes of behavior are possible. In some cases, plastic deformation plays a major role in the convection by allowing the cold regions to deform, which produces large lateral density contrasts and leads to topographic features up to approximately 100 m tall. In other cases, the stresses remain low enough that little plastic deformation occurs, and stagnant-lid convection, with minimal topography, results.

Author

Convection; Europa; Ice; Plastic Properties; Topography; Numerical Analysis; Computerized Simulation

20040055885 International Research School of Planetary Sciences, Pescara, Italy

Numerical Simulations of Subsolidus Convection in the Ice Shell of Europa: Implications for the Thermal Evolution and Present State

Mitri, G.; Showman, A. P.; Geissler, P.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Heat generated by decay of the radioactive isotopes and by tidal internal heating are the principal sources of energy for the formation of endogenic surface structures on Europa such as chaotic terrains, pits and domes. Europa could undergo gradual or rapid changes of heat production during its thermal history. Variations in heat production may been caused by the early differentiation of the core and rocky mantle, or later on by changes in the satellite s orbit over time (timescales of 10(exp 8) yr), with episodic thermal (volcanic) activity on the sea floor. The heat transfer from the silicate interior to the surface occurs in the ice shell by thermal conduction or possibly by subsolidus convection. Two dimensional numerical simulations of convection in the ice shell of Europa are preformed to explore the basic fluid mechanics that potentially govern the response to changes in amount of heat production.

Derived from text

Europa; Heat Generation; Icy Satellites; Numerical Analysis; Convection; Simulation; Two Dimensional Models

20040055886 University Coll., London, UK

Neutron Diffraction Studies of Planetary Ices

Fortes, A. D.; Wood, I. G.; Knight, K. S.; Brodholt, J. P.; Alfredsson, M.; Vocadlo, L.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many of the icy satellites in the outer Solar System contain significant quantities of water, either in the form of pure ice or combined with other substances to form hydrates. The structure and evolution of these icy moons is determined by the physical properties of their component ices; their thermal expansivity, incompressibility, and phase stability. We are therefore engaged in a programme of study to measure the physical characteristics of candidate materials using neutron diffraction techniques. Neutrons are powerful probes of low molecular-weight solids, hydrogen-bearing species in particular, and their penetrative power allows one to study materials even in complex sample environments, such as pressure cells and cryostats. In practice, we measure the variation in molar volume of a solid as a function of pressure and temperature; this leads to derivatives in P and T, such as thermal expansivity and compressibility. Furthermore, we can observe phase transitions in situ, and collect diffraction data which may lead to a successful solution of the new polymorph's structure. In this contribution, we

present the results of our work on a high-pressure polymorph of solid water - ice II - and the heptahydrate of magnesium sulfate epsomite. Our work on ammonia dihydrate is presented in a companion abstract and poster presentation.
Author
Icy Satellites; Neutron Diffraction; Solar System; Planetary Structure; Physical Properties

20040055887 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mass Anomalies on Ganymede
Schubert, G.; Anderson, J. D.; Jacobson, R. A.; Lau, E. L.; Moore, W. B.; Palguta, J.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Radio Doppler data from two Ganymede encounters (G1 and G2) on the first two orbits in the Galileo mission have been analyzed previously for gravity information . For a satellite in hydrostatic equilibrium, its gravitational field can be modeled adequately by a truncated spherical harmonic series of degree two. However, a fourth degree field is required in order to fit the second Galileo flyby (G2). This need for a higher degree field strongly suggests that Ganymede s gravitational field is perturbed by a gravity anomaly near the G2 closest approach point (79.29 latitude, 123.68 west longitude). In fact, a plot of the Doppler residuals , after removal of the best-fit model for the zero degree term (GM) and the second degree moments (J2 and C22), suggests that if an anomaly exists, it is located downtrack of the closest approach point, closer to the equator.
Author
Ganymede; Gravity Anomalies

20040055888 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
H2O2 Synthesis Induced by Irradiation of H2O with Energetic H(+) and Ar(+) Ions at Various Temperatures
Baragiola, R. A.; Loeffler, M. J.; Raut, U.; Vidal, R. A.; Carlson, R. W.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The detection of H2O2 on Jupiter's icy satellite Europa by the Galileo NIMS instrument presented a strong evidence for the importance of radiation effects on icy surfaces. A few experiments have investigated whether solar flux of protons incident on Europa ice could cause a significant if any H2O2 production. These published results differ as to whether H2O2 can be formed by ions impacting water at temperatures near 80 K, which are appropriate to Europa. This discrepancy may be a result of the use of different incident ion energies, different vacuum conditions, or different ways of processing the data. The latter possibility comes about from the difficulty of identifying the 3.5 m peroxide OH band on the long wavelength wing of the much stronger water 3.1 m band. The problem is aggravated by using straight line baselines to represent the water OH band with a curvature, in the region of the peroxide band, that increases with temperature. To overcome this problem, we use polynomial baselines that provide good fits to the water band and its derivative.
Derived from text
Irradiation; Peroxides; Water Temperature; Hydrogen Ions; Synthesis (Chemistry); Europa; Argon

20040055889 University Coll., London, UK
Thermal and Topographic Tests of Europa Chaos Formation Models
Nimmo, F.; Giese, B.; Figueredo, P.; Moore, W. B.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The manner in which chaos terrain formed is the subject of considerable debate, and has important implications for the shell thickness, heat flow and astrobiological potential of Europa . Here we investigate two models of chaos terrain formation, and conclude that neither model is entirely satisfactory for the areas studied. The diapiric melting model of Collins et al. is unable to produce sufficient melting to explain the observations. The melt-through model of O Brien et al. requires implausible amounts of heating. We investigated two areas for which we have access to topography data. shows two series of topographic profiles: one using high-resolution stereo data from the E15 orbit ; the other using photoclinometry across the Mitten (Murias Chaos) . In both cases the chaos terrain is bounded by a steep scarp, and is lower than the immediately adjacent background terrain. However, both chaos areas are domed, so that their centres are higher than the background terrain. Below we investigate two mechanisms which may explain this topography.
Author
Europa; Topography

20040055890 Arizona Univ., Tucson, AZ, USA
Ridges on Europa: Origin by Incremental Ice-Wedging
Melosh, H. J.; Turtle, E. P.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879
Contract(s)/Grant(s): NAG5-11493; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The surface of Europa is covered by ridges that display a variety of morphologies . The most common type is characterized by a double ridge divided by an axial trough. These ridges are, in general, narrow (typically only a few km across) and remarkably linear. They are up to a few hundred meters high and the inner and outer slopes appear to stand at the angle of repose . A number of diverse mechanisms have been proposed to explain the formation of these ubiquitous features , although none can fully account for all of their observed characteristics. We propose a different formation theory in which accumulation of material within cracks that open during the extensional phase of the tidal cycle prevents complete closure of the cracks during the tidal cycle s compressional phase. This accumulation deforms the surrounding ice and, in time, results in the growth of a landform remarkably similar to the ridges observed on Europa.
Author
Europa; Landforms

20040055891 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Berlin, Germany
Crater Size Distributions on Callisto: A Galileo SSI Summary
Wagner, R.; Wolf, U.; Neukum, G.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Callisto, the outermost icy satellite of Jupiter, shows a surface exclusively dominated by impact features at medium resolution (1-2 km/pxl). The SSI camera onboard the Galileo spacecraft which was in orbit around Jupiter from December 1995 to September 2003, imaged Callisto's surface at high resolutions during six close flybys (C3, C9, C10, C20, C20, C30). In this paper we present results from measurements of crater size frequency distributions (CSFD) in various localities imaged at resolutions down to 7 m/pxl. Topics addressed in this work are (1) whether CSFDs on Callisto are production or equilibrium distributions, (2) if there are variations in crater frequency with angular distance to the apex point of orbital motion, and (3) if there is a general depletion of small craters. Also, we address the issue of possible impactor sources in the Jovian system which is still in debate but as yet still is an unsolved question.
Derived from text
Callisto; Size Distribution; Icy Satellites; Galileo Spacecraft; Craters

20040055892 Brown Univ., Providence, RI, USA
Europan Chaos and Lenticulae: A Synthesis of Size, Spacing, and Areal Density Analyses
Spaun, N. A.; Head, J. W.; Pappalardo, R. T.; Lunar and Planetary Science XXXV: Icy Worlds: Moving and Grooving; 2004; 2 pp.; In English; See also 20040055879; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We performed detailed analyses of Europa s near-equatorial region at several longitudes to assess the size, spacing, and surface distribution of micro-chaos lenticulae and chaos in order to determine the properties of the Europan ice shell. Chaos is defined as large, irregularly shaped regions commonly containing linear-textured blocks of pre-existing terrain and also containing a hummocky matrix material. Micro-chaos lenticulae are smaller features containing a hummocky matrix material similar to that within chaos . Both a 'melt-through' model and a diapiric model have been suggested for the origin of chaos and lenticulae.
Author
Europa; Terrain Analysis

20040055895 Eotvos Lorand Univ., Budapest, Hungary
Unusual Guidebook to Terrestrial Field Work Studies: Microenvironmental Studies by Landers on Planetary Surfaces (New Atlas in the Series of the Solar System Notebooks on Eotvos University, Hungary)
Mortl, M.; Foldi, T.; Hargitai, H.; Hegyi, S.; Illes, E.; Hudoba, Gy; Kovacs, Zs; Kereszturi, A.; Sik, A.; Jozsa, S., et al.; Lunar and Planetary Science XXXV: Education Programs Demonstrations; 2004; 2 pp.; In English; See also 20040055893
Contract(s)/Grant(s): MUI-TP-190/2003; MUI-TP-154/2003; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We compiled a new atlas in the series of the Solar System Research with Microenvironmental Studies of landers on Planetary Surfaces. The main chapters were a) field petrology and geography of the deserts, b) rock surface textural studies, c) landing on Venus, d) impacts around the landers, e) characteristics of water formed surface on Mars, f) man on the Moon: Apollo, g) micrometeorological measurements on Earth and Mars, h) electrostatics of the thin planetary atmospheres, i) measurement of the atmospheric chemical composition, j) biological measurements of Vikings.
Derived from text
Handbooks; Micrometeorology; Planetary Atmospheres; Planetary Surfaces; Solar System

20040055902 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Mars Polar Science and Exploration
2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040055903 - 20040055915
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

The session, 'Mars Polar Science and Exploration' included the following reports: Evidence for Possible Exposed Water Ice Deposits in Martian Low Latitude Chasms and Chaos; Stability and Exchange of Subsurface Ice on Mars; Evaporation Rates for Liquid Water and Ice Under Current Martian Conditions; Seasonal Cycle of Carbon Dioxide and Atmospheric Circulation in Mars Southern Hemisphere as Observed by Neutron Spectroscopy; Imaging Polarimetry of Mars with Hubble Space Telescope in 2003 Opposition; GCM Simulations of Tropical Ice Accumulations: Implications for Cold-based Glaciers; Numerical Modeling of Glaciers in Martian Paleoclimates; Valley Glaciers on Mars: Calculation of Flow Rate and Thickness; Internal Structure of the Southern Polar Cap of Mars and Formation Implications; Sublimation at the Base of a Seasonal CO2 Slab on Mars; Impact Crater Abundance of the Martian South Polar Layered Deposits from THEMIS Visible Imaging; Recent Changes in South-Polar-Polygonal Terrain During One Martian Year: Implications for Subsurface Ice-Wedges; and An Historical Search for Unfrozen Water at the Phoenix Landing Site.
Author
Mars Environment; Mars Surface

20040055903 Kharkov State Univ., Ukraine
Imaging Polarimetry of Mars with Hubble Space Telescope in 2003 Opposition
Shkuratov, Y.; Kreslavsky, M.; Kaydash, V.; Opanasenko, N.; Videen, G.; Bell, J.; Wolff, M.; Hubbard, M.; Noll, K.; Lubenow, A.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The polarization state of solar light scattered by atmospheric aerosols may provide information about particle size, shape and orientation; polarization of light scattered by surfaces bears information about small-scale structure. During Mars close approach to the Earth in 2003 an extensive series of observations was carried out by the Hubble Space Telescope (HST). This series included (for the first time) high resolution polarimetric observations. We present results of the initial processing of these observations.
Derived from text
Polarimetry; Mars (Planet); Solar Atmosphere; Polarized Light; Imaging Techniques

20040055904 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Impact Crater Abundance of the Martian South Polar Layered Deposits from THEMIS Visible Imaging
Plaut, J. J.; Christensen, P.; Koutnik, M.; Marsden, P.; Murray, B.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The polar layered deposits (PLD) of Mars have attracted considerable attention since their identification in Mariner 9 images, largely due to the possibility that these finely layered, volatile-rich deposits hold a record of recent eras in Martian climate history. The PLD have been a target of imaging and other sensors in the last several decades, but only recently has it been possible to obtain a moderately high resolution image map, using the visible sensor on 2001 Mars Odyssey's Thermal Emission Imaging System (THEMIS). THEMIS has acquired a 36 meter/pixel contiguous single-band visible image data set of the south polar layered deposits (SPLD), during the southern spring in 2003. The data will undoubtedly be applied to many problems in Mars polar studies. We use these images to further characterize the population of impact craters on the SPLD,

and the implications of the observed population for the age and evolution of the SPLD.
Derived from text
Mineral Deposits; Mars Surface; Thermal Emission; Imaging Techniques; Planetary Geology; Abundance; Polar Regions; Mars Craters; Light (Visible Radiation); Deposits

20040055905 Los Alamos National Lab., NM, USA
Seasonal Cycle of Carbon Dioxide and Atmospheric Circulation in Mars' Southern Hemisphere as Observed by Neutron Spectroscopy
Prettyman, T. H.; Wiens, R. C.; Murphy, J. R.; Reisner, J. M.; Feldman, W. C.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The purpose of this study is to analyze data from the Mars Odyssey Neutron Spectrometer to determine the column abundance of noncondensable gases and CO2 ground ice as a function of position and time in the southern hemisphere. Data acquired by the neutron spectrometer span the advance and recession of the south polar cap during a single martian year. The spectrometer can resolve spatial features on the surface that are 10 deg of arc length in scale (600 km) and temporal variations on the order of 5 of LS can be monitored.
Author (revised)
Neutron Spectrometers; Mars Atmosphere; Atmospheric Circulation; Southern Hemisphere; Annual Variations; Polar Caps

20040055906 California Inst. of Tech., Pasadena, CA, USA
Stability and Exchange of Subsurface Ice on Mars
Schorghofer, N.; Aharonson, O.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Martian atmosphere has low absolute humidity, but it is often close to saturation. In particular, when vapor enters a sufficiently cold subsurface void it will freeze out as frost. On the other hand, any ice exposed to an unsaturated atmosphere will sublime away over time.
Derived from text
Ice; Mars Atmosphere; Mars Surface; Stability

20040055907 NASA Ames Research Center, Moffett Field, CA, USA
An Historical Search for Unfrozen Water at the Phoenix Landing Site
Zent, Aaron; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The goal of this work is to explore the history of the high-latitude subsurface in the latitude range of the Phoenix landing site (65-75 deg. N). The approach is to use time-marching climate models to search for times, locations, and depths where thick films of unfrozen water might periodically occur. Thick films of unfrozen water (as distinct from ubiquitous monolayer water) are interesting for two reasons. First, multi-layer films of water may be bio-available. Second, patterned ground may require the occurrence of thick films of unfrozen water to facilitate the migration of particles and the development of excess pore ice, as reported by the Odyssey Gamma Ray Spectrometer (GRS) results. For the purposes of this work, we define conditions adequate to establish thick films of unfrozen water to be T greater than 268 K, and RH greater than 0.5. We start with the need to understand the atmospheric pressure. Because of the fact that we're looking at high latitudes, the seasonal cap buffers surface temperature for some part of the year. That directly affects the subsurface thermal regime, at least in the uppermost meter where we will be
Derived from text
Atmospheric Pressure; Histories; Ice; Landing Sites; Polar Regions; Surface Temperature; Water

20040055908 NASA Ames Research Center, Moffett Field, CA, USA
Evidence for Possible Exposed Water Ice Deposits in Martian Low Latitude Chasms and Chaos
Leovy, C.; Wood, S. E.; Catling, D.; Montgomery, D. R.; Moore, J.; Barnhart, C.; Ginder, E.; Louie, M.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A light-toned interior layer deposit (ILD) on the floor of the deep martian depression Juventae Chasma is found to have a relatively high thermal inertia approx. 500 J m(exp -2) s(exp -1/2) K(exp -1). This could imply rock, but is also similar to the average value of thermal inertia found for north polar layered deposits. Furthermore, ILD-B is found to exhibit a bluff and terrace structure . A terrace structure arises naturally in model simulations of the sublimation of large ice deposits. Such a staircase terrain, of course, is a further characteristic of north polar layered terrain. Morphological similarity, thermal inertia in the range of thermal inertias of the north polar cap layered terrain, and relatively high albedo lead us to propose that the ILD-B may consist of residual water ice partially covered by, and perhaps mixed with, varying amounts of dust or sand. Other ILDs (A-C) are also found in Juventae Chasma. While these ILDs lack the close morphological resemblance to the north polar cap, they share many other common features and appear to be part of the same formation. Similar ILDs are found in chaotic terrain elsewhere in the martian tropics. This leads us to propose that water ice may exist in the martian tropics today and may be implicit in the formation of chaotic terrain.
Author
Mars Surface; Morphology; Canyons; Ice; Planetary Geology

20040055909 Colorado Univ., Boulder, CO, USA
Valley Glaciers on Mars: Calculation of Flow Rate and Thickness
Arfstrom, J. D.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On Mars, ice masses 10 m to 100 m thick, on slopes of about 20 to 30 degrees, have strain rates in the range necessary to produce glacier-like flows (GLF) in tens of thousands years or more. Here, I demonstrate how to calculate strain rates in a manner more applicable to valley GLF such as in Dao Vallis, which are typically on slopes of about 1 degree and thick enough for flow rates to be significantly affected by geothermal heating.
Author
Mars Surface; Planetary Geology; Glaciers; Valleys; Flow Velocity; Strain Rate

20040055910 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Internal Structure of the Southern Polar Cap of Mars and Formation Implications
Byrne, S.; Ivanov, A. B.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The surfaces of the Martian polar caps have been studied in detail but little is known about their internal structure. Exposures of the cap interior can be seen in the many troughs and scarps which incise them. The layered sequences visible in these topographic features have been known to exist for many years, however first order questions concerning the internal stratigraphy remain. We have identified a prominent bench forming layer near the top of the southern layered deposits. We have mapped its exposure in high-resolution MOC images on the eastern and western scarps. These images have been carefully registered to a MOLA derived DEM so topographic measurements along this bench can be extracted along with the location of each trace. What results are a set of measurements of the top of the bench forming layer in three dimensions. The top of this layer represents a distinct stratigraphic horizon. The prominent bench outcrops on both the eastern and western scarps which bound the highest portion of the southern layered deposits. Confirmation that these are two benches are indeed the same stratigraphic surface comes from the similarity of surrounding (nonbench forming) layers.
Derived from text
Mars Surface; Polar Caps; Southern Hemisphere; Formations; Planetary Geology

20040055911 NASA Ames Research Center, Moffett Field, CA, USA
GCM Simulations of Tropical Ice Accumulations: Implications for Cold-based Glaciers
Haberle, R. M.; Montmessin, F.; Forget, F.; Levrard, B.; Head, J. W., III; Laskar, J.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 1 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Each of the three Tharsis Montes shield volcanoes on Mars has fan-shaped deposits on their flanks. A detailed analysis of the multiple facies of the Arsia Mons deposits, coupled with field observations of polar glaciers in Antarctica, shows that they are consistent with deposition from cold-based mountain glaciers. Key features of these glaciers are: (1) they formed only on the western flank of each volcano, (2) enough ice accumulated to cause them to flow but without basal melting, (3) there

were multiple advances and retreats, (4) the last major glaciation was more than several million years ago, (5) the areal extent of the deposits they left behind decreases northward, (6) together the deposits range in elevation from a low of 1.5 to a high of 8.5 km, and (7) there are no signs that significant accumulation is occurring today.
Derived from text
Deposition; Glaciers; Ice; Mars Surface; Mars Volcanoes

20040055912 Freie Univ., Berlin, Germany
Recent Changes in South-Polar-Polygonal Terrain During One Martian Year: Implications for Subsurface Ice-Wedges
vanGasselt, S.; Reiss, D.; Neukum, G.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In previous work the inventory of south polar polygonal patterns has been mapped and classified in terms of size and shape on the basis of MOC high resolution imagery. The shape and pattern of polygons, their size and trough conjugations and intersection angles are controlled mainly by the mechanical properties of the surface and the thermal regime. In this work we focus on seasonal observations in the south polar region and changes of cracking patterns within one Martian year which discourage the idea of crack propagation to a notable depth as known from terrestrial recurrent ice wedges.
Derived from text
Ice; Mars Surface; Polar Regions; Polygons; Terrain; Structural Properties (Geology)

20040055913 California Inst. of Tech., Pasadena, CA, USA
Sublimation at the Base of a Seasonal CO2 Slab on Mars
Aharonson, Oded; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A host of new observations of defrosting features appearing during the sublimation of polar CO2 ice on Mars have been reported. The development of some of these features, from vents, to plumes, and eventually spider landforms has been linked to exhausting of a pressurized gas layer trapped between a CO2 slab and the underlying ground, being heated from above from solar insolation. This mechanism relies on the slab s being sufficiently transparent to sunlight to allow heating to occur at the base of the slab, which may be about 1 m thick. A self cleaning mechanism of the slab resulting from heating of dust particles by the sun has been proposed. Here we consider the role of subsurface heat conduction in the energy balance at the base of the slab, and show that sublimation results from this process alone, which may explain the early onset of surface features. There are certainly additional lines of evidence which argue an annealed CO2 slab (termed cryptic terrain) may develop both in the north and south seasonal caps based on visible and thermal properties, and indeed spider forms appear geographically correlated with such areas. We aim to evaluate another mechanism, that may act in addition to ones previously suggested. As will be shown, the hypothesis of heat conduction is particularly attractive for explaining venting activity that appears during the earliest parts of the spring season, before the sun has risen sufficiently high above the horizon to supply significant heat and clean the slab of impurities. A portion of a Mars Orbiter Camera image is shown, collected during an areocentric solar longitude of L(sub s) = 174.3 degrees, at a latitude of 86.5 S, in polar twilight. The image shows numerous dark spots of the type that are seen to develop into plumes.
Derived from text
Carbon Dioxide; Sublimation; Mars Surface; Mathematical Models; Plates (Structural Members); Spring (Season)

20040055914 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Evaporation Rates for Liquid Water and Ice Under Current Martian Conditions
Sears, D. W. G.; Moore, S. R.; Meier, A.; Chittenden, J.; Kareev, M.; Farmer, C. B.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 2 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A number of studies have been concerned with the evaporation rates under martian conditions in order to place limits on the possible survival time of both liquid water and ice exposed on the surface of Mars. Such studies also aid in assessing the efficacy of an overlying layer of dust or loose regolith material in providing a barrier to free evaporation and thus prolong the lifetime of water in locations where its availability to putative living organisms would be significant. A better quantitative understanding of the effects of phase changes of water in the near surface environment would also aid the evaluation of the possible role of water in the formation of currently observed features, such as gullies in cliff walls and relatively short-term

changes in the albedo of small surface areas ('dark stains'). Laboratory measurements aimed at refinement of our knowledge of these values are described here. The establishment of accurate values for evaporation rates and their dependence on the physical conditions of temperature, pressure and energy input, is an important benchmark for the further investigation of the efficacy of barriers to free evaporation in providing a prolonged period of survival of the water, particularly as a liquid.
Author
Mars Environment; Water; Evaporation Rate; Planetary Geology

20040055915 NASA Ames Research Center, Moffett Field, CA, USA
Numerical Modeling of Glaciers in Martian Paleoclimates
Colaprete, A.; Haberle, R. M.; Montmessin, F.; Scheaffer, J.; Lunar and Planetary Science XXXV: Mars Polar Science and Exploration; 2004; 1 pp.; In English; See also 20040055902; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Numerous geologic features suggest the presence of ice flow on the surface of mars. These features include lobate debris aprons, concentric crater fill, and lineated valley fill. The lateral extent of these features can range from 100 meters to over 20 km. Previous work has demonstrated that these features could not have formed in current Martian conditions. It has long been speculated that changes in Mars orbital properties, namely its obliquity, eccentricity, and argument of perihelion, can result in dramatic changes to climate. Recent climate model studies have shown that at periods of increased obliquity north polar water ice is mobilized southward and deposited at low ad mid latitudes. Mid latitude accumulation of ice would provide the necessary conditions for rock glaciers to form. A time-marching, finite element glacier model is used to demonstrate the ability of ice and ice-rock mixtures to flow under Martian paleoclimate conditions. Input to this model is constrained by the NASA Ames Mars General Circulation Model (MGCM).
Author
Glaciers; Paleoclimatology; Mars Environment; Mathematical Models; Planetary Geology; Mars Surface

20040055955 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Origin of Planetary Systems
2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040055956 - 20040055968
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

The session titled Origin of Planetary Systems' included the following reports:Convective Cooling of Protoplanetary Disks and Rapid Giant Planet Formation; When Push Comes to Shove: Gap-opening, Disk Clearing and the In Situ Formation of Giant Planets; Late Injection of Radionuclides into Solar Nebula Analogs in Orion; Growth of Dust Particles and Accumulation of Centimeter-sized Objects in the Vicinity of a Pressure enhanced Region of a Solar Nebula; Fast, Repeatable Clumping of Solid Particles in Microgravity ; Chondrule Formation by Current Sheets in Protoplanetary Disks; Radial Migration of Phyllosilicates in the Solar Nebula; Accretion of the Outer Planets: Oligarchy or Monarchy?; Resonant Capture of Irregular Satellites by a Protoplanet ; On the Final Mass of Giant Planets ; Predicting the Atmospheric Composition of Extrasolar Giant Planets; Overturn of Unstably Stratified Fluids: Implications for the Early Evolution of Planetary Mantles; and The Evolution of an Impact-generated Partially-vaporized Circumplanetary Disk.
Derived from text
Solar Nebula; Protoplanetary Disks; Planetary Evolution

20040055958 Tokyo Univ., Japan
The Evolution of an Impact-generated Partially-vaporized Circumplanetary Disk
Machida, R.; Abe, Y.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

According to the giant impact hypothesis, a partially vaporized disk is formed through the collision of a Mars-sized body with the proto-Earth. Most of the disk material is distributed interior to the Roche radius. Since the impact-generated disk has high temperature (approx. 5000 K) and high gas pressure, the disk consists of the mixture of vaporized gas and condensate liquid drops (In the following, we call them dust, for simplicity). The following moon-forming process is proposed under the assumption of a gas-free disk composed of debris: spiral-arm structures are formed through gravitational instability in the disk, and the disk spreads owing to their gravitational torque, then a single large moon is formed outside the Roche radius of the

Earth by the accretion of disk materials. However, the impact-generated disk is partially vaporized in reality. There are two possible modes of gravitational instability in a partially vaporized disk; one is the instability of the dust-gas mixture, and the other is the instability of the equatorial dust layer formed by the sedimentation in the disk. If the dust and gas are coupled firmly, the instability of the dust-gas mixture occurs through the decrease of the gas fraction induced by the radiative cooling of the disk. If the dust sedimentation forms an equatorial dust layer in a shorter time scale than the cooling, the instability of the dust layer may occur. Here, we investigate the latter possibility. We perform a two-phase fluid numerical simulation for the evolution of the circumplanetary disk. We assume a hydrostatically equilibrated axisymmetric disk with uniform temperature T (varies from 4000 K to 6000 K) and initially uniform gas fraction X. Here, we focus on the separation of dust particles from the gas, and neglect the coagulation and evaporation of dust particles. The total mass of the disk, M(sub disk), varies from 2M(sub moon) to 4M(sub moon), where M(sub moon) is the present lunar mass. We approximate the initial surface density of the disk is proportional to the negative power of distance from the Earth, Sigma is proportional to r(exp -alpha), where alpha is a parameter which denotes the compactness of the disk (alpha = 1, 3, and 5).
Derived from text
Accretion Disks; Planetary Evolution; Hypervelocity Impact; Protoplanets

20040055959 NASA Ames Research Center, Moffett Field, CA, USA
Radial Migration of Phyllosilicates in the Solar Nebula
Ciesla, F. J.; Lauretta, D. S.; Hood, L. L.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has long been recognized that the high temperatures of the inner solar nebula (within approx. 3 AU) would not have allowed water to be incorporated into solids. However, the presence of water on the surface of Earth, as well as evidence for it on the surface of an early Mars imply that water was incorporated into solid bodies in this region. How this water was delivered to the solid bodies has yet to be identified. In this abstract we explore the possibility that hydrous minerals, such as phyllosilicates, formed somewhere in the asteroid belt region of the solar nebula or beyond, and then migrated inward where they would be accreted into larger bodies.
Derived from text
High Temperature; Minerals; Solar Nebula; Solids; Water

20040055960 American Museum of Natural History, New York, NY, USA
Chondrule Formation by Current Sheets in Protoplanetary Disks
Ebel, D. S.; Joung, M. K. R.; MacLow, M.-M; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Theories of protoplanetary disk evolution require that the viscosity of the differentially rotating disk (the resistance of the disk to shear forces) be sufficient for stellar accretion on timescales of 10(exp 6) years. With only molecular (frictional) viscosity, accretion takes 10(exp 3) times longer. Vertical turbulent convection cannot provide the needed viscosity. The leading mechanisms for disk viscosity are (a) gravitational instability, which would drive density waves in the disk, and (b) coupling of the disk rotation to its magnetic field. In cold disk regions with a high mass density, gravitational instabilities could occur, and drive chondrule-forming shocks. Alternatively, magnetorotational instability (MRI) is predicted to occur in regions of the disk where the gas is ionized enough to couple to magnetic fields. Like spiral density waves, MRI effectively transfers angular momentum outward in the disk. The MRI also produces magnetic field gradients. In weakly ionized regions where neutral particles can slip through ions (i.e.-where ambipolar diffusion occurs), magnetic field gradients are predicted to grow steeper with time, producing sheets of strong electrical current. We propose that these current sheets could melt chondrule precursors.
Derived from text
Chondrule; Current Sheets; Protoplanetary Disks; Magnetohydrodynamics; Meteoritic Composition

20040055961 Planetary Science Inst., Tucson, AZ, USA
Resonant Capture of Irregular Satellites by a Protoplanet
Kortenkamp, S. J.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Numerical simulations of the gravitational scattering of planetesimals by a protoplanet reveal that a significant fraction of scattered planetesimals can become trapped very near the protoplanet in an unusual co-orbital resonance. The simulations include solar nebula gas drag and use planetesimals with diameters ranging from approx. 1 to approx. 1000 km. Protoplanet masses range from 2 to 15 Earth-masses, effectively covering both the range of likely core masses for Jupiter and Saturn, as well as the full masses of Uranus and Neptune. Protoplanet eccentricities range from e(sub p) = 0 to 0.15. For protoplanets on moderately eccentric orbits (e(sub p) > or = 0.1) most simulations show from 5-25% of all scattered planetesimals can become temporarily trapped in the resonance. While trapped, these resonant planetesimals can subsequently have deep low-velocity encounters with the protoplanet that result in temporary or permanent capture onto highly eccentric prograde or retrograde circumplanetary orbits. We used N-body simulations to model the combined effects of solar nebula gas drag and gravitational scattering of planetesimals by a protoplanet. None of the initial orbits were in co-orbital resonance with the protoplanets. In the N-body simulations, planetesimals were treated as massless test particles that had no mutual gravitational interactions nor any gravitational effect on the protoplanets. We used a v squared gas drag force, where v velocity of the planetesimal's motion with respect to the gas.
Derived from text
Orbital Resonances (Celestial Mechanics); Natural Satellites; Protoplanets; Gravitational Effects; Astronomical Models

20040055962 Carnegie Institution of Washington, Washington, DC, USA
Convective Cooling of Protoplanetary Disks and Rapid Giant Planet Formation
Boss, A. P.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The rapid formation of self-gravitating clumps of gas and dust in a marginally gravitationally unstable disk requires a reasonably efficient means of cooling the disk gas. Clumps form on the dynamical time scale of a few orbital periods in the disk instability scenario. Radiative transfer is not able to cool the midplanes of optically thick protoplanetary disks fast enough to permit the disk instability mechanism to form dense clumps. However, vertically-oriented convective cells, driven by the temperature gradient between the disk's midplane and surface, appear to be capable of cooling the disk midplanes on the desired time scale. We demonstrate this possibility by analyzing the vertical convective energy fluxes in one of the first three dimensional radiative hydrodynamics model (HR) of clump formation by disk instability. Convective cells can be seen in the model, with vertical velocities (approx. 0.1 km/s) and energy fluxes large enough to cool the disk at the desired rate.
Derived from text
Convective Heat Transfer; Cooling; Protoplanetary Disks; Gas Giant Planets; Planetary Evolution

20040055963 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Predicting the Atmospheric Composition of Extrasolar Giant Planets
Sharp, A. G.; Moses, J. I.; Friedson, A. J.; Fegley, B., Jr.; Marley, M. S.; Lodders, K.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To date, approximately 120 planet-sized objects have been discovered around other stars, mostly through the radial-velocity technique. This technique can provide information about a planet s minimum mass and its orbital period and distance; however, few other planetary data can be obtained at this point in time unless we are fortunate enough to find an extrasolar giant planet that transits its parent star (i.e., the orbit is edge-on as seen from Earth). In that situation, many physical properties of the planet and its parent star can be determined, including some compositional information. Our prospects of directly obtaining spectra from extrasolar planets may improve in the near future, through missions like NASA's Terrestrial Planet Finder. Most of the extrasolar giant planets (EGPs) discovered so far have masses equal to or greater than Jupiter's mass, and roughly 16% have orbital radii less than 0.1 AU - extremely close to the parent star by our own Solar-System standards (note that Mercury is located at a mean distance of 0.39 AU and Jupiter at 5.2 AU from the Sun). Although all EGPs are expected to have hydrogen-dominated atmospheres similar to Jupiter, the orbital distance can strongly affect the planet's temperature, physical, chemical, and spectral properties, and the abundance of minor, detectable atmospheric constituents. Thermochemical equilibrium models can provide good zero-order predictions for the atmospheric composition of EGPs. However, both the composition and spectral properties will depend in large part on disequilibrium processes like photochemistry, chemical kinetics, atmospheric transport, and haze formation. We have developed a photochemical kinetics, radiative transfer, and 1-D vertical transport model to study the atmospheric composition of EGPs. The chemical reaction list contains H-, C-, O-, and N-bearing species and is designed to be valid for atmospheric temperatures ranging from 100-3000 K and pressures up to 50 bar. Here we examine the effect of stellar distance (e.g., incident ultraviolet flux, atmospheric

temperature) on the chemical properties of EGPs. The model is applied to two generic Class II and III intermediate temperature EGPs located at 3.3 and 0.27 AU from a solar-like parent star, and the results are compared with a model for Jupiter at 5.2 AU.
Derived from text
Atmospheric Composition; Extrasolar Planets; Gas Giant Planets; Planetary Evolution; Solar System

20040055964 NASA Ames Research Center, Moffett Field, CA, USA
When Push Comes to Shove: Gap-opening, Disk Clearing and the In Situ Formation of Giant Planets
Mosqueira, I.; Estrada, P. R.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Here we investigate a scenario in which cores as small as a few Earth masses stall in the terrestrial planet region, but continue to grow as a result of the Type I migration of other Earth sized objects, taking place in a timescale approx. 10(exp 6) years similar to the disk clearing timescale (such migration may thus significantly reduce the accretion efficiency, particularly in the terrestrial planet region). Since the core may intercept such inwardly migrating objects (possibly by altering the surface density to the point that the object stalls within the core's feeding zone) or coalesce with neighboring cores, its growth may continue until it reaches a CCM. The question then arises whether such a core can accrete enough gas to become a Jovian-sized giant planet. In the limit of low opacity (such that the protoplanet s tidal torque fails to clear gas from its feeding zone in time to prevent its accretion), the final mass of the planet is given by the gaseous isolation mass (provided alpha is < or approx. = 10(exp -4) and that the gas component dominates the planet's mass).
Derived from text
Planetary Evolution; Gas Giant Planets; Planetary Cores

20040055965 NASA Ames Research Center, Moffett Field, CA, USA
On the Final Mass of Giant Planets
Estrada, P. R.; Mosqueira, I.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the core accretion model of giant planet formation, when the core reaches critical mass, hydrostatic equilibrium is no longer possible and gas accretion ensues. If the envelope is radiative, the critical core mass is nearly independent of the boundary conditions and is roughly M(sub crit) ~ 10Mass of the Earth (with weak dependence on the rate of planetesimal accretion M(sub core) and the disk opacity k). Given that such a core may form at the present location of Jupiter in a time comparable to its Type I migration time (10(exp 5) - 10(exp 6) years) provided that the nebula was significantly enhanced in solids with respect to the MMSN and stall at this location in a weakly turbulent (alpha approximately less than 10(exp -4) disk, it may be appropriate to assume that such objects inevitably form and drive the evolution of late-phase T Tauri star disks. Here we investigate the final masses of giant planets in disks with one or more than one such cores. Although the presence of several planets would lead to Type II migration (due to the effective viscosity resulting from the planetary tidal torques), we ignore this complication for now and simply assume that each core has stalled at its location in the disk. Once a core has achieved critical mass, its gaseous accretion is governed by the given Kelvin-Helmholtz timescale.
Derived from text
Gas Giant Planets; Planetary Mass; Cosmology; Stellar Mass Accretion; Mathematical Models

20040055966 Carnegie Institution of Washington, Washington, DC, USA
Growth of Dust Particles and Accumulation of Centimeter-sized Objects in the Vicinity of a Pressure-enhanced Region of a Solar Nebula
Haghighipour, N.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The results of a numerical study of the effects of gas-drag and pressure gradients on the growth and accumulation of micron-sized to millimeter-sized objects in the vicinity of a local pressure maximum of a nebula are presented. It has recently been shown that the combined effect of gas-drag and pressure gradients could cause solid objects to migrate toward the location of pressure enhancements on the midplane of a gaseous nebula. This paper will focus its study on the growth of an object due to the sweeping up of particles of a background material which is considered to be coupled to the gas. The effect

of such a growth on the rate of migration of the object and the implications of the combined effect of growth and gas-drag induced migration for collisional coagulations of small solids are also discussed.
Author
Solar Nebula; Numerical Analysis; Pressure Gradients; Interplanetary Dust; Gas Giant Planets

20040055967 NASA Johnson Space Center, Houston, TX, USA
Fast, Repeatable Clumping of Solid Particles in Microgravity
Kive, S. G.; Pettit, D. R.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A crucial step in planet formation is the growth of solid bodies in the sub-millimeter to meter size range: too large to condense directly from the gas phase and too small to interact meaningfully through mutual gravitation. The existence of planets in our solar system demands that some growth process once operated in that size regime, but the mechanism has not been positively identified. Whatever it was, it worked despite nebular turbulence that was probably strong enough to break dust structures cohering by weak surface forces and to disrupt small-scale gravitational collapse via the Goldreich-Ward mechanism. Recent work on this topic, reviewed in, has focussed on ice and frost in the laboratory, silicate dust in drop-tower and orbital microgravity environments, and numerically modelled magnetic particles.
Derived from text
Dust; Gravitational Collapse; Ice; Microgravity; Turbulence; Vapor Phases

20040055968 Brown Univ., Providence, RI, USA
Overturn of Unstably Stratified Fluids: Implications for the Early Evolution of Planetary Mantles
Zaranek, S. E.; Parmentier, E. M.; Elkins-Tanton, L. T.; Lunar and Planetary Science XXXV: Origin of Planetary Systems; 2004; 2 pp.; In English; See also 20040055955; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Models for Mars and the Moon that treat a deep magma ocean predict that magma ocean fractional crystallization creates initial density stratification in the solidified mantle. This stratification is gravitationally unstable with respect to overturn. Subsequent overturn to a stable configuration may have important implications for the production of the earliest crust. The final stable compositional configuration would also control the subsequent evolution of the planet through the distribution of heat producing elements and compositional controls on density and rheology. These factors will influence the vigor and depth extent of subsequent solid-state thermal convection. Deep, stable, dense layers that founder during overturn may remain sequestered from convective mixing and melting, thus effectively changing the apparent bulk compositional of the mantle. Two dimensional numerical experiments are presented to characterize overturn.
Derived from text
Planetary Mantles; Stratification; Planetary Evolution; Stability; Rheology

20040055983 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Mars Tectonism and Volcanism
2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040055984 - 20040055992
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

The session 'Mars Tectonism and Volcanism', included the following reports:Structural Attitudes of Large Scale Layering in Valles Marineris, Mars, Calculated from Mars Orbiter Laser Altimeter Data and Mars Orbiter Camera Imagery; Stratigraphy of Eastern Coprates Chasma, Mars; Temporal Variability in Tharsis Stress State Based on Wrinkle Ridges and Strike-Slip Faulting; State of Stress in the Martian Lithosphere; Displacement-Length Scaling of Faults on Earth, Mars, and Beyond; Topographic Analysis of Quasi-Circular Depressions Around the Utopia Basin, Mars; The Olympus Mons Aureole Deposits: New Evidence for a Flank-failure Origin; Cerberus Fossae and Elysium Planitia Lavas, Mars: Source Vents, Flow Rates, Edifice Styles and Water Interactions; and Topographic Evidence for Eruptive Style Changes and Magma Evolution of Small Plains.
Derived from text
Mars Volcanoes; Mars Surface; Tectonics

20040055987 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Topographic Analysis of Quasi-Circular Depressions Around the Utopia Basin, Mars

Buczkowski, D. L.; Frey, H. V.; Roark, J. H.; McGill, G. E.; Lunar and Planetary Science XXXV: Mars Tectonism and Volcanism; 2004; 2 pp.; In English; See also 20040055983; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Orbiting Laser Altimeter (MOLA) has yielded a high-precision, topographic gridded data set. These data reveal the presence of Quasi-Circular Depressions (QCDs) in both the southern highlands and the northern lowlands . Many of these roughly circular depressions have no corresponding visible structural feature on the surface. It is proposed that these QCDs are the surface representation of buried impact craters . Based on this assumption, cumulative number vs. diameter curves were constructed, which placed the age of the buried surface of the northern lowlands in the Early Noachian .

Derived from text

Mars Surface; Topography

20040055989 Lunar and Planetary Inst., Houston, TX, USA

The Olympus Mons Aureole Deposits: New Evidence for a Flank-failure Origin

McGovern, P. J.; Smith, J. R.; Morgan, J. K.; Bulmer, M.; Lunar and Planetary Science XXXV: Mars Tectonism and Volcanism; 2004; 2 pp.; In English; See also 20040055983; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Olympus Mons is an immense volcano, reaching up to 23 km height above base and 600 km in diameter, located to the northwest of the Tharsis Rise on Mars. The volcanic edifice is partially bounded by an escarpment of height up to 10 km, known as the basal scarp. Lobate deposits with rugged morphology (the Olympus Mons aureole deposits, or 'OMAD') extend outwards from the base of the scarp for hundreds of kilometers, with greatest extents and widths to the northwest of the edifice. The origin of the OMAD is controversial. Plausible emplacement mechanisms for the OMAD fall broadly into two categories. Under the first category, flank failure, the OMAD are interpreted as material derived from the slopes of the Olympus Mons edifice either as catastrophic landslides or as thrusting or gravity spreading/sliding of local sediments or flank material at low strain rates. Structural modeling of stresses in a growing volcanic edifice subject to a detached basal boundary condition suggested an analog to the large landslides and slumps discovered off the flanks of Hawaiian volcanoes. The second group of hypotheses proposes that the OMAD are volcanic products, e.g., pyroclastic flows or eroded effusive volcanic flows emplaced locally, i.e., from a source beneath the deposits themselves, possibly predating the construction of the Olympus Mons edifice. For such scenarios, the basal scarp has no direct relation to the aureoles. The apparent absence of bedding in Viking images of aureole ridges led to their characterization as thick, easily eroded deposits typical of unwelded ash flow tuffs.

Derived from text

Mars Surface; Mars Volcanoes; Mineral Deposits; Structural Failure; Planetary Geology

20040055995 NASA Johnson Space Center, Houston, TX, USA

Redox Conditions Among the Terrestrial Planets

Jones, J. H.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Early solar system conditions should have been extremely reducing. The redox state of the early solar nebula was determined by the H2O/H2 of the gas, which is calculated (based on solar composition) to have been about IW-5. At high temperature under such conditions, ferrous iron would exist only as a trace element in silicates and the most common type of chondritic material should have been enstatite chondrites. The observation that E-chondrites form only a subset of the chondrite suite and that the terrestrial planets (Earth, Moon, Mars, Venus, 4 Vesta) contain ferrous and ferric iron as major and minor elements, respectively, implies that either most chondritic materials formed under conditions that were not solar or that early-formed metals oxidized at low temperature, producing FeO. For example, equilibrated ordinary chondrites (by definition, common chondritic materials), by their phase assemblage of olivine, orthopyroxene and metal, must fall not far from the QFI (Quartz-Fayalite-Iron) oxygen buffer. The QFI buffer is about IW-0.5 and, as we shall see, this fo2 is close to that inferred for many materials in the inner solar system.

Derived from text

Oxidation-Reduction Reactions; Solar System; Terrestrial Planets; Meteoritic Composition

20040055998 Chicago Univ., Chicago, IL, USA

The Origin of Oxygen Isotope Variations in the Early Solar System

Clayton, R. N.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Stripped of all its details, the pattern of oxygen isotope variations in meteorites and inner Solar Systems appears to consist of three major features: 1) A cluster of data near delta (18)O = delta (17)O = -40%, representing compositions of primary refractory inclusions; 2) A more diffuse cluster of data centered near delta (18)O = +5%, delta (17)O = +2%, representing compositions of ordinary chondrites, most achondrites and terrestrial planets; 3) A linear array between clusters 1 and 2, representing mixtures of the two end-members, as seen in altered refractory inclusions and in ureilites. This pattern has been interpreted as resulting from interaction of two reservoirs in which the oxygen had somewhat different nucleosynthetic histories: a (16)O-poor gas reservoir, and a dust reservoir that was enriched in (16)O of nucleosynthetic origin. With the advent of many new isotopic and elemental analyses of refractory inclusions, especially ion microprobe analyses on small physical scales, it has become evident that the (16)O-rich endmember is not dominated by residual solids, but is in fact a condensate from a (16)O-rich gas. Clayton postulated that this gas reservoir was the Solar Nebula, and that the Sun has delta 18 = delta 17 = 40%. This postulate will be tested directly by the measurement of the oxygen isotopic composition of the solar wind by the Genesis mission.

Derived from text

Oxygen Isotopes; Isotope Ratios; Meteoritic Composition; Solar System Evolution

20040055999 Alberta Univ., Edmonton, Alberta, Canada

Redox Complexity in Martian Meteorites: Implications for Oxygen in the Terrestrial Planets

Herd, C. D. K.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Terrestrial Planets Group of the Oxygen in the Solar System Initiative seeks to understand redox and isotopic variation within and between the inner planets. Implicit in this goal is a desire to quantify and characterize: 1) the initial conditions of the planets at the time of accretion, and 2) the processes that have acted since that time to modify those characteristics. These aspects may differ between planets, due to broad differences in planetary evolution; however, it is these differences that may yield the most insight. A summary of recent studies and interpretations of the redox conditions of martian meteorites provides an illuminating example. The purpose of this abstract is to summarize the techniques, general results, and interpretations regarding the redox conditions of martian basalts (i.e., the shergottite meteorites); specific results can be obtained from the references herein.

Author

Mars (Planet); Oxidation-Reduction Reactions; Oxygen; Terrestrial Planets; SNC Meteorites

20040056003 Washington Univ., Saint Louis, MO, USA

On the Oxidation States of the Galilean Satellites: Implications for Internal Structures, Ocean Chemistry, and Magnetic Fields

McKinnon, W. B.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The interiors of the Moon and Mars are highly reduced and by inference the interior of the early Earth was as well. Oxidation by means of aqueous alteration and hydrogen loss is likely responsible for the more oxidized nature of the martian crust, and through subduction transport, at least some of the oxidation of the Earth's upper mantle. The Galilean satellites formed from material gravitationally attracted from solar orbit to Jupiter after its initial formation. Thermochemical reprocessing of this material in the jovian subnebula may have been minimal, especially in the gas-starved disk, and thus the satellites probably accreted from material similar to that which makes up the dark asteroids of the outermost asteroid belt and Trojan groups at best partially aqueously altered solar composition rock and metal mixed with water ice and carbonaceous matter. With water available in excess, the Galilean satellites are potentially among the most oxidized bodies in the solar system, with numerous consequences for their evolution and present states. A discussion on the internal evolution, ocean chemistry and magnetic fields of Io, Europa and Ganymede is presented.

Derived from text

Galilean Satellites; Oxidation; Planetary Geology; Magnetic Fields; Extraterrestrial Oceans; Planetary Structure

20040056004 Maryland Univ., College Park, MD, USA

Implications of Sulfur Isotopes for the Evolution of Atmospheric Oxygen

Farquhar, J.; Johnston, D. T.; Calvin, Christina; Condie, Kent; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An atmospheric origin for the origin of nonzero DELTA S-33 is preferred, and the disappearance of large nonzero DELTA S-33 at approximately 2.45 Ga is interpreted to reflect the initial rise of atmospheric oxygen. It is not known whether oxygen rose to near present levels, or intermediate levels immediately after 2.45 Ga, or whether oscillations in atmospheric oxygen levels occurred. The responsible mechanism for these mass-independent fractionations must similarly produce a DELTA S-36 anomaly that is correlated with DELTA S-33.

Author

Oxygen; Sulfur Isotopes; Chemical Reactions; Atmospheric Composition

20040056005 Arizona Univ., Tucson, AZ, USA

Oxygen in the Outer Solar System

Lunine, J. I.; Kargel, J. S.; Calvin, W.; Gautier, Daniel; Moses, J.; Owen, T. C.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Outer Planets team for the LPI Solar System Oxygen Initiative will survey the role of oxygen in the formation and evolution of the outer planets and their satellites as well as the role oxygen plays in current processes. We will consider oxygen in the atmospheres and interiors of the gas giants and their satellites, and on satellite surfaces in hydrated minerals and a variety of ices (water, SO2, CO2, as well as oxygen, ozone and peroxides). Topics of interest include current models of solar system formation and outer planet satellite accretion; the delivery of volatiles to Earth and the inner planets; establishment of oxidation states of other oxygen-bonded elements in the cores, mantles, crusts, and oceans of icy satellites during their differentiation and in ongoing processes; surface and atmospheric modification through sublimation, hydration/dehydration, photochemistry, and ion-molecule (plasma) interactions. We will explore the relationship of outer planet oxygen reservoirs to those in the inner solar system, the early solar system, and comets through the mediation of water. The use of isotopic and elemental measurements as indicators of formation processes, evolution pathways, and sources of oxygen and current processes in different objects will be examined.

Author

Planetary Evolution; Solar System Evolution; Oxygen; Abundance

20040056006 Massachusetts Inst. of Tech., Cambridge, MA, USA

Tracing Meteorites to Their Sources Through Asteroid Spectroscopy

Binzel, R. P.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 1 pp.; In English; See also 20040055994

Contract(s)/Grant(s): NAG5-12355; NSF AST-02-05863; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The goal of tracing meteorites to their main-belt sources is seemingly impossible given the inherent uncertainties in relating astronomical remote sensing measurements of asteroids to laboratory measurements of meteorites. What's more, the chaotic routes for delivery of meteorites would seem to be sufficient to mask any trace of their points of origin. Yet reasonably compelling links can be made for the origin for two meteorite types: highly reduced enstatite achondrites (aubrites) appear to have a source from the inner most edge of the main-belt known as the Hungaria region; reduced basaltic achondrite howardite-eucrite-diogenite (HED) meteorites are plausibly derived from the large asteroid 4 Vesta. Beyond these specific examples, we seek to find additional evidence to more thoroughly pinpoint original locations for the much wider range of meteorite types and the oxidation environments they sample. A discussion on Near Earth asteroids along with CCD visible and near-infrared spectra observations are presented.

Derived from text

Asteroids; Meteorites; Remote Sensing; Spectroscopy

20040056021 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Plenary Session
2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040056022 - 20040056022
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

The Dwornik Awards were presented at the plenary session, which includes the Masursky Lecture: 'Planetary Science: A New Discipline?'

CASI
Planetary Composition; Planetary Evolution

20040056023 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXV: Venus
2004; In English; Lunar and Planetary Science XXXV, 15-19 Mar. 2004, Houston, TX, USA; See also 20040056024 - 20040056032
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1197; Copyright; Avail: CASI; C01, CD-ROM

The session 'Venus' included the following reports:Is It Possible to Detect Magnetic Materials on Venus with Bistatic Radar Probing?; Airfall Crater Deposits on the Surface of Venus: Do We See Them in the Venera Panoramas?; Rift System Architecture on Venus; Constraints on Deformation Belt Evolution on Venus; An Admittance Survey of Large Volcanoes on Venus: Implications for Volcano Growth; Crustal Thickening Above a Convecting Mantle with Application to Venus and Mars; Geological Mapping of Venus: Interpretation of Geologic History and Assessment of; Directional and Non-Directional Models; Ages of Venusian Ridge Belts Relative to Regional Plains; and Plumes as a Mechanism for Equilibrium Resurfacing of Venus.

Derived from text
Venus (Planet); Mars (Planet); Planetary Surfaces

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20040051100 Communications Research Lab., Tokyo, Japan
Solar Wind Plasma Instrument for the L5 mission
Miyake, Wataru; Kazama, Youichi; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 27-46; In English; See also 20040051097; Copyright; Avail: Other Sources

The objectives of the solar wind plasma instrument for the L5 mission are to forecast the geomagnetic storms by means of the measurement of solar wind parameters for identifying the disturbances, and to study the particle acceleration processes, wave-particle interactions and propagation of accelerated particles in the interplanetary space. The instrument has a set of electrostatic deflectors for 2(pi) str field of view and a spherical electrostatic analyzer. We developed a numerical model to obtain the energy-angle characteristics and the geometrical factor of the instrument. We conclude that the instrument under consideration is suitable for the solar wind plasma measurement.

Author
Solar Wind; Plasmas (Physics); Magnetic Storms; Wind Measurement; Forecasting

20040051101 Communications Research Lab., Tokyo, Japan
A Forecast Tool using Java Script for Predicting Arrival Time of Interplanetary Disturbances to the Earth
Watari, Shin-ichi; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 47-54; In English; See also 20040051097; Copyright; Avail: Other Sources

In this report, we presented a forecast tool to predict arrival time of interplanetary disturbances using a simple model and evaluation of this tool. The tool was written in Java script and arrival time of disturbances was calculated on web. Input

parameters of this tool are occurrence time and initial speed of solar source of disturbance and background solar wind speed. Author

Coronal Mass Ejection; Predictions; Forecasting

20040051107 Communications Research Lab., Tokyo, Japan

Research on a System for Monitoring, Analyzing, and Forecasting of the Space Environment

Kikuchi, Takashi; Journal of the Comminications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 1; In English; See also 20040051097; Copyright; Avail: Other Sources

In the 21st century, an age of widespread space-based endeavors, satellite communication, broadcast, and positioning applications have become an essential part of our social and economic activities. Furthermore, opportunities for manned space activities are increasing, such as through the utilization of the International Space Station, and in the future, space tourism may become a reality. Accordingly, the CRL has been pursuing research to develop technologies to monitor, analyze, and forecast variations in numerous space weather phenomena, in order to sustain a high-tech society that relies heavily on satellite technology. An additional goal of such research is to minimize human exposure to radiation during manned space activities. The Special Issue of Space Weather Forecasting I (Sept. 2002 issue) presented the results of research concerning variations in the space environment that interfere with normal satellite operation. The present issue is a compilation of the results of research focusing mainly on the development of technologies for monitoring, analyzing, and forecasting the space weather. This issue consists of two parts: the first deals with the development of technologies relating to the sun and solar winds, the magnetosphere, and the ionosphere and thermosphere; the second deals with the development of technologies to be applied to systems of collecting and distributing space weather information. The section on the sun and solar winds presents the results of optical and radio observations of solar surface phenomena that cause space environment variations, in addition to the results of studies on the methods of predicting the arrival time at the Earth of solar surface disturbances. This section also contains a paper regarding a project involving observation of coronal gas (coronal mass ejections) using solar-orbiting satellites. The section on the magnetosphere consists of a paper on a receiving system for satellites that perform direct observation of solar wind disturbances, another paper on the development of instrumentation and satellite data-acquisition system to observe various magnetospheric phenomena, and a paper on a system for monitoring magnetosphere-ionosphere disturbances using ground magnetometer networks. The section on the ionosphere and the thermosphere presents papers on the technology for total electron content (TEC) of which variations cause errors in positioning, and on the observation of ionospheric variations. The second part of this issue, dealing with information services, consists of papers on a remote control system for ionospheric observation and a system for the distribution of space weather information. We hope that this issue, together with Special Issue I, will con- tribute to a deeper understanding of the space weather phenomena that occur between the sun and the Earth and of the methods for monitoring, analyzing, and forecasting these phenomena.

Author

Solar Cosmic Rays; Solar Flares; Solar Prominences; Solar Radio Bursts; Forecasting; Information Systems; Satellite Communication

20040051109 Communications Research Lab., Tokyo, Japan

Solar and Solar Wind: L5 Mission and observation of Interplanetary CME

Akioka, Maki; Nagatsuma, Tsutomu; Miyake, Wataru; Ohtaka, Kazuhiro; Maruhashi, Katsuhide; Journal of the Communications Research Lab. Special Issue on Space Weather Forecast II: Development of Observation and Forecasting Systems and Information Services, Volume 49, No. 4; December 2002, pp. 12-26; In English; See also 20040051097; Copyright; Avail: Other Sources

CME (Coronal Mass Ejection) is one of the most important drivers of space environment disturbances. The 'L5 mission' is the first challenge to track propagating CME toward the earth by side-view observation from the 5th Lagrangian point of the sun and the earth system. On 2002, international corporation program for construction space weather observation network with space missions (International Living with a Star). Our L5 mission plan is expected as an important component of the program and CRL will promote the plan under collaboration with ISAS scientists and NASDA. Study and BBM development for wide field of view camera and high performance mission processor are already started in CRL. In this article, overview of the plan and the status of the development are briefly introduced.

Author

Coronal Mass Ejection; Space Weather; Meteorological Parameters; Data Processing Equipment

20040051183 Massachusetts Inst. of Tech., MA, USA
Reduction and Analysis of Data from the IMP 8 Spacecraft
[2003]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-8031
Report No.(s): MIT-OSP-6807100; No Copyright; Avail: CASI; A01, Hardcopy

The IMP 8 spacecraft was launched in 1973 and the MIT solar wind Faraday Cup experiment continues to produce excellent data except for a slightly increased noise level. Those data have been important for determining the solar wind interaction with Earth's magnetic field; studies of interplanetary shocks; studies of the correlation lengths of solar wind features through comparisons with other spacecraft; and more recently, especially important for determination of the regions in which the Wind spacecraft was taking data as it passed through Earth's magnetotail and for understanding the propagation of solar wind features from near 1 AU to the two Voyager spacecraft.
Derived from text
Solar Wind; Plasma Interactions; Geomagnetism; Noise Intensity; Geomagnetic Tail

20040052863 Johns Hopkins Univ., Baltimore, MD, USA
O VI Emission from the Interstellar Medium
Shelton, Robin L.; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-10394; No Copyright; Avail: CASI; A01, Hardcopy

This project's primary goal was to examine the Local Bubble, a large hot bubble surrounding the solar neighborhood. In order to do this, we observed the 1032 and 1038 A resonance line emission from O VI in the bubble and used the,results to comment on models for the Local Bubble and its embedded clouds. In order to maximize the signal to noise of our spectrum, we combined the awarded guest investigator observation with unpublished FUSE In Orbit Checkout observations. The resulting spectrum was sufficiently good as to enable us to place tight 2 sigma upper limits on the intensities of the 1032 and the 1038 A resonance lines. We also measured or placed upper limits on the other cosmic lines in the bandpass, including C III and C II. These are the first known ultraviolet emission line measurements and/or upper limits for the gas in the Local Bubble (as opposed to gas anywhere along long lines of sight). With the O VI upper limits, we were able to quantitatively evaluate competing theories for the origins of the Local Bubble. The upper limits are well below those expected in the Breitschwerdt model (which proposes that during its its early development, the Local Bubble rapidly expanded beyond its nascent cloud and, as a result, is now vastly underionized). The upper limits on the O VI resonance line doublet intensity and the measurement of the C III intensity, garnered from this project, combined with measurements of the O VI column density, garnered from another project, are so far below the predictions, that they make a good case for eliminating the Breitschwerdt model from the field of possibilities. Thus, instead of being vastly underionized, the Local Bubble is near ionizational equilibrium. In addition, the upper limits challenge the other well-known model for the Local Bubble. In that model, the Local Bubble was blown by a series of supernova explosions and winds and contains a myriad of evaporating clouds. The intensity of the O VI resonance line doublet predicted from models exceeds the observationally determined 2 sigma upper limits. The discrepancy prompts the exciting suggestion that there may be some astrophysics yet to be considered in standard hydrodynamic models. These measurements performed a second useful function. By subtract- ing them from the O VI intensity observed on long sight-lines through the Galactic halo and Local Bubble, we were able to estimate the intensity originating the Galactic halo.
Author
Emission Spectra; Interstellar Matter; Bubbles; Line of Sight; Ultraviolet Emission; Visual Perception

20040052869 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Passage to a Ringed World: The Cassini-Huygens Mission to Saturn and Titan
Spilker, Linda J., Editor; October 1997; 168 pp.; In English
Report No.(s): NASA-SP-533; No Copyright; Avail: CASI; A08, Hardcopy

This book is for you. You will find that it lives up to the promise of its cover and title. The text is authoritative, but at the same time easy to understand. It is written for any layperson who is interested in space exploration. In this book, we will give you a good look at what is involved in sending a large spacecraft to the outer solar system. Join us and share in the excitement of this extended voyage of discovery! One of the first things you will learn is that Cassini Huygens is an international mission. Seventeen countries are involved. You will also learn that Huygens is an atmospheric probe that the Cassini spacecraft will deliver to Titan, the largest moon of Saturn. Titan has a gaseous atmosphere that is thicker and more obscuring than the atmosphere here on Earth. We will look through Titan s atmosphere with Cassini s radar and discover surface details for the first time. The mission will find out if there are really liquid hydrocarbons on Titan s surface in the form

of lakes or seas. The Cassini spacecraft itself will spend four years in orbit about Saturn. We will examine the rings and visit many of the satellites. We will sample special locations in the magnetosphere that are believed to harbor interesting some might say strange plasma processes (that is, electromagnetic interactions involving electrons, protons and ions). You can see in the table of contents the menu we have prepared for you. One chapter explains the mission, another the spacecraft. Other chapters tell you about Saturn, Titan, the rings and the various other parts of the Saturn system. These chapters reflect the facts and theories as we know them today. The chapters were prepared by expert researchers in each of the areas covered. Professional writers then edited the text for clarity and to make sure that you would not be overwhelmed with jargon and technospeak. Working hand-in-hand with them were graphic designers and illustrators who created the page layouts and the many informative diagrams. Finally, to assure that the final product was accurate, the book was reviewed by scientists and engineers who work on the Cassini Huygens mission. Come with us now as we set out on this voyage of exploration. We have over three billion kilometers to go! It will take more than six years to reach Saturn. We will get there on July 1, 2004. By the end of the Cassini Huygens mission, four years later, we will have completed the most complicated scientific experiment ever performed. We wish you good reading!
Author
Cassini Mission; Electromagnetic Interactions; Environmental Monitoring; Gas Giant Planets; Plasmas (Physics); Saturn Rings; Space Exploration

20040053352 National Center for Atmospheric Research, Boulder, CO, USA
Testing and Calibration of the NASA COR1 Coronagraph for the Solar Terrestrial Relations Observatory (STEREO)
Burkepile, J. T.; [2001]; 42 pp.; In English
Contract(s)/Grant(s): NAG5-12049
Report No.(s): NCAR-2001-092; No Copyright; Avail: CASI; A03, Hardcopy

This proposal is for a no cost extension on the period of performance of the existing grant. The period of performance shall be extended to the end of FY 2003. This extension is required due to schedule changes in the COR1 program. Funding for Phase II and Phase III of this grant has been obtained. This unsolicited proposal was for scientific and engineering collaboration between NASA s Goddard Space Flight Center (GSFC) and HAO. Performance testing of the COR1 engineering test unit has been partially completed. The COR1 coronagraph engineering test unit requires further testing at NASA s GSFC and the National Center for Atmospheric Research (NCAR) Mauna Loa Solar Observatory (MLSO), operated by the High Altitude Observatory (HAO). HAO personnel have recently supported efforts to test component and breadboard versions of the COR1 using the NCAR Vacuum Tunnel Facility (NVTF). HAO personnel will continue to work closely with scientists and engineers at NASA/GSFC in the development, design, assembly, testing, and operation of this key element of NASA's Solar Terrestrial Relations Observatory (STEREO) mission. The element is an internally-occulted coronagraphic telescope, and the design and development effort is already underway at GSFC.
Author
Calibrating; Performance Tests; Coronagraphs; Solar Terrestrial Interactions

20040055896 NASA, Washington, DC, USA
New Thematic Solar System Exploration Products for Scientists and Educators
Lowes, Lesile; Wessen, Alice; Davis, Phil; Lindstrom, Marilyn; Lunar and Planetary Science XXXV: Education Programs Demonstations; March 19, 2004; 1 pp.; In English; See also 20040055893; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The next several years are an exciting time in the exploration of the solar system. NASA and its international partners have a veritable armada of spaceships heading out to the far reaches of the solar system. We'll send the first spacecraft beyond our solar system into interstellar space. We'll launch our first mission to Pluto and the Kuiper Belt and just our second to Mercury (the first in 30 years). We'll continue our intensive exploration of Mars and begin our detailed study of Saturn and its moons. We'll visit asteroids and comets and bring home pieces of the Sun and a comet. This is truly an unprecedented period of exploration and discovery! To facilitate access to information and to provide the thematic context for these missions NASA s Solar System Exploration Program and Solar System Exploration Education Forum have developed several products.
Derived from text
Space Exploration; Solar System; Asteroids

20040055996 Los Alamos National Lab., NM, USA
Solar and Solar-Wind Oxygen Isotopes and the Genesis Mission
Wiens, R. C.; Burnett, D. S.; McKeegan, K. D.; Thiemens, M. H.; Franchi, I. A.; Franchi, I. A.; Bochsler, P.; Lunar and

Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The oxygen isotope heterogeneity exhibited by a wide variety of solar system materials is not understood. Various models that will likely be discussed in this oxygen isotope session include 1) partial equilibration of O-16 enriched solids with isotopically heavier gases in the solar nebula to produce the slope-1 mixing line on the oxygen three-isotope plot; 2) non-mass-dependent fractionation by gas-phase chemical reactions to produce a trend with a slope of exactly 1.0; 3) oxygen isotopic self-shielding to enrich starting materials in O-17,O-18. It is widely accepted that an accurate oxygen isotope composition measurement for the Sun, which represents >99% of all material in the present-day solar system, would distinguish between these theories, thereby providing important information on the processing of pre-planetary materials in the solar nebula. In the case of the nebular mixing model, the predicted solar composition is heavier than oxygen in meteoritic or planetary bodies. Non-mass dependent chemical fractionation predicts a solar composition that is close to the average of meteoritic and planetary materials, i.e., close to the terrestrial fractionation line. On the other hand, isotopic self-shielding would be expected to enrich planetary materials in heavy isotopes of oxygen, in which case the solar oxygen composition would be isotopically light, similar to oxygen in calcium-aluminum inclusions.

Derived from text

Solar Wind; Genesis Mission; Chemical Reactions; Slopes; Oxygen Isotopes

20040056000 New Mexico Univ., Albuquerque, NM, USA

Oxygen Isotopes in Early Solar System Materials: A Perspective Based on Microbeam Analyses of Chondrules from CV Carbonaceous Chondrites

Jones, R. H.; Leshin, L. A.; Guan, Y.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994

Contract(s)/Grant(s): NAG5-9463; NAG5-7540; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Some of the biggest challenges to understanding the early history of the solar system include determining the distribution of oxygen isotopes amongst materials that existed in the solar nebula, and interpreting the processes that might have resulted in the observed isotopic distributions. Oxygen isotope ratios in any individual mineral grain from a chondritic meteorite may be the cumulative product of a variety of processes, including stellar nucleosynthetic events, gas/solid interactions in the molecular cloud, mixing of independent isotopic reservoirs in the nebula, mass-independent processing in the nebula, and mass-dependent fractionation effects in various environments. It is not possible to unravel this complex isotopic record unless the distribution of oxygen isotope ratios in chondritic materials is fully understood.

Derived from text

Oxygen Isotopes; Solar System; Solar Nebula; Chondrule; Carbonaceous Chondrites

20040056001 New Mexico Univ., Albuquerque, NM, USA

Oxygen in the Solar System: Origins of Isotopic and Redox Complexity

Papike, J. J.; Mackwell, S.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Oxygen is the third most abundant element in the cosmos. Late in the last millennium, cosmochemists discovered that objects in the solar system show wide ranges in the isotopic composition of oxygen, and extreme variations in oxidation state as evidenced in mineralogy and mineral chemistry. Yet, while these variations are well documented, an overarching model to explain their development remains beyond our grasp. But our scientific reach should always exceed our grasp. The NASA Cosmochemistry Program and the Lunar and Planetary Institute are therefore sponsoring a five-year initiative aimed at better understanding how these variations came to be, and what they tell us about the formation and evolution of the solar system. The Oxygen in the Solar System initiative is not limited to that element. Rather, the initiative anticipates that a wide range of topics as described below need to be addressed in order to further our understanding of how oxygen isotopic and chemical variations were established, and the processes that have affected them since. Addressing such a wide variety of topics will be difficult. Our intent, therefore, is to leverage the latent, inherent synergies of the NASA Cosmochemistry Program and also incorporate input from the international planetary and geoscience communities.

Derived from text

Cosmochemistry; Isotopes; Minerals; Oxidation-Reduction Reactions; Solar System

20040056002 Clemson Univ., SC, USA
Solar O-18/O-17 and the Setting for Solar Birth
Clayton, D. D.; Lunar and Planetary Science XXXV: Special Session: Oxygen in the Solar System, I; 2004; 2 pp.; In English; See also 20040055994; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Solar oxygen contains an anomalously high fraction of O-18. I here attribute that excess O-18 to the supernova starburst initiated by the merger of a satellite galaxy with the Milky Way. This starburst spawned the mixing line seen in the AGB star compositions whose SiC dust constitutes the observed mainstream SiC grains. The number of starburst AGB stars born in this short time interval exceeds that born locally by the steady rate of galactic star birth, so they dominate the SiC grains. Given that, the anomalously large O-18/O-17 ratio in the sun resulted from these presolar circumstances for the origin of the sun. Author
Oxygen 18; Asymptotic Giant Branch Stars; Starburst Galaxies; Oxygen 17; Solar System Evolution

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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*.

20040051181 Central Arizona Coll., Coolidge, AZ, USA
UV Studies of Jupiter's Aerosols and Hydrocarbons
Pryor, Wayne; [2004]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

This project funded research related to our involvement in the Galileo Ultraviolet Spectrometer experiment. Pryor was a Co-I on that experiment, which recently ended when Galileo crashed into Jupiter's atmosphere. It also funded related research on HST observations of Jupiter's atmosphere, and Cassini observations of Jupiter's atmosphere, and ground-based studies of Jupiter's atmosphere using the facilities of McDonald Observatory. Specific activities related to this grant include study of UV spectra returned by Galileo UVS and Cassini UVIS, development of simple models to explain these spectra, participation in archiving activities for these data sets, travel to conferences, and publication of scientific papers. Highlights of our Jupiter research efforts include: 1.) evidence for heavy hydrocarbons in Jupiter's atmosphere (from HST) (Clarke et al. poster), that may be the source of Jupiter's stratospheric aerosols, 2.) detection of auroral flares in Jupiter's atmosphere from Galileo (Pryor et al., 2001). 3.) establishing a connection between coronal mass ejections and auroral outbursts (Gurnett et al., 2002), and 4) establishing a connection between short-term variations in Jupiter's auroral emissions and radio emissions (Pryor et al. presented at AGU in 2002, paper in preparation).
Derived from text
Galileo Spacecraft; Ultraviolet Spectra; Jupiter Atmosphere; Hydrocarbons; Coronal Mass Ejection; Aerosols

20040055352 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Distribution of Hydrogen Peroxide, Carbon Dioxide, and Sulfuric Acid in Europa's Icy Crust
Carlson, R. W.; Workshop on Europa's Icy Shell: Past, Present, and Future; 2004, pp. 15; In English; See also 20040055312; No Copyright; Avail: CASI; A01, Hardcopy

Galileo's Near Infrared Mapping Spectrometer (NIMS) detected hydrogen peroxide, carbon dioxide and a hydrated material on Europa's surface, the latter interpreted as hydrated sulfuric acid (H2SO4*nH2O) or hydrated salts. Related compounds are molecular oxygen, sulfur dioxide, and two chromophores, one that is dark in the ultraviolet(UV) and concentrated on the trailing side, the other brighter in the UV and preferentially distributed in the leading hemisphere. The UV-dark material has been suggested to be sulfur.
Derived from text
Galileo Spacecraft; Near Infrared Radiation; Infrared Spectrometers; Carbon Dioxide; Hydrogen Peroxide; Sulfuric Acid; Europa

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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.

20040053380 NASA, Washington, DC, USA
ASK Magazine, No. 16
Laufer, Alexander, Editor; Post, Todd, Editor; Brady, Jody Lannen, Editor; February 2004; 47 pp.; In English; See also 20040053381 - 20040053388; Original contains black and white illustrations
Report No.(s): NASA/NP-2004-01-333-HQ; No Copyright; Avail: CASI; A03, Hardcopy

The contents include the following: The Journey Back;What GOES Around, Comes Around;Marbles for the Imagination;End-to-End Commitment;Fly Away; Going Up; Say What You Mean; ASK Talks with William Ready.
Derived from text
Astronauts; Education

20040053381 NASA, Washington, DC, USA
ASK Talks with William Readdy
ASK Magazine, No. 16; February 2004, pp. 38-43; In English; See also 20040053380; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

An interview with William Readdy is presented.Rsaddy graduated From the USA Naval Academy in 1974. After eleven years service as a naval aviator and test pilot, he joined NASA in 1986 as a research pilot. His technical assignments to date have included Training and Safety Officer, Orbiter project staff; NASA Director of Operations in Star City, Russia; and Space Shuttle Program Development Manager.
CASI
Astronauts; Biography

20040053540 California Univ., Berkeley, CA, USA
Cosmic: Carbon Monoxide And Soot In Microgravity Inverse Combustion
Mikofski, M. A.; Blevins, L. G.; Davis, R. W.; Moore, E. F.; Mulholland, G. W.; Sacksteder, Kurt, Technical Monitor; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 53-56; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

Almost seventy percent of fire related deaths are caused by the inhalation of toxins such as CO and soot that are produced when fires become underventilated.(1) Although studies have established the importance of CO formation during underventilated burning,(2) the formation processes of CO (and soot) in underventilated fires are not well understood. The goal of the COSMIC project is to study the formation processes of CO and soot in underventilated flames. A potential way to study CO and soot production in underventilated flames is the use of inverse diffusion flames (IDFs). An IDF forms between a central air jet and a surrounding fuel jet. IDFs are related to underventilated flames because they may allow CO and soot to escape unoxidized. Experiments and numerical simulations of laminar IDFs of CH4 and C2H4 were conducted in 1-g and micro-g to study CO and soot formation. Laminar flames were studied because turbulent models of underventilated fires are uncertain. Microgravity was used to alter CO and soot pathways. A IDF literature survey, providing background and establishing motivation for this research, was presented at the 5th IWMC.(3) Experimental results from 1-g C2H4 IDFs and comparisons with simulations, demonstrating similarities between IDFs and underventilated fires, were presented at the 6th IWMC.(4) This paper will present experimental results from micro-g and 1-g IDFs of CH4 and C2H4 as well as comparisons with simulations, further supporting the relation between IDFs and underventilated flames.
Derived from text
Carbon Monoxide; Soot; Microgravity; Combustion; Diffusion Flames; Fires

20040053576 NASA Glenn Research Center, Cleveland, OH, USA
Modeling Candle Flame Behavior In Variable Gravity
Alsairafi, A.; Tien, J. S.; Lee, S. T.; Dietrich, D. L.; Ross, H. D.; Seventh International Workshop on Microgravity Combustion and Chemically Reacting Systems; August 2003, pp. 261-264; In English; See also 20040053504; No Copyright; Avail: CASI; A01, Hardcopy

The burning of a candle, as typical non-propagating diffusion flame, has been used by a number of researchers to study

the effects of electric fields on flame, spontaneous flame oscillation and flickering phenomena, and flame extinction. In normal gravity, the heat released from combustion creates buoyant convection that draws oxygen into the flame. The strength of the buoyant flow depends on the gravitational level and it is expected that the flame shape, size and candle burning rate will vary with gravity. Experimentally, there exist studies of candle burning in enhanced gravity (i.e. higher than normal earth gravity, g(sub e)), and in microgravity in drop towers and space-based facilities. There are, however, no reported experimental data on candle burning in partial gravity (g < g(sub e)). In a previous numerical model of the candle flame, buoyant forces were neglected. The treatment of momentum equation was simplified using a potential flow approximation. Although the predicted flame characteristics agreed well with the experimental results, the model cannot be extended to cases with buoyant flows. In addition, because of the use of potential flow, no-slip boundary condition is not satisfied on the wick surface. So there is some uncertainty on the accuracy of the predicted flow field. In the present modeling effort, the full Navier-Stokes momentum equations with body force term is included. This enables us to study the effect of gravity on candle flames (with zero gravity as the limiting case). In addition, we consider radiation effects in more detail by solving the radiation transfer equation. In the previous study, flame radiation is treated as a simple loss term in the energy equation. Emphasis of the present model is on the gas-phase processes. Therefore, the detailed heat and mass transfer phenomena inside the porous wick are not treated. Instead, it is assumed that a thin layer of liquid fuel coated the entire wick surface during the burning process. This is the limiting case that the mass transfer process in the wick is much faster than the evaporation process at the wick surface.
Derived from text

Electric Fields; Diffusion Flames; Burning Rate; Gravitational Effects; Microgravity; Heat Transfer; Flow Distribution

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