National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

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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.
- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.
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- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

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- Telephone the NASA STI Help Desk at (301) 621-0390
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  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

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

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

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

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

The NASA STI Program

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

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

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NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

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

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National Technical Information Service (NTIS)

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

The Federal Depository Library Program (FDLP)

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

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

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

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20040170436 Federal Aviation Administration, Washington, DC

Title 14 Code of Federal Regulations Part 145 Approved Training Program: Research and Recommendations

Berg, R.; Keller, S.; Burke, T.; Cassella, P.; Leonelli, F. J.; Oct. 2004; 78 pp.; In English

Report No.(s): PB2005-100546; DOT/FAA/AR-04/36; No Copyright; Avail: CASI; A05, Hardcopy

The Federal Aviation Administration (FAA) has significantly changed Title 14 Code of Federal Regulations (CFR) Part 145, which governs foreign and domestic air agencies that perform maintenance and alterations on U.S.-registered aircraft, engines, propellers, and appliances. In particular, there is a new provision-14 CFR 145.163-that requires each repair station to submit a training program to the FAA for approval no later than April 6, 2005. To assist industry and FAA inspectors in complying with this requirement, the FAA Flight Standards Aircraft Maintenance Division (AFS-300) requested the Risk Analysis Branch (ATO-P) to research the current state of training and to provide guidance and recommendations for establishing training programs at repair stations. The research team reviewed the FAA's and other aviation authorities' requirements on repair station training and conducted interviews with FAA and industry personnel. The general consensus among those interviewed was that the FAA should specify hourly requirements as well as acceptable content and format for the training programs. Due to the diversity of the maintenance segment of the aviation industry, the challenge for the FAA is to create a reasonable compromise between an acceptable minimum of formalized training at smaller, less complex repair stations without reducing the training offered by the larger repair stations. Based on the 14 CFR 145.163 regulatory requirement, the current state of training at repair stations, and the interview results with FAA and industry personnel, this report offers guidance and recommendations on establishing training programs at repair stations. The report discusses the elements and functions that constitute an effective training program and the recommended number of hours and topics for training repair station mechanics, managers, supervisors, and inspectors.

NTIS

Regulations; Air Transportation; Aircraft Industry

02
AERODYNAMICS

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

20040170655 Army Research Lab., Aberdeen Proving Ground, MD

Time-Accurate Simulations of Synthetic Jet-Based Flow Control for An Axisymmetric Spinning Body

Sahu, Jubaraj; Sep. 2004; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426557; ARL-TR-3300; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes a computational study undertaken to consider the aerodynamic effect of synthetic jets as a means of providing the control authority needed to maneuver a projectile at a low subsonic speed. A time-accurate Navier-Stokes computational technique has been used to obtain numerical solutions for the unsteady jet-interaction flow field for a spinning projectile at a subsonic speed, Mach 0.24, and angle of attack, 0 degree. Numerical solutions have been obtained by Reynolds-averaged Navier-Stokes (RANS) and hybrid RANS-large-eddy simulation turbulence models. Unsteady numerical

results show the effect of the jet on the flow field and the aerodynamic coefficients, particularly the lift force. These numerical results are being used to assess if synthetic jets can be used to provide the control authority needed for maneuvering munitions to hit the targets with precision.
DTIC
Aerodynamics; Axisymmetric Bodies; Flow Distribution; Jet Flow; Simulation

20040170678 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Aeroelastic Analysis of a Joined-Wing Sensorcraft
Sitz, Jennifer J.; Jun. 2004; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426635; AFIT/GAE/ENY/04-J12; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study performed an aeroelastic analysis of a joined-wing SensorCraft. The analysis was completed using an aluminum structural model that was splined to an aerodynamic panel model. The force and pressure distributions were examined for the four aerodynamic panels: aft wing, fore wing, joint, and outboard tip. Both distributions provide the expected results (elliptical distribution), with the exception of the fore wing. The fore wing appears to be affected by interference with the joint. The use of control surfaces for lift and roll was analyzed. Control surfaces were effective throughout most of the flight profile, but may not be usable due to radar requirements. The aft wing was examined for use in trimming the vehicle. Also, two gust conditions were examined. In one model, the wing twist was simulated using a series of scheduled control surfaces. Trim results (angle of attack and twist angle) were compared to those of previous studies, including gust conditions. The results are relatively consistent with those calculated in previous studies, with variations due to differences in the aerodynamic modeling. To examine a more physically accurate representation of aft wing twist, it was also modeled by twisting the wing at the root. The twist was then carried through the aft wing by the structure. Trim results were again compared to previous studies. While consistent for angle of attack results, the aft wing twist deflection remained relatively constant throughout the flight profile and requires further study.
DTIC
Aerodynamics; Aeroelasticity; Wings

20040170684 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Detached Eddy Simulation Analysis of Pak-B Low Pressure Turbine Blade
Malone, Kyle; Jun. 2004; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426651; AFIT/GAE/ENY/04J-06; No Copyright; Avail: Defense Technical Information Center (DTIC)

Two cases were computationally investigated using the detached eddy simulation (DES) turbulence model: an unmodified Pak-B blade and a Pak-B blade with a dimple located at 65% of axial chord. Both cases were created so that they simulated an infinite span with an infinite number of dimples. The cases were run for an inlet Reynolds number of 25,000. The computed results were used to resolve the location of separation and reattachment, visualize the streamlines for the dimpled case, build velocity magnitude contour and vector plots, and map the thickness of the boundary layer. The results were then compared to previous computational and experimental studies in order to validate the detached eddy simulation model for future research into the effect of dimples on low pressure turbine flow fields. For the unmodified blade, the performance of the DES model compared favorably to other available viscous and turbulence models. For the dimpled blade, preliminary results also compare favorably to other models although further development of the flow field is needed to verify this. Based on these results, future researchers studying dimples on turbine blades should strongly consider using the DES turbulence model.
DTIC
Aerodynamic Characteristics; Computerized Simulation; Low Pressure; Simulation; Turbine Blades; Vortices

20040171638 Defence Science and Technology Organisation, Fishermans Bend, Australia
DSPFRC: Force and Moment Data Display and Monitoring Program for the Low Speed Wind Tunnel at DSTO
Lam, Stephen; Blandford, Adam; June 2004; 23 pp.; In English
Report No.(s): DSTO-GD-0396; DODA-AR-013-134; Copyright; Avail: Other Sources

DSTO operates a low speed wind tunnel within the Air Vehicles Division of the Platforms Sciences Laboratory. Airspeeds up to approximately 100 m/s can be produced in the empty test section which is 2.7 m wide by 2.1 m high. Realtime display of acquired test data from the wind tunnel is important for providing feedback to the project manager and test engineer. A software package called DSPFRC was developed for this purpose, giving a graphical display of the force and moment

coefficients. This document provides details of the software and its operation. It also provides information on programming and development considerations of the software.
Author
Applications Programs (Computers); Data Acquisition; Low Speed Wind Tunnels

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*.

20040170427 Department of Transportation, Washington, DC, USA
Human Factors Integration Challenges in the Air Route Traffic Control Center (ARTCC) Environment
Cardosi, K.; May 2004; 118 pp.; In English
Report No.(s): PB2005-100242; DOT/VNTSC/FAA-04/07; No Copyright; Avail: CASI; A06, Hardcopy

This document describes human factors challenges that need to be considered in the implementation of planned enhancements in the en route (ARTCC) environment. Some of the enhancements are tools that have been developed specifically to increase efficiency and capacity. Others provide information (regarding weather or aircraft position) that is more precise than the information currently available to controllers. The scope is limited to the air traffic control (ATC) specialist's workstation and excludes issues specific to Airways Facilities and Air Traffic Management Units. Issues are discussed within the en route ATC environment and between the en route and terminal environments, flight deck, and traffic management, where applicable. The intent of this document is to pave the way for successful future integration efforts by identifying issues that need to be considered in the implementation process.
NTIS
Human Factors Engineering; Air Traffic Controllers (Personnel)

20040170704 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Fidelity Analysis of ATFS Series 400 G-FET II Motion-Based Flight Simulator
Ray, Kenneth L.; Jun. 15, 2004; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426725; AFIT/GAE/ENY/04-J10; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research was to analyze the fidelity of the ATFS400X centrifuge-based motion flight simulator. A survey was conducted during an event organized by Environmental Tectonics Corporation (ETC). The survey results were gathered and an overall pilot opinion of the ATFS400X was obtained. It was found that due to the physics of the centrifuge on which the ATFS400X is built, a high level of motion cueing fidelity can not be obtained for the purposes of authentic tactical combat flight simulation. This is due to frequent miscommunications with the brain about how the body is being moved by the visual and vestibular systems. These miscommunications cause spatial disorientation and motion sickness, hindering the effectiveness of training. Also, it was found that pilot acceptance is affected by the quality of visual cueing presented to them in the simulator. Specifically, they require adequate resolution and field of view. The ATFS400X was inadequate in these areas; however improvements can be made in the future.
DTIC
Field Effect Transistors; Flight Simulators; Motion Sickness; Motion Simulators

20040170832 Naval Safety Center, Norfolk, VA
The Naval Flight Surgeon's Pocket Reference to Aircraft Mishap Investigation. Fifth Edition
Jan. 2001; 213 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426968; No Copyright; Avail: Defense Technical Information Center (DTIC)

Aircraft mishap investigation can be extremely difficult, time consuming, stressful, but also rewarding when we recognize that the contributions we make will improve aviation safety. A thorough mishap investigation is absolutely necessary to determine the cascading events causal to a mishap and recommending corrective actions to prevent recurrence. This edition of the Pocket Reference introduces a new tool in accident investigation, the Human Factors Analysis and Classification System (HFACS). HFACS provides the accident investigator with a proven template that aids in organizing the investigation while

providing a detailed analysis of human error for post-hoc mishap data analysis, revealing previously unidentified trends and hazards.
DTIC
Accident Investigation; Aircraft Accidents; Flight Surgeons

20040171336 Select Committee on Homeland Security (U.S. House), Washington, DC, USA
America at Risk: Closing the Aviation Security Gap
May 2004; 20 pp.; In English
Report No.(s): PB2005-101006; No Copyright; Avail: CASI; A03, Hardcopy

Terrorists attacks involving aircraft continue to be of great interest to al Qaeda and a major threat to the security of the USA. Despite massive federal investments in aviation security since September 11, 2001, major security gaps remain. Serious deficiencies have been revealed in many of the layers of security the Transportation Security Administration has put in place at our nation's airports. To close security gaps in the aviation system, the Transportation Security administration should improve the performance of its screening workforce, take aggressive steps to secure air cargo adopt new measures to defend aircraft against missile attack, and improve controls over access to sensitive airport locations and airplanes.
NTIS
Security; Transportation; Air Cargo

20040171487 NASA Langley Research Center, Hampton, VA, USA
ADS-B within a Multi-Aircraft Simulation for Distributed Air-Ground Traffic Management
Barhydt, Richard; Palmer, Michael T.; Chung, William W.; Loveness, Ghyrn W.; [2004]; 10 pp.; In English; 23rd Digital Avionics Systems Conference (DASC), 24-28 Oct. 2004, Salt Lake City, UT, USA; Copyright; Avail: CASI; A02, Hardcopy

Automatic Dependent Surveillance Broadcast (ADS-B) is an enabling technology for NASA s Distributed Air-Ground Traffic Management (DAG-TM) concept. DAG-TM has the goal of significantly increasing capacity within the National Airspace System, while maintaining or improving safety. Under DAG-TM, aircraft exchange state and intent information over ADS-B with other aircraft and ground stations. This information supports various surveillance functions including conflict detection and resolution, scheduling, and conformance monitoring. To conduct more rigorous concept feasibility studies, NASA Langley Research Center s PC-based Air Traffic Operations Simulation models a 1090 MHz ADS-B communication structure, based on industry standards for message content, range, and reception probability. The current ADS-B model reflects a mature operating environment and message interference effects are limited to Mode S transponder replies and ADS-B squitters. This model was recently evaluated in a Joint DAG-TM Air/Ground Coordination Experiment with NASA Ames Research Center. Message probability of reception vs. range was lower at higher traffic levels. The highest message collision probability occurred near the meter fix serving as the confluence for two arrival streams. Even the highest traffic level encountered in the experiment was significantly less than the industry standard 'LA Basin 2020' scenario. Future studies will account for Mode A and C message interference (a major effect in several industry studies) and will include Mode A and C aircraft in the simulation, thereby increasing the total traffic level. These changes will support ongoing enhancements to separation assurance functions that focus on accommodating longer ADS-B information update intervals.
Author
Feasibility Analysis; Broadcasting; Surveillance; Air Traffic Control

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

20040170642 Air Force Inst. of Tech., Wright-Patterson AFB, OH
An Analysis of the Potential for Using Over-the- Horizon Radar Systems for Space Surveillance
Colbert, Matthew J.; Mar. 2004; 92 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426463; AFIT/GSS/ENG/04-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Australian Defence Force is investigating the development of a space surveillance system. While several dedicated facilities for space surveillance are in operation around the world, Australia s Over-The-Horizon Radar (OTHR) network has some potential for this role. The OTHR operates in the HF band and is constrained by the propagation effects of the

ionosphere. A spherically stratified ionospheric model and a model for a nominal OTHR antenna are developed that allow calculation of path propagation, power distribution, and clutter returns. A software-based radar receiver processing system is modeled to determine detection probabilities and the minimum detectable radar cross-section of targets in typical low earth orbit (LEO) trajectories. The high clutter power levels, coupled with long target ranges and high velocities, mean that range-Doppler tradeoffs have a great impact on the resulting detection capabilities. While the system as modeled has the potential to provide some coverage for LEO targets, operational constraints mean the necessary conditions for detection of space targets would rarely be met while the system is involved in traditional OTHR tasking. Further, the long wavelengths and large antenna beams mean the accuracy of any positioning information is low. The Australian Defence Force is investigating the development of a space surveillance system. While several dedicated facilities for space surveillance are in operation around the world, Australia's Over-The-Horizon Radar (OTHR) network has some potential for this role. The OTHR operates in the HF band and is constrained by the propagation effects of the ionosphere. A spherically stratified ionospheric model and a model for a nominal OTHR antenna are developed that allow calculation of path propagation, power distribution, and clutter returns.
DTIC
Earth Orbits; Over-the-Horizon Radar

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*.

20040170437 Wichita State Univ., Wichita, KS, USA
Comparison of Various Impedance Measurement Techniques for Assessing Degradation in Wiring Harness Shield Effectiveness and a Field Survey of FADEC Shield Integrity of In-Service Aircraft
O'Loughlin, J. B.; Skinner, S. R.; Oct. 2004; In English
Report No.(s): PB2005-100544; No Copyright; Avail: National Technical Information Service (NTIS)

This report compares the performance of various impedance measurement techniques for measuring degradation in wire harness shield effectiveness. For field measurements, comparisons were made between a Boeing loop resistance tester (LRT) and a Hewlett-Packard (HP) network analyzer. For laboratory measurements, comparisons were made between an HP network analyzer, a Boeing LRT operating at 200 Hz, an Airbus LRT operating at 1000 Hz, and a Keithley Model 580 Micro-Ohmmeter. In the field survey, the electrical characteristics of shielded wire bundles of an aircrafts critical system were analyzed for increase in shield loop resistance from time of manufacture through 5 years of service. Full Authority Digital Engine Control (FADEC) wire harnesses from general aviation business jet aircraft were chosen for this shield degradation field survey.
NTIS
Aircraft Engines; Control; Impedance Measurement

20040170644 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Swarming Reconnaissance Using Unmanned Aerial Vehicles in a Parallel Discrete Event Simulation
Corner, Joshua J.; Mar. 2004; 187 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426466; AFIT/GCE/ENG/04-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Current military affairs indicate that future military warfare requires safer, more accurate, and more fault- tolerant weapons systems. Unmanned Aerial Vehicles (UAV) are one answer to this military requirement. Technology in the UAV arena is moving toward smaller and more capable systems and is becoming available at a fraction of the cost. Exploiting the advances in these miniaturized flying vehicles is the aim of this research. How are the UAVs employed for the future military? The concept of operations for a micro-UAV system is adopted from nature from the appearance of flocking birds, movement of a school of fish, and swarming bees among others. All of these natural phenomena have a common thread: a global action resulting from many small individual actions. This 'emergent behavior' is the aggregate result of many simple interactions occurring within the flock, school, or swarm. In a similar manner, a more robust weapon system uses emergent behavior resulting in no 'weakest link' because the system itself is made up of simple interactions by hundreds or thousands of homogeneous UAVs. The global system in this research is referred to as a swarm. Losing one or a few individual unmanned vehicles would not dramatically impact the 'swarms' ability to complete the mission or cause harm to any human operator.

Swarming reconnaissance is the emergent behavior of swarms to perform a reconnaissance operation. An in-depth look at the design of a reconnaissance swarming mission is studied. A taxonomy of passive reconnaissance applications is developed to address feasibility. Evaluation of algorithms for swarm movement, communication, sensor input/analysis, targeting, and network topology result in priorities of each model's desired features. After a thorough selection process of available implementations, a subset of those models are integrated and built upon resulting in a simulation that explores the innovations of swarming UAVs.
DTIC
Computerized Simulation; Parallel Processing (Computers); Pilotless Aircraft; Reconnaissance; Simulation; Swarming; Weapon Systems

20040170652 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Swarm Based Implementation of a Virtal Distributed Database System in a Sensor Network
Lee, Wen C.; Mar. 2004; 119 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426505; AFIT/GCE/ENG/04-06; No Copyright; Avail: Defense Technical Information Center (DTIC)
The deployment of unmanned aerial vehicles (UAVs) in recent military operations has had success in carrying out surveillance and combat missions in sensitive areas. An area of intense research on UAVs has been on controlling a group of small-sized UAVs to carry out reconnaissance missions normally undertaken by large UAVs such as Predator or Global Hawk. A control strategy for coordinating the UAV movements of such a group of UAVs adopts the bio-inspired swarm model to produce autonomous group behavior. This research proposes establishing a distributed database system on a group of swarming UAVs, providing for data storage during a reconnaissance mission. A distributed database system model is simulated treating each UAV as a distributed database site connected by a wireless network. In this model, each UAV carries a sensor and communicates to a command center when queried. Drawing equivalence to a sensor network, the network of UAVs poses as a dynamic ad-hoc sensor network. The distributed database system based on a swarm of UAVs is tested against a set of reconnaissance test suites with respect to evaluating system performance. The design of experiments focuses on the effects of varying the query input and types of swarming UAVs on overall system performance. The results show that the topology of the UAVs has a distinct impact on the output of the sensor database. The experiments measuring system delays also confirm the expectation that in a distributed system, inter-node communication costs outweigh processing costs.
DTIC
Data Bases

20040170669 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Optimization Process for Configuration of Flexible Joined-Wing
Rasmussen, Cody C.; Mar. 2004; 142 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426591; AFIT/GAE/ENY/04-M14; No Copyright; Avail: Defense Technical Information Center (DTIC)
This study established a weight optimized configuration design of a joined-wing sensor-craft. The joined- wing aircraft concept fulfills a proposed long-endurance surveillance mission that contains an antenna structure embedded in the wing skin. The analysis was completed utilizing structural optimization, aerodynamic analyses, and response surface methodology. A sample of 62 joined-wing configurations were weight optimized. Each optimized structure was determined through a change of skin, spar, and rib thickness in the wing box by determining trimmed maneuver and gust conditions for critical flight mission points. Since the joined-wing concept has non-linear deformation characteristics, the structural optimization used both strain and buckling limits. The collection of the optimized data points was combined to create a response surface to predict the best joined-wing geometric configuration. Each configuration varied one of six key geometric variables. The geometric configuration variables included front wing sweep, aft wing sweep, outboard wing sweep, joint location, vertical offset, and thickness to chord ratio.
DTIC
Flexible Wings; Wings

20040170679 Air Force Inst. of Tech., Wright-Patterson AFB, OH
An Assessment of Modern Methods for Rotor Track and Balance
Renzi, Michael J.; Jun. 2004; 104 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426636; AFIT/GAE/ENY/04-J11; No Copyright; Avail: Defense Technical Information Center (DTIC)
One routine maintenance item facing the helicopter industry today is the issue of rotor track and balance (RT&B). While the task of reducing vibrations is often overlooked as simply an unimportant maintenance concern, what should not be

overlooked is the extensive amount of time and money committed by maintenance to smoothing an aircraft. If there were a way to make the process of rotor track and balance more efficient it would be a huge boost to the helicopter industry in both time and money. The first steps towards research into new and improved methods is to evaluate what is currently used in the field, determine if there is room for improvement and if so what can be improved. While each company may use a slightly different approach to correct the problem, each method has essentially the same objective--to reduce vibrations in the helicopter structure due to main and tail rotor rotation. This document reflects the findings of a study done to gather information and evaluate the different RT&B methods that currently exist, pinpointing the existing weaknesses in the process. In most all cases, a qualitative approach was used in determining problems and comparing current systems as the actual proprietary algorithms used by RT&B companies were unavailable.
DTIC
Aerodynamic Balance; Helicopters; Maintenance; Rotary Wings; Rotor Aerodynamics

20040170691 Air Force Research Lab., Wright-Patterson AFB, OH
Complexity in UAV Cooperative Control
Chandler, Phillip R.; Swaroop, Dharba; Howlett, Jason K.; Pachter, Meir; Fowler, Jeffrey M.; Jul. 2004; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-OAFF
Report No.(s): AD-A426660; AFRL-VA-WP-TP-2004-315; AFRL-VA-WP-TP-2004-315; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper addresses complexity and coupling issues in cooperative decision and control of distributed autonomous UAV teams. In particular, the recent results obtained by the in-house research team are presented. Hierarchical decomposition is implemented where team vehicles are allocated to subteams using set partition theory. Results are presented for single assignment and multiple assignment using network flow and auction algorithms. Simulation results are presented for wide area search munitions where complexity and coupling are incrementally addressed in the decision system, yielding radically improved team performance.
DTIC
Coupling; Drone Vehicles

20040170724 Naval War Coll., Newport, RI
Future Capabilities and Roles of Uninhabited Combat Aerial Vehicles (UCAV)
Kelly, Scott K.; May 18, 2004; 27 pp.; In English
Report No.(s): AD-A426774; No Copyright; Avail: CASI; A03, Hardcopy

In 2001, Congress stated '...that, within 10 years, one-third of U.S. military operational deep strike aircraft would be unmanned and, within 15 years, one-third of all U.S. military ground combat vehicles would be unmanned.' While aggressive and optimistic, this statement demonstrates the determination of our nation's decision makers in supporting unmanned aviation technology. This determination, coupled with recent successes in the Joint Unmanned Combat Air Systems (J- UCAS) demonstration program, makes uninhabited combat aerial vehicles (UCAV) a credible combat force in the near future. Unfortunately, the futuristic air surrounding these accomplishments has led to inaccurate analysis methods for future employment, resulting in outlandish claims or limited expectations. In similar circumstances, other emerging technologies have been rushed into use, without the establishment of joint doctrine, with fatal results. Therefore, to exploit UCAV's emerging abilities, military leaders must possess a clear analysis of the unmanned systems undergoing testing, the advantages and limitations of UCAVs, the weapons intended for integration, and the implications of using these unique capabilities under existing doctrinal architecture. (2 figures, 28 refs.)
DTIC
Combat; Drone Vehicles

20040170746 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Extending the Aircraft Availability Model to a Constrained Depot Environment Using Activity-Based Costing and the Theory of Constraints
Voegeli, Gerardo A.; Jun. 2004; 222 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426810; AFIT/GLM/ENS/04-01; No Copyright; Avail: CASI; A10, Hardcopy

The Aircraft Availability Model (AAM) assists managers in the selection of an optimal list of items to repair in order to attain the best aircraft availability rate. The model considers procurement or repair costs for the components as if the costs

were unit variable as a price, instead of a repair cost representing a mix of both fixed and variable cost. This research used the AAM in conjunction with Activity Based-Costing (ABC) and The Theory of Constraints (TOC) methodologies to investigate the relationships between price, product mix, Aircraft Availability (AA) and total cost. This approach explicitly recognizes that the Air Force Material Command uses its own resources in repairing components, and that it is always operating in a constrained environment in which resources practical capacities are exceeded by requirements that limit the attainable AA. The results of this investigation shows that the choice of the optimal mix of reparable items is sensitive to the pricing method used as well as environmental factors like repair cycle time, fleet size, and the intensity and balanced of shop resource load. In addition, the research found that the performance of the repair center should be evaluated under the metric Aircraft Availability per System Total Cost, following the rationale under the TOC methodology that considers labor costs as operational expenses, fixed in the period, and only raw materials as variable costs.
DTIC
Cost Analysis; Cost Estimates

20040170748 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Hybrid Stochastic Models for Remaining Lifetime Prognosis
Cox, Steven M.; Aug. 2004; 178 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426813; AFIT/DS/ENS/04-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA Air Force is developing its next generation aircraft and is seeking to reduce the risk of catastrophic failures, maintenance activities, and the logistics footprint while improving its sortie generation rate through a process called autonomic logistics. Vital to the successful implementation of this process is remaining lifetime prognosis of critical aircraft components. Complicating this problem is the absence of failure time information; however, sensors located on the aircraft are providing degradation measures. This research has provided a method to address at least a portion of this problem by uniting analytical lifetime distribution models with environment and/or degradation measures to obtain the remaining lifetime distribution.
DTIC
Drone Vehicles; Prognosis; Stochastic Processes

20040170758 Johns Hopkins Univ., Baltimore, MD
Application of Non-Contact Hybrid Acoustical Techniques for Remote Inspection of Naval Structures
Djordjevic, B. B.; Green, Robert E., Jr; Aug. 2004; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0158; Proj-02PR03588-01
Report No.(s): AD-A426833; No Copyright; Avail: CASI; A03, Hardcopy

The Johns Hopkins University Center for Nondestructive Evaluation (CNDE) has pioneered the development of non-contact remote ultrasonic technology. In this project, we have developed, optimized, and applied non-contact ultrasonic methods of non-intrusive, remote inspection of advanced materials and assessed the feasibility of this technology for implementation on Naval structures. Ultrasonic testing of material properties is a demonstrated technology and has proven to be a robust industrial tool. The major difficulty in ultrasonic testing is the conventional need to use contact transducers with the associated mechanical coupling materials. We have further demonstrated non-contact methodology for the materials characterization that should enable in situ and on platform assessment of structural degradation due to fatigue or corrosion for metals and composites. Implementation of these measurements would result in considerable risk reduction and cost savings to the Navy while permitting rapid inspection of large areas of Naval structures, including those made of metal, ceramics, polymers, composites and hybrid combinations of materials.
DTIC
Inspection; Nondestructive Tests; Sound Detecting and Ranging; Ultrasonic Tests

20040170769 Cornell Univ., Ithaca, NY
Nanogel Polymer Electrolytes
Giannelis, Emmanuel P.; Sep. 2004; 13 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0082; Proj-2303
Report No.(s): AD-A426846; AFRL-SR-AR-TR-04-0506; No Copyright; Avail: CASI; A03, Hardcopy

Fuel cells based on proton exchange membranes have the potential to provide the core of all Air Force power production, from aircraft ground support equipment to unmanned aerial vehicle and remote power generation. The objective of our program is to develop nanohybrid proton membranes and new proton conductors, which combine high proton conductivity (especially at high temperature/low relative humidity), low gas permeability and methanol crossover, decreased swelling and

mechanical robustness for fuel cell applications. High temperature/low relative humidity operation, although desirable, is currently not possible as high temperature gives rise to water evaporation and decreased conductivity. One of the big challenges facing the scientific community is to engineer a membrane material that fulfills all materials requirements, is inexpensive and endures the aggressive fuel- cell environment for a long period of time. Our initial results suggest that nanostructuring can indeed be exploited to circumvent the trade-offs typically found in conventional (composite) membranes.
DTIC
Electrolytes; Fuel Cells; Membranes

20040170794 Naval Research Lab., Stennis Space Center, MS
Test Specification for the Alternate Repair Verification Process of the Finnish Air Force Digital Memory Unit Writer
Trenchard, Michael E.; Riedlinger, Lancelot; Sep. 30, 2004; 11 pp.; In English
Contract(s)/Grant(s): Proj-74-5236-14
Report No.(s): AD-A426889; NRL/MR/7440-04-8714; No Copyright; Avail: CASI; A03, Hardcopy

The Digital Memory Unit Writer (DMU) is a ruggedized optical drive assembly built by Honeywell. The DMU writer is used specifically to write specially formatted map data to militarized Aircraft Optical Disks (AOD) for use in the AN/ASQ-l96 Digital Map System (consisting of both a Digital Map Computer and a DMU reader) of both U.S. and ally AV-8B Harrier and F/A-18 Hornet aircraft. The AN/ASQ-196 and its support equipment (including the DMU writers) have been in use by the fleet for well over 13 years. Obsolescence problems exist with the AN/ASQ-l96 and its support equipment. In particular, DMU writers have proven to be much less rugged, reliable, and more sensitive to power fluctuations than DMU readers, particularly in recent years when obsolescence issues have become more prevalent. In addition, only a handful of DMU writers exist (less than 15 overall) compared to several hundred DMU readers.
DTIC
Optical Memory (Data Storage); Proving; Specifications

20040171354 Analog Interfaces, Inc., Alliance, OH, USA
Material Testing Research and Indenter Equipment Modifications for Determining Aging of Wires (Cables) in Aircraft
Denny, B.; Oct. 2004; In English
Report No.(s): PB2005-100545; No Copyright; Avail: National Technical Information Service (NTIS)

The objective of this research study was to validate the Indenter Polymer Aging Monitor (Indenter), originally develop by The Electric Power Research Institute in the 1980s for use in utility nuclear power plants, as a means of characterizing aircraft wire degradation by means of monitoring the properties of the wire insulation. The Indenter is a portable, simple-to-operate, nondestructive instrument for gathering data, which could be used as a test method that monitors the aging of wires and cables by measuring the changes in compressive modulus. The data and analysis in this report demonstrates that insulation hardness measurements obtained with the Indenter can be correlated with accepted destructive methods such as elongation-at-break and Wire Insulation Deterioration Analysis System to provide a relative measure of wire insulation degradation.
NTIS
Wire; Materials Tests; Aging (Materials)

20040171562 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Evaluation of a Head Injury Criteria Component Test Device
DeWeese, Richard L.; Moorcroft, David M.; November 2004; 20 pp.; In English
Contract(s)/Grant(s): FAA-AM-B-03-PRS96
Report No.(s): DOT/FAA/AM-18; No Copyright; Avail: CASI; A03, Hardcopy

Aircraft seats that are certified to meet the requirements of 14 CFR Parts 23.562, 25.562, 27.562 and 29.562 must protect the occupant from serious head injury as defined by the Head Injury Criterion (HIC). Currently this is demonstrated during a dynamic sled test that includes a 50% male-size test dummy, the seat, and any surrounding aircraft structure that could be impacted by the occupant's head. To reduce cost and expedite design and certification, a means of demonstrating compliance using a component-level test was desired. A project to develop a component test method was initiated by the FAA Technical Center's Materials and Structures Branch, under contract to the National Institute for Aviation Research (NAIR) at Wichita State University (WSU). This effort resulted in the development of the HIC Component Test Device (HCTD) as described in FAA report DOT/FAAlAR-02-99. The HCTD consisted of a test dummy head attached to a pivoted arm that is propelled in an arc by an air actuator. The device was transferred to CAMI in Dec. 2002 for evaluation and further development. A series

of sled and component tests were conducted to evaluate the HCTD's predictability, repeatability, and degree of correlation with the sled tests. The device produced head impact velocity and HIC results that were very repeatable when impacting surfaces with consistent force/deflection properties. A relationship for impact velocity versus firing pressure was also developed. Several representative aircraft interior surfaces were tested at various head impact velocities and impact angles. These surfaces included padded rigid walls, unpadded composite walls and wall sections, and energy absorbing and non-energy absorbing seat backs. When the results for the two test methods were compared, impacts with some surfaces showed correlation and some did not. Impacts with padded rigid walls correlated well, while impacts with stiff walls or wall sections did not. Impacts with seat backs yielded mixed results with correlation being dependent on the stiffness of the area of the seat back being impacted. A MADYMO computer model was developed to investigate factors that could improve correlation. Further investigation is necessary to determine if modifications to the device could improve the degree of correlation.

Author

Seats; Dynamic Tests; Head (Anatomy); Injuries; Predictions; Computerized Simulation; Certification

20040171643 NASA Goddard Space Flight Center, Greenbelt, MD, USA

UAVs: Current and Future Use

Newman, P.; [2004]; 1 pp.; In English; ISSAOS 2004, 19-24 Sep. 2004, L'Aquilla, Italy; Copyright; Avail: Other Sources; Abstract Only

Uninhabited Aerial Vehicles (UAVs) provide ideal sampling platforms for atmospheric missions. In this presentation, I will: 1) review the atmospheric science missions that have used UAVs, 2) review and describe UAVs, 3) discuss the future of UAVs in atmospheric science missions.

Author

Pilotless Aircraft; Space Missions; Atmospheric Chemistry

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*.

20040161581 NASA Marshall Space Flight Center, Huntsville, AL, USA

Spaceflight Operations Services Grid (SOSG) Prototype Implementation and Feasibility Study

Bradford, Robert N.; Thigpen, William W.; Lisotta, Anthony J.; Redman, Sandra; [2004]; 2 pp.; In English; 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

Science Operations Services Grid is focusing on building a prototype grid-based environment that incorporates existing and new spaceflight services to enable current and future NASA programs with cost savings and new and evolvable methods to conduct science in a distributed environment. The Science Operations Services Grid (SOSG) will provide a distributed environment for widely disparate organizations to conduct their systems and processes in a more efficient and cost effective manner. These organizations include those that: 1) engage in space-based science and operations, 2) develop space-based systems and processes, and 3) conduct scientific research, bringing together disparate scientific disciplines like geology and oceanography to create new information. In addition educational outreach will be significantly enhanced by providing to schools the same tools used by NASA with the ability of the schools to actively participate on many levels in the science generated by NASA from space and on the ground. The services range from voice, video and telemetry processing and display to data mining, high level processing and visualization tools all accessible from a single portal. In this environment, users would not require high end systems or processes at their home locations to use these services. Also, the user would need to know minimal details about the applications in order to utilize the services. In addition, security at all levels is an underlying goal of the project. The Science Operations Services Grid will focus on four tools that are currently used by the ISS Payload community along with nine more that are new to the community. Under the prototype four Grid virtual organizations PO) will be developed to represent four types of users. They are a Payload (experimenters) VO, a Flight Controllers VO, an Engineering and Science Collaborators VO and an Education and Public Outreach VO. The User-based services will be implemented to replicate the operational voice, video, telemetry and commanding systems. Once the User-based services are in place, they will be analyzed to establish feasibility for Grid enabling. If feasible then each User-based service will be Grid enabled. The remaining non-Grid services if not already Web enabled will be so enabled. In the end, four portals will be developed one for

each VO. Each portal will contain the appropriate User-based services required for that VO to operate.
Derived from text
Flight Control; Operational Problems; Feasibility Analysis; Prototypes; Data Mining

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*.

20040171368 Department of Energy, Washington, DC
Advanced Gas Turbine Systems Research
Golan, L. P.; 2004; In English
Report No.(s): DE2004-824021; No Copyright; Avail: National Technical Information Service (NTIS)

The activities of the Advanced Gas Turbine Systems Research (AGTSR) program for the reporting period October 1, 2002 to December 31, 2002 are described in this quarterly report. No new membership, workshops, research projects, internships, faculty fellowships or special studies were initiated during this reporting period. Contract completion is set for June 30, 2003. During the report period, six research progress reports were received (3 final reports and 3 semi-annual reports). The University of Central Florida contract SR080 was terminated during this period, as UCF was unable to secure research facilities. AGTSR now projects that it will under spend DOE obligated funds by approximately 340-350K$.
NTIS
Gas Turbines; Research and Development

20040171407 NASA Glenn Research Center, Cleveland, OH, USA
Minnowbrook IV: 2003 Workshop on Transition and Unsteady Aspects of Turbomachinery Flows
LaGraff, John E., Editor; Ashpis, David E., Editor; August 2004; 101 pp.; In English; Minnowbrook IV: 2003 Workshop on Transition and Unsteady Aspects of Turbomachinery Flows, 17-20 Aug. 2003, Blue Mountain Lake, NY, USA
Contract(s)/Grant(s): F49620-03-1-0086; NAG3-2837; WBS 22-714-30-10
Report No.(s): NASA/TM-2004-212913; E-14349; No Copyright; Avail: CASI; A06, Hardcopy

The workshop sessions on turbomachinery flows were held at the Syracuse University Minnowbrook Conference Center in Blue Mountain Lake, New York, and followed the theme, venue, and format of three earlier workshops in 1993,' 1997; and 2000. Earlier themes focused on improving the understanding of late stage (final breakdown) of boundary layer transition. The specific engineering application of improving design codes for turbomachinery was encouraged by the attendance of representatives from gas turbine manufacturers. The 2003 workshop had a particularly strong representation from industry.This volume contains abstracts and copies of the viewgraphs presented, organized according to the workshop sessions. The hard copy contains the keynote lecture, abstracts, and the transcripts of the plenary and summary sessions. The post-workshop summary and the plenary-discussion transcript clearly highlight the need for continued vigorous research in the technologically important area of transitional and unsteady flows in turbomachines.
Author
Turbomachinery; Unsteady Flow

20040171480 NASA Glenn Research Center, Cleveland, OH, USA
Unsteady, Cooled Turbine Simulation Using a PC-Linux Analysis System
List, Michael G.; Turner, Mark G.; Chen, Jen-Pimg; Remotigue, Michael G.; Veres, Joseph P.; October 2004; 24 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NAS3-01099; WBS 22-708-40-73; WBS 22-714-09-12
Report No.(s): NASA/TM-2004-212976; E-14449; AIAA Paper 2004-0370; No Copyright; Avail: CASI; A03, Hardcopy

The fist stage of the high-pressure turbine (HPT) of the GE90 engine was simulated with a three-dimensional unsteady Navier-Sokes solver, MSU Turbo, which uses source terms to simulate the cooling flows. In addition to the solver, its pre-processor, GUMBO, and a post-processing and visualization tool, Turbomachinery Visual3 (TV3) were run in a Linux environment to carry out the simulation and analysis. The solver was run both with and without cooling. The introduction of cooling flow on the blade surfaces, case, and hub and its effects on both rotor-vane interaction as well the effects on the blades themselves were the principle motivations for this study. The studies of the cooling flow show the large amount of unsteadiness

in the turbine and the corresponding hot streak migration phenomenon. This research on the GE90 turbomachinery has also led to a procedure for running unsteady, cooled turbine analysis on commodity PC's running the Linux operating system. Author

Turbines; Navier-Stokes Equation; Three Dimensional Models; High Pressure; Cooling; Computational Fluid Dynamics

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*.

20040171488 NASA Langley Research Center, Hampton, VA, USA

Development and Evaluation of an Airborne Separation Assurance System for Autonomous Aircraft Operations

Barhydt, Richard; Palmer, Michael T.; Eischeid, Todd M.; [2004]; 12 pp.; In English; 24th Congress International Council of the Aeronautical Sciences, 30 Aug. - 2 Sep. 2004, Yokohama, Japan; No Copyright; Avail: CASI; A03, Hardcopy

NASA Langley Research Center is developing an Autonomous Operations Planner (AOP) that functions as an Airborne Separation Assurance System for autonomous flight operations. This development effort supports NASA s Distributed Air-Ground Traffic Management (DAG-TM) operational concept, designed to significantly increase capacity of the national airspace system, while maintaining safety. Autonomous aircraft pilots use the AOP to maintain traffic separation from other autonomous aircraft and managed aircraft flying under today's Instrument Flight Rules, while maintaining traffic flow management constraints assigned by Air Traffic Service Providers. AOP is designed to facilitate eventual implementation through careful modeling of its operational environment, interfaces with other aircraft systems and data links, and conformance with established flight deck conventions and human factors guidelines. AOP uses currently available or anticipated data exchanged over modeled Arinc 429 data buses and an Automatic Dependent Surveillance Broadcast 1090 MHz link. It provides pilots with conflict detection, prevention, and resolution functions and works with the Flight Management System to maintain assigned traffic flow management constraints. The AOP design has been enhanced over the course of several experiments conducted at NASA Langley and is being prepared for an upcoming Joint Air/Ground Simulation with NASA Ames Research Center.

Author

Autonomy; Airborne Equipment; Flight Operations; Flight Management Systems; Air Traffic Control

20040171492 NASA Langley Research Center, Hampton, VA, USA

Design of a Multi-mode Flight Deck Decision Support System for Airborne Conflict Management

Barhydt, Richard; Krishnamurthy, Karthik; January 2004; 7 pp.; In English; 2004 International Conference on Human Computer Interaction in Aeronautics, 29 Sep. - 1 Oct. 2004, Toulouse, France

Contract(s)/Grant(s): 727-01-10; No Copyright; Avail: CASI; A02, Hardcopy

NASA Langley has developed a multi-mode decision support system for pilots operating in a Distributed Air-Ground Traffic Management (DAG-TM) environment. An Autonomous Operations Planner (AOP) assists pilots in performing separation assurance functions, including conflict detection, prevention, and resolution. Ongoing AOP design has been based on a comprehensive human factors analysis and evaluation results from previous human-in-the-loop experiments with airline pilot test subjects. AOP considers complex flight mode interactions and provides flight guidance to pilots consistent with the current aircraft control state. Pilots communicate goals to AOP by setting system preferences and actively probing potential trajectories for conflicts. To minimize training requirements and improve operational use, AOP design leverages existing alerting philosophies, displays, and crew interfaces common on commercial aircraft. Future work will consider trajectory prediction uncertainties, integration with the TCAS collision avoidance system, and will incorporate enhancements based on an upcoming air-ground coordination experiment.

Author

Decision Support Systems; Human Factors Engineering; Autonomy; Air Traffic Control; Airborne Equipment; Control Systems Design

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

20040161549 NASA Marshall Space Flight Center, Huntsville, AL, USA

Human Motion Tracking at Marshall Space Flight Center's Collaborative Engineering Center ANVIL

Henderson, Steven J.; Hamilton, George S.; [2004]; 1 pp.; In English; Huntsville Simulation Conference, 19-21 Oct. 2004, Huntsville, AL, USA; No Copyright; Avail: Other Sources; Abstract Only

The installation and use of electromagnetic human motion trackers requires a specially designed and metal-free environment for optimal performance. Such an area is not readily available at the Marshall Space Flight Center Collaborative Engineering Center ANVIL. Our paper details a systems engineering approach to installing and operating Ascension Technologies Ethernet MotionStar tracking system in a sub-optimal environment, used with the JACK human computer model's motion capture capabilities. We also discuss how this system is integrated into the Marshall Space Flight Center's Human Engineering process.

Author

Human Factors Engineering; Installing; Systems Engineering; Operations; Operational Problems; Electromagnets

20040170827 Gracar Corp., Dayton, OH

Aircraft Battle Damage Assessment and Repair (ABDAR) Evaluation

Leftwich, James; Grafton, Arthur P.; Sep. 2003; 105 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33600-03-F-6065; Proj-1710

Report No.(s): AD-A426954; AFRL-HE-WP-TR-2004-0119; No Copyright; Avail: CASI; A06, Hardcopy

The Aircraft Battle Damage Assessment and Repair (ABDAR) program is an advanced research and development (R&D) project under the sponsorship of Air Force Research Laboratory/Deployment and Sustainment Division Logistics Readiness Branch (AFRL/HESR). The intent of this system is to provide a significant enhancement in the capability of USAF Aircraft Battle Damage Repair (ABDR) assessors and technicians to rapidly assess battle damaged aircraft. These individuals face the critical task of assessing, repairing, and returning battle-damaged aircraft to mission readiness as rapidly as possible while maintaining a high level of precision. AFRL completed an ABDAR project in 2000 that featured prototype software that demonstrated how software and digitized technical data could increase speed and accuracy of the ABDR process. ABDR experts from AFMC/MSG also completed an ABDAR software tool in 2002, referred to in this document as the MSG mockup. AFMC/MSG and the Combat Logistics Support Squadrons (CLSS) have shown continued interest in this capability, but it is unknown what portions of the mockup software packages, if any can be used to produce an ABDAR system that meets minimum CLSS requirements and can be fielded quickly. The objective of the ABDAR evaluation effort was to assess the AFRL and MSG software currently demonstrating the concept of automating the documentation and repair of aircraft battle damage. The evaluation will determine what existing software code and processes, if any, are economically and technically valuable in developing a new product that meets CLSS requirements. In addition, this software will be evaluated to determine the level of effort required to modify them in order to meet the minimal functional requirements.

DTIC

Computer Programs; Damage Assessment

20040171627 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Model Requirements

Barth, Janet; [2004]; 10 pp.; In English; Workshop on Radiation Belt Models, 5-8 Oct. 2004, Greenbelt, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy

Contents include the following: 1. Scientific Research: Space science. Earth science. Aeronautics and space. Transportation. Human exploration of space. 2. Navigation. 3. Telecommunications. 4. Defense. 5. Space Environment Monitoring.and 6. Terrestrial Weather Monitoring.

CASI

Aerospace Environments; Radiation; Models

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*.

20040161555 Gray Research, Inc., Huntsville, AL, USA

Architecture Synthesis and Reduced-Cost Architectures for Human Exploration Missions

Woodcock, Gordon; [2004]; 13 pp.; In English; AIAA Space 2004, 28-30 Sep. 2004, San Diego, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy

Development of architectures for human exploration missions has been pursued in the international aerospace community for a long time. This paper attempts a different approach and way of looking at architectures. Most of the emphasis is on lunar architectures with a brief look at Mars. The first step is to set forth overarching gods in order to understand origins of requirements. Then, principles and guidelines are developed for architecture formulation. It is argued that safety and cost are the primary factors. Alternative mission profiles are examined for adherence to the principles, and specific architectures formulated according to the guidelines. The guidelines themselves indicate preferred evolution paths from lunar to Mars architectures. Results of example calculations are given to illustrate the process, and an evolution path is recommended. Safety and cost criteria tend to conflict, but it is shown that cost-efficient architectures can be enhanced for good safety ratings at modest cost.

Author

Manned Space Flight; Lunar Exploration; Mission Planning

20040161580 NASA Marshall Space Flight Center, Huntsville, AL, USA

Low Gravity Materials Science Research for Space Exploration

Clinton, R. G., Jr.; Semmes, Edmund B.; Schlagheck, Ronald A.; Bassler, Julie A.; Cook, Mary Beth; Wargo, Michael J.; Sanders, Gerald B.; Marzwell, Neville I.; [2004]; 2 pp.; In English; 4th International Conference on Solidification and Gravity, 6-9 Sep. 2004, Miskolc, Hungary; No Copyright; Avail: Other Sources; Abstract Only

On January 14, 2004, the President of the USA announced a new vision for the USA civil space program. The Administrator of the National Aeronautics and Space Administration (NASA) has the responsibility to implement this new vision. The President also created a Presidential Commission 'to obtain recommendations concerning implementation of the new vision for space exploration.' The President's Commission recognized that achieving the exploration objectives would require significant technical innovation, research, and development in focal areas defined as 'enabling technologies.' Among the 17 enabling technologies identified for initial focus were advanced structures; advanced power and propulsion; closed-loop life support and habitability; extravehicular activity system; autonomous systems and robotics; scientific data collection and analysis; biomedical risk mitigation; and planetary in situ resource utilization. The Commission also recommended realignment of NASA Headquarters organizations to support the vision for space exploration. NASA has aggressively responded in its planning to support the vision for space exploration and with the current considerations of the findings and recommendations from the Presidential Commission. This presentation will examine the transformation and realignment activities to support the vision for space exploration that are underway in the microgravity materials science program. The heritage of the microgravity materials science program, in the context of residence within the organizational structure of the Office of Biological and Physical Research, and thematic and sub-discipline based research content areas, will be briefly examined as the starting point for the ongoing transformation. Overviews of future research directions will be presented and the status of organizational restructuring at NASA Headquarters, with respect to influences on the microgravity materials science program, will be discussed. Additional information is included in the original extended abstract.

Author (revised)

NASA Programs; Microgravity; Research and Development; Materials Science

20040170780 Wyle Labs Life Science and Services, Inc., San Antonio, TX

The Effect of Staged Decompression While Breathing 100% Oxygen on Altitude Decompression Sickness

Webb, James T.; Pilmanis, Andrew A.; Kannan, Nandini; Olson, Robert M.; Jul. 2000; 8 pp.; In English

Contract(s)/Grant(s): F33615-89-C-0603; F33615-92-C-0018; Proj-7184

Report No.(s): AD-A426861; AFRL-HE-BR-JA-1999-0009; No Copyright; Avail: CASI; A02, Hardcopy

Space Shuttle extravehicular activity (EVA) requires decompression from sea level pressure (14.7 psia) to a 4.3 psia

(30,300 ft) pressure suit. The transition currently involves altering the shuttle atmosphere to allow shirt-sleeve denitrogenation to occur during a 12 to 36-h staged decompression (SD) at 10.2 psia (9,800 ft) with an oxygen- enriched breathing gas (26.5% oxygen, 73.5% nitrogen). The denitrogenation provides protection from decompression sickness (DCS) during EVA in a 4.3 psia pressure suit. Our goal was to determine the highest altitude at which SD while breathing 100% oxygen (SD100) could provide effective protection from development of DCS symptoms after further decompression to 29,500 ft (4.5 psia). There were 30 male subjects exposed to at least six of 11 conditions in random order on successive months to 29,500 ft for four hours while performing mild exercise and being monitored for venous gas emboli (VGE) with an echo-imaging system. The subjects received 15 min of ground-level (GL) preoxygenation and an additional 60 or 120 min of SD100 atone of four altitudes between 8,000 ft (10.9 psia) and 18,000 ft (7.3 psia). Control exposures followed a 75-or 135-min ground-level preoxygenation. During SD100, one case of DOS occurred at 18,000 ft, but not at lower staging altitudes. Higher levels of VGE were observed during SD100 at 18,000 ft than during SD100 at any lower altitude. CONCLUSION: Staged decompression at 16,000 ft and below results in decompression risk during subsequent decompression to 29,500 ft similar to that following equivalent periods of ground-level preoxygenation.
DTIC
Altitude Sickness; Decompression Sickness; Exercise Physiology; Extravehicular Activity; Oxygen; Pressure Reduction

20040171343 NASA, Washington, DC, USA
Renewed Commitment to Excellence: An Assessment of the NASA Agency-Wide Applicability of the Columbia Accident Investigation Board Report
Jan. 30, 2004; In English
Report No.(s): PB2005-100968; No Copyright; Avail: National Technical Information Service (NTIS)
The Space Shuttle fleet has been grounded since the Columbia accident. As a result, 'Return to Flight' has become not just a phrase but a program and the global of virtually everyone associated with NASA. Even those who are not affiliated with the Shuttle Program are looking forward to the safe and successful completion of the next Shuttle mission. In this recovery process, NASA will be guided by the Report of the Columbia Accident Investigation Board (CAIB). The CAIB was an investigating body, convened by NASA Administrator O'Keefe the day of the Columbia accident, according to procedures established after the loss of Space Challenger.
NTIS
Space Shuttles; Accident Investigation

20040171466 NASA Marshall Space Flight Center, Huntsville, AL, USA
NASA Marshall Space Flight Center Barrel-Shaped Asymmetrical Capacitor
Campbell, J. W.; Carruth, M. R.; Edwards, D. L.; Finchum, A.; Maxwell, G.; Nabors, S.; Smalley, L.; Huston, D.; Ila, D.; Zimmerman, R., et al.; June 2004; 62 pp.; In English
Report No.(s): NASA/TM-2004-213283; M-1115; No Copyright; Avail: CASI; A04, Hardcopy
The NASA Barrel-Shaped Asymmetrical Capacitor (NACAP) has been extensively tested at NASA Marshall Space Flight Center and the National Space Science and Technology Center. Trichel pulse emission was first discovered here. The NACAP is a magnetohydrodynamic device for electric propulsion. In air it requires no onboard propellant nor any moving parts. No performance was observed in hard vacuum. The next step shall be optimizing the technology for future applications.
Author
Asymmetry; Capacitors; Electric Propulsion; Magnetohydrodynamics; Barrels (Containers)

13
ASTRODYNAMICS

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

20040171613 NASA Goddard Space Flight Center, Greenbelt, MD, USA, AI Solutions, Inc., Lanham, MD, USA
Sun-Earth L1 Region Halo-To-Halo Orbit and Halo-To-LisaJous Orbit Transfers
Roberts, Craig E.; DeFazio, Robert; [2004]; 4 pp.; In English; ISSFD Conference, 11-15 Oct. 2004, Munich, Germany; No Copyright; Avail: CASI; A01, Hardcopy
Practical techniques for designing transfer trajectories between Libration Point Orbits (LPOs) are presented. Motivation for development of these techniques was provided by a hardware contingency experienced by the Solar Heliospheric Observatory (SOHO), a joint mission of the European Space Agency (ESA) and the National Aeronautics and Space

Administration (NASA) orbiting the L1 point of the Sun-Earth system. A potential solution to the problem involved a transfer from SOHO s periodic halo orbit to a new LPO of substantially different dimensions. Assuming the SOHO halo orbit as the departure orbit, several practical LPO transfer techniques were developed to obtain new Lissajous or periodic halo orbits that satisfy mission requirements and constraints. While not implemented for the SOHO mission, practical LPO transfer techniques were devised that are generally applicable to current and future LPO missions.
Author
Libration; Trajectories; Orbits; Solar Observatories; Sun

20040171652 Draper (Charles Stark) Lab., Inc., Cambridge, MA, USA
Optimal Reconfiguration of Tetrahedral Formations
Huntington, Geoffrey; Rao, Anil V.; Hughes, Steven P.; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NCC5-730; Copyright; Avail: CASI; A01, Hardcopy

The problem of minimum-fuel formation reconfiguration for the Magnetospheric Multi-Scale (MMS) mission is studied. This reconfiguration trajectory optimization problem can be posed as a nonlinear optimal control problem. In this research, this optimal control problem is solved using a spectral collocation method called the Gauss pseudospectral method. The objective of this research is to provide highly accurate minimum-fuel solutions to the MMS formation reconfiguration problem and to gain insight into the underlying structure of fuel-optimal trajectories.
Author
Satellite Constellations; Spacecraft Maneuvers; Tetrahedrons; Formation Flying; Fuel Consumption

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)*.

20040161558 NASA Marshall Space Flight Center, Huntsville, AL, USA
Real-Time Payload Operations on the International Space Station
Cissom, Rick D.; Watson, Kristi; [2004]; 1 pp.; In English; 2004 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

This paper will focus on the challenges that Payload Operations have faced as Payload Utilization has evolved over the last three years of real-time experience. Specifically the paper will focus on the planning challenges and the constant battle over program allocation between core systems and payloads, the process of developing and implementing crew training in a centralized location that is being support by a payload development community spread out all over the US, the unique challenges associated with deployed pressurized payload payloads that are not located within an ISPR, and the importance of documenting specific requirements that the payload development community must implement to get through the crew reviews associated with training and procedures. The authors will focus on specific lessons learned and improvements that have been made in both the streamlining of the processes and the associated documentation.
Author
Payloads; International Space Station; Real Time Operation; Project Management

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*.

20040161559 NASA Marshall Space Flight Center, Huntsville, AL, USA
Small Satellites and the DARPA/Air Force Falcon Program
Weeks, David J.; Walker, Steven H.; Sackheim, Robert L.; [2004]; 10 pp.; In English; International Astronautical Congress Meeting, 4-8 Oct. 2004, Vancouver, Canada
Report No.(s): IAC-4-IAA.4.11.5; No Copyright; Avail: CASI; A02, Hardcopy

The FALCON ((Force Application and Launch from CONUS) program is a technology demonstration effort with three

major components: a Small Launch Vehicle (SLV), a Common Aero Vehicle (CAV), and a Hypersonic Cruise Vehicle (HCV). Sponsored by DARPA and executed jointly by the USA Air Force and DARPA with NASA participation, the objectives are to develop and demonstrate technologies that will enable both near-term and far-term capability to execute time-critical, global reach missions. The focus of this paper is on the SLV as it relates to small satellites and the implications of lower cost to orbit for small satellites. The target recurring cost for placing 1000 pounds payloads into a circular reference orbit of 28.5 degrees at 100 nautical miles is $5,000,000 per launch. This includes range costs but not the payload or payload integration costs. In addition to the nominal 1000 pounds to LEO, FALCON is seeking delivery of a range of orbital payloads from 220 pounds to 2200 pounds to the reference orbit. Once placed on alert status, the SLV must be capable of launch within 24 hours.
Author
Microsatellites; Spacecraft Launching; Commercial Spacecraft; Cost Analysis

20040170737 Montana State Univ., Bozeman, MT
Reaction Dynamics Relevant to Spacecraft in Low Earth Orbit
Minton, Timothy K.; Sep. 29, 2004; 17 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0276
Report No.(s): AD-A426792; AFRL-SR-AR-TR-04-0507; No Copyright; Avail: CASI; A03, Hardcopy

The key goal of the project (to improve our understanding of fundamental gas-surface and gas-phase reaction/interaction dynamics that relate directly to orbital and sub-orbital spacecraft or missile missions of direct relevance to the U.S. Air Force) was fulfilled. However, the details of the work performed differed from those proposed. Scientific curiosity, experimental opportunities, and discussions with the Program Manager (Dr. Michael Berman) led to a modification of some of the detailed objectives of this project. Seminal data were obtained on the hyperthermal reactions of ground-state O(3P) with H2, D2, and small hydrocarbons (methane, ethane, and propane). The hyperthermal atomic oxygen source was confirmed to contain atomic oxygen in its ground O(3P) state by a combination experiment/theory study of the reaction, O+H2-\gOH+H, where Prof. George Schatz of Northwestern University conducted the theoretical calculations. A similar study on the reaction of the hyperthermal beam with CH4 showed that the molecular oxygen component of the beam is in its ground state.
DTIC
Chemical Reactions; Earth Orbits; Gas-Solid Interactions; Low Earth Orbits; Spacecraft Orbits; Surface Reactions

20040171575 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Next Generation Geostationary Operational Environmental Satellite (GOES-R Series): A Space Segment Overview
Krimchansky, Alexander; Machi, Dino; Cauffman, Sandra A.; Davis, Martin A.; [2004]; 1 pp.; In English; 11th SPIE International Symposium on Remote Sensing, 13-17 Sep. 2004, Maspalomas, Gran Canaria, Spain; No Copyright; Avail: Other Sources; Abstract Only

The next-generation National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellite (GOES-R series) is currently being developed by NOAA in cooperation with the National Aeronautics and Space Administration (NASA). The GOES-R series satellites represents a significant improvement in spatial, temporal, and spectral observations (several orders of magnitude) over the capabilities of the currently operational GOES-1 series and the about to be launched GOES-N series satellite. The GOES-R series will incorporate technically advanced third-generation instruments and spacecraft enhancements to meet evolving observational requirements of forecasting for the era 2012-2025. The GOES-R instrument complement being developed includes a Advanced Baseline Imager (ABI), a Hyperspectral Environmental Suite (HES), a GEO Lighting Mapper (GLM), a Solar Imaging Suite (SIS) and a Space Environment In-Situ Suite (SEISS). Also, candidates for a number of GOES-R Pre-Planned Product Improvements (P(sup 3)Is) includes a Geo microwave Sounder, a Coronograph, a Hyperspectral Imager, and a Solar Irradiance Sensor. Currently, the GOES-R Space Segment architecture is being evaluated as part of a GOES-R system end-to-end architecture study. The GOES-R notional baseline architecture is a constellation of two satellites (A-sat and B-sat) each nominally located at 75 degrees west longitude and at 135 degrees west longitude at geostationary altitude, 0 degrees inclination. The primary mission of the A-sat is to provide imaging from the ABI. The A-sat will also contain the SIS and the GLM. The primary mission of the B-sat is to provide sounding of the hemispherical disk of the earth from the HES. The B-sat also contains the SEISS. Both satellites have mesoscale capabilities for severe weather sounding or imaging. This paper overviews the GOES-R Space Segment development including satellite constellation trade-off, improvements and differences between the current and future instrument and spacecraft capabilities, and technology infusion.
Author
GOES Satellites; NASA Space Programs; General Overviews; Space Missions

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*.

20040170477 NASA Marshall Space Flight Center, Huntsville, AL, USA

Improving Performance of the System Safety Function at Marshall Space Flight Center

Kiessling, Ed; Tippett, Donald D.; Shivers, Herb; [2004]; 10 pp.; In English; American Society for Engineering Management 25th National Conference, 20-23 Oct. 2004, Alexandria, VA, USA; Copyright; Avail: CASI; A02, Hardcopy

The Columbia Accident Investigation Board (CAIB) determined that organizational and management issues were significant contributors to the loss of Space Shuttle Columbia. In addition, the CAIB observed similarities between the organizational and management climate that preceded the Challenger accident and the climate that preceded the Columbia accident. To prevent recurrence of adverse organizational and management climates, effective implementation of the system safety function is suggested. Attributes of an effective system safety program are presented. The Marshall Space Flight Center (MSFC) system safety program is analyzed using the attributes. Conclusions and recommendations for improving the MSFC system safety program are offered in this case study.

Author

Safety Management; Systems Management; Aerospace Safety

20040170636 Instituto Politecnico de Setubal, Setubal, Portugal

Privacy Audits and Trust: The Internet Dilemma

Gochenouer, John E.; Tyler, Michael L.; ICEIS 2001; [2001], pp. 54-55; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper reviews the current efforts at self-regulation on the Internet. It examines audit procedures used by Web companies to protect personal privacy and compares them with those used by Brick and Mortar companies. A series of focus groups valued consumer insurance and security technologies of highest priority to instil trust. The conclusion is that insuring Web users against the damages of lost privacy would be the most powerful method to gain consumer trust. Surprisingly, there are no major Web vendors carrying such an insurance policy.

Author

Privacy; Internets; Security

20040171387 NASA Marshall Space Flight Center, Huntsville, AL, USA

Transformational System Concepts and Technologies for Our Future in Space

Howell, Joe T.; Mankins, John C.; [2004]; 1 pp.; In English; 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

Continued constrained budgets and growing national and international interests in the commercialization and development of space requires NASA to be constantly vigilant, to be creative, and to seize every opportunity for assuring the maximum return on space infrastructure investments. Accordingly, efforts are underway to forge new and innovative approaches to transform our space systems in the future to ultimately achieve two or three or five times as much with the same resources. This bold undertaking can be achieved only through extensive cooperative efforts throughout the aerospace community and truly effective planning to pursue advanced space system design concepts and high-risk/high-leverage research and technology. Definitive implementation strategies and roadmaps containing new methodologies and revolutionary approaches must be developed to economically accommodate the continued exploration and development of space. Transformation can be realized through modular design and stepping stone development. This approach involves sustainable budget levels and multi-purpose systems development of supporting capabilities that lead to a diverse amy of sustainable future space activities. Transformational design and development requires revolutionary advances by using modular designs and a planned, stepping stone development process. A modular approach to space systems potentially offers many improvements over traditional one-of-a-kind space systems comprised of different subsystem element with little standardization in interfaces or functionality. Modular systems must be more flexible, scaleable, reconfigurable, and evolvable. Costs can be reduced through learning curve effects and economies of scale, and by enabling servicing and repair that would not otherwise be feasible. This paper briefly discusses achieving a promising approach to transforming space systems planning and evolution into a meaningful stepping stone design, development, and implementation process. The success of this well

planned and orchestrated approach holds great promise for achieving innovation and revolutionary technology development for supporting future exploration and development of space.
Author
Aerospace Industry; Aerospace Systems; Space Commercialization; Standardization

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*.

20040171188 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Lunar Navigation with Libration Point Orbiters and GPS
Carpenter, J. Russell; [2004]; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

NASA is currently studying a Vision for Space Exploration based on spiral development of robotic and piloted missions to the moon and Mars, but research into how to perform such missions has continued ever since the first era of lunar exploration. One area of study that a number of researchers have pursued is libration point navigation and communication relay concepts. These concepts would appear to support many of NASA's current requirements for navigation and communications coverage for human and robotic spacecraft operating in lunar space and beyond. In trading libration point concepts against other options, designers must consider issues such as the number of spacecraft, required to provide coverage, insertion and stationkeeping costs, power and data rate requirements, frequency allocations, and many others. The libration points, along with a typical cis-lunar trajectory, are equilibrium locations for an infinitesimal mass in the rotating coordinate system that follows the motion of two massive bodies in circular orbits with respect to their common barycenter. There are three co-linear points along the line connecting the massive bodies: between the bodies, beyond the secondary body, and beyond the primary body. The relative distances of these points along the line connecting the bodies depend on the mass ratios. There are also two points that form equilateral triangles with the massive bodies. Ideally, motion in the neighborhood of the co-linear points is unstable, while motion near the equilibrium points is stable. However, in the real world, the motions are highly perturbed so that a satellite will require stationkeeping maneuvers.
Author
Lunar Trajectories; Space Navigation; Libration

20040171406 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Libration Point Navigation Concepts Supporting the Vision for Space Exploration
Carpenter, J. Russell; Folta, David C.; Moreau, Michael C.; Quinn, David A.; [2004]; 15 pp.; In English; AIAA/AAS Astrodynamic Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A03, Hardcopy

This work examines the autonomous navigation accuracy achievable for a lunar exploration trajectory from a translunar libration point lunar navigation relay satellite, augmented by signals from the Global Positioning System (GPS). We also provide a brief analysis comparing the libration point relay to lunar orbit relay architectures, and discuss some issues of GPS usage for cis-lunar trajectories.
Author
Autonomous Navigation; Lunar Trajectories; Spacecraft Guidance

20040171430 NASA Goddard Space Flight Center, Greenbelt, MD, USA, AI Solutions, Inc., Lanham, MD, USA
Operational Experiences in Planning and Reconstructing Aqua Inclination Maneuvers
Rand, David; Reilly, Jacqueline; Schiff, Conrad; [2004]; 6 pp.; In English; 18th International Symposium on Space Flight Dynamics, 11-15 Oct. 2004, Munich, Germany; No Copyright; Avail: CASI; A02, Hardcopy

As the lead satellite in NASA's growing Earth Observing System (EOS) PM constellation, it is increasingly critical that Aqua maintain its various orbit requirements. The two of interest for this paper are maintaining an orbit inclination that provides for a consistent mean local time and a semi-major Axis (SMA) that allows for ground track repeatability. Maneuvers to adjust the orbit inclination involve several flight dynamics constraints and complexities which make planning such maneuvers challenging. In particular, coupling between the orbital and attitude degrees of freedom lead to changes in SMA when changes in inclination are effected. A long term mission mean local time trend analysis was performed in order to determine the size and placement of the required inclination maneuvers. Following this analysis, detailed modeling of each burn and its Various segments was performed to determine its effects on the immediate orbit state. Data gathered from an

inclination slew test of the spacecraft and first inclination maneuver uncovered discrepancies in the modeling method that were investigated and resolved. The new modeling techniques were applied and validated during the second spacecraft inclination maneuver. These improvements should position Aqua to successfully complete a series of inclination maneuvers in the fall of 2004. The following paper presents the events and results related
Author
Aerodynamics; Attitude (Inclination); Operational Problems; Spacecraft Maneuvers

20040171635 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NASA's Swarm Missions: The Challenge of Building Autonomous Software
Truszkowski, Walt; Hinchey, Mike; Rash, James; Rouff, Christopher; IT Pro; September/October 2004; ISSN 1520-9202, pp. 51-56; In English; Copyright; Avail: Other Sources

The days of watching a massive manned cylinder thrust spectacularly off a platform into space might rapidly become ancient history when the National Aeronautics and Space Administration (NASA) introduces its new millenium mission class. Motivated by the need to gather more data than is possible with a single spacecraft, scientists have developed a new class of missions based on the efficiency and cooperative nature of a hive culture. The missions, aptly dubbed nanoswarm will be little more than mechanized colonies cooperating in their exploration of the solar system. Each swarm mission can have hundreds or even thousands of cooperating intelligent spacecraft that work in teams. The spacecraft must operate independently for long periods both in teams and individually, as well as have autonomic properties - self-healing, -configuring, -optimizing, and -protecting- to survive the harsh space environment. One swarm mission under concept development for 2020 to 2030 is the Autonomous Nano Technology Swarm (ANTS), in which a thousand picospacecraft, each weighing less than three pounds, will work cooperatively to explore the asteroid belt. Some spacecraft will form teams to catalog asteroid properties, such as mass, density, morphology, and chemical composition, using their respective miniature scientific instruments. Others will communicate with the data gatherers and send updates to mission elements on Earth. For software and systems development, this is uncharted territory that calls for revolutionary techniques.
Author
Autonomy; Spacecraft Control; Software Engineering; Artificial Intelligence; Satellite Constellations

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*.

20040161547 NASA Marshall Space Flight Center, Huntsville, AL, USA, Tennessee Technological Univ., Cookeville, TN, USA
Similarity Rules for Scaling Solar Sail Systems
Canfield, Stephen L.; Beard, James W., III; Peddieson, John; Ewing, Anthony; Garbe, Greg; September 15, 2004; 10 pp.; In English; Solar Sail Technology and Applications Conference (SSTAC), 28-30 Sep. 2004, Greenbelt, MD, USA; Copyright; Avail: CASI; A02, Hardcopy

Future science missions will require solar sails on the order 10,000 sq m (or larger). However, ground and flight demonstrations must be conducted at significantly smaller Sizes (400 sq m for ground demo) due to limitations of ground-based facilities and cost and availability of flight opportunities. For this reason, the ability to understand the process of scalability, as it applies to solar sail system models and test data, is crucial to the advancement of this technology. This report will address issues of scaling in solar sail systems, focusing on structural characteristics, by developing a set of similarity or similitude functions that will guide the scaling process. The primary goal of these similarity functions (process invariants) that collectively form a set of scaling rules or guidelines is to establish valid relationships between models and experiments that are performed at different orders of scale. In the near term, such an effort will help guide the size and properties of a flight validation sail that will need to be flown to accurately represent a large, mission-level sail.
Author
Solar Sails; Models; Data Acquisition; Dynamic Structural Analysis

20040161571 NASA Marshall Space Flight Center, Huntsville, AL, USA
Determine Important Nuclear Fragmentation Processes for Space Radiation Protection in Human Space Explorations
Lin, Zi-wei; [2004]; 1 pp.; In English; Physic Colloquium, 5 Oct. 2004, Huntsville, AL, USA
Contract(s)/Grant(s): NCC8-200; No Copyright; Avail: Other Sources; Abstract Only

Space radiation from cosmic ray particles is one of the main challenges for long-term human space explorations such as a permanent moon base or a trip to Mars. Material shielding may provide significant radiation protection to astronauts, and models have been developed in order to evaluate the effectiveness of different shielding materials and to predict radiation environment inside the spacecraft. In this study we determine the nuclear fragmentation cross sections which will most effect the radiation risk behind typical radiation shielding materials. These cross sections thus need more theoretical studies and accurate experimental measurements in order for us to more precisely predict the radiation risk in human space explorations. Author

Fragmentation; Nuclear Chemistry; Extraterrestrial Radiation; Radiation Protection; Astronauts

20040167158 NASA Langley Research Center, Hampton, VA, USA
Vacuum/Zero Net-Gravity Application for On-Orbit TPS Tile Repair
Harvey, Gale A.; Humes, Donald H.; Siochi, Emilie J.; [2004]; 9 pp.; In English; 23rd Space Simulation Conference, 8-11 Nov. 2004, Annapolis, MD, USA
Contract(s)/Grant(s): 376-70-30-01; No Copyright; Avail: CASI; A02, Hardcopy

The Orbiter Columbia catastrophically failed during reentry February 1, 2003. All space Shuttle flights were suspended, including logistics support for the International Space Station. NASA LaRC s Structures and Materials Competency is performing characterizations of candidate materials for on-orbit repair of orbiter Thermal Protection System (TPS) tiles to support Return-to-Flight activities led by JSC. At least ten materials properties or attributes (adhesion to damage site, thermal protection, char/ash strength, thermal expansion, blistering, flaming, mixing ease, application in vacuum and zero gravity, cure time, shelf or storage life, and short-term outgassing and foaming) of candidate materials are of interest for on-orbit repair. This paper reports application in vacuum and zero net-gravity (for viscous flow repair materials). A description of the test apparatus and preliminary results of several candidate materials are presented. The filling of damage cavities is different for some candidate repair materials in combined vacuum and zero net-gravity than in either vacuum or zero net- gravity alone. Author

Vacuum; Gravitational Effects; Thermal Protection; Thermal Expansion; Adhesion; Materials Selection

20040171113 NASA Marshall Space Flight Center, Huntsville, AL, USA
Nuclear Electric Vehicle Optimization Toolset (NEVOT)
Tinker, Michael L.; Steincamp, James W.; Stewart, Eric T.; Patton, Bruce W.; Pannell, William P.; Newby, Ronald L.; Coffman, Mark E.; Kos, Larry D.; Qualls, A. Lou; Greene, Sherrell, et al.; [2004]; 9 pp.; In English; 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, 30 Aug. - 1 Sep. 2004, Albany, NY, USA
Contract(s)/Grant(s): 090-26-02; No Copyright; Avail: CASI; A02, Hardcopy

The Nuclear Electric Vehicle Optimization Toolset (NEVOT) optimizes the design of all major nuclear electric propulsion (NEP) vehicle subsystems for a defined mission within constraints and optimization parameters chosen by a user. The tool uses a genetic algorithm (GA) search technique to combine subsystem designs and evaluate the fitness of the integrated design to fulfill a mission. The fitness of an individual is used within the GA to determine its probability of survival through successive generations in which the designs with low fitness are eliminated and replaced with combinations or mutations of designs with higher fitness. The program can find optimal solutions for different sets of fitness metrics without modification and can create and evaluate vehicle designs that might never be considered through traditional design techniques. It is anticipated that the flexible optimization methodology will expand present knowledge of the design trade-offs inherent in designing nuclear powered space vehicles and lead to improved NEP designs.
Author

Nuclear Electric Propulsion; Spacecraft Propulsion; Spacecraft Design; Design Optimization; Genetic Algorithms; Propulsion System Configurations

20040171123 NASA Marshall Space Flight Center, Huntsville, AL, USA
A High-Energy Technology Demonstration Platfom: The First Step in a Stepping Stones Approach to Energy-Rich Space Infrastructures
Carrington, Connie; Day, Greg; [2004]; 10 pp.; In English; 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada
Report No.(s): IAC-04-R.1.06; No Copyright; Avail: CASI; A02, Hardcopy

The sun provides an abundant source of energy in space, which can be used to power exploration vehicles and infrastructures that support exploration. A first step in developing and demonstrating the necessary technologies to support solar-powered exploration could be a 100-kWe-class solar-powered platform in Earth orbit. This platform would utilize advanced technologies in solar power collection and generation, power management and distribution, thermal management, and electric propulsion. It would also provide a power-rich free-flying platform to demonstrate in space a portfolio of technology flight experiments. This paper presents a preliminary design concept for a 100-kWe solar-powered satellite with the capability to use high-powered electric propulsion, and to flight-demonstrate a variety of payload experiments.
Author
Sun; Solar Powered Aircraft; Payloads; Electric Propulsion

20040171167 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Minimum-Time and Vibration Avoidance Attitude Maneuver for Spacecraft with Torque and Momentum Limit Constraints in Redundant Reaction Wheel Configuration
Ha, Kong Q.; Femiano, Michael D.; Mosier, Gary E.; [2004]; 18 pp.; In English; SPIE Conference on Space Systems Optomechanics and Dynamics, 2-6 Aug. 2004; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation presents an algorithm for trajectory control of a spacecraft that minimizes the time to perform slews, including settling, by avoiding reaction wheel torque and momentum limits that would excite flexible structural modes. This algorithm was validated by simulation during the design of the NGST 'Yardstick' (precursor to JWST). Performance verification of a reduced form for single-axis slews was carried out using the MIT Origins Testbed. It is currently baselined for use by TPF-Coronagraph.
Derived from text
Spacecraft Control; Reaction Wheels; Trajectory Control

20040171176 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Effect of Variable Emittance Coatings on the Operation of a Miniature Loop Heat Pipe
Douglas, Donya M.; Ku, Jentung; Ottenstein, Laura; Swanson, Theodore; Hess, Steve; Darrin, Ann; [2005]; 8 pp.; In English; STAIF Conference on Thermophysics and Microgravity, 13-17 Feb. 2005, Albuquerque, NM, USA; No Copyright; Avail: CASI; A02, Hardcopy

Abstract. As the size of spacecraft shrink to accommodate small and more efficient instruments, smaller launch vehicles, and constellation missions, all subsystems must also be made smaller. Under NASA NFL4 03-OSS-02, Space Technology-8 (ST 8), NASA Goddard Space Flight Center and Jet Propulsion Laboratory jointly conducted a Concept Definition study to develop a miniature loop heat pipe (MLHP) thermal management system design suitable for future small spacecraft. The proposed MLHP thermal management system consists of a miniature loop heat pipe (LHP) and deployable radiators that are coated with variable emittance coatings (VECs). As part of the Phase A study and proof of the design concept, variable emittance coatings were integrated with a breadboard miniature loop heat pipe. The miniature loop heat pipe was supplied by the Jet Propulsion Laboratory (PL), while the variable emittance technology were supplied by Johns Hopkins University Applied Physics Laboratory and Sensortex, Inc. The entire system was tested under vacuum at various temperature extremes and power loads. This paper summarizes the results of this testing and shows the effect of the VEC on the operation of a miniature loop heat pipe.
Author
Coatings; Emittance; Heat Pipes; Miniaturization; Spacecraft Design

20040171179 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Up, Up and Away: Arc Minute Pointing at 130,000 Feet
Freesland, Doug; Gruner, Timothy; Olney, Dave; Bromberg, Bruce; Collinson, Tom; Patel, Kiran; [2005]; 1 pp.; In English; AAS Guidance and Control Conference, 5-9 Feb. 2005, Breckenridge, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

The InFOC-S X-ray telescope was launched September 16, 2004 aboard a 40 million cubic foot zero pressure high altitude balloon. Its primary objective was to demonstrate advances in hard X-ray focusing optics technology by flying an incident grazing mirror developed in cooperation between NASA Goddard Space Flight Center and Nagoya University, Japan. Launched from Ft. Sumner, NM and recovered near Wickenburg, AZ, the payload successfully collected photons from several X-ray sources during its 27 hour flight at a float altitude of 130,000 feet. To accommodate the instrument's narrow field of view, a precision arc-minute attitude determination and control systems was flown. This paper describes the application of a

traditional spacecraft star tracker gyro based attitude determination and control system to the balloon problem. The control system architecture is presented, hardware identified, and software outlined. Simulated results are compared against actual flight data, with recommendations for enhanced performance identified.
Author
Attitude Control; X Ray Sources; High Altitude Balloons; Control Systems Design; Gyroscopes; X Ray Telescopes

20040171211 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Tetrahedron Formation Control
Petruzzo, Charles; Guzman, Jose; [2004]; 30 pp.; In English
Contract(s)/Grant(s): NAS5-01090; No Copyright; Avail: CASI; A03, Hardcopy

This paper considers the preliminary development of a general optimization procedure for tetrahedron formation control. The maneuvers are assumed to be impulsive and a multi-stage optimization method is employed. The stages include (1) targeting to a fixed tetrahedron location and orientation, and (2) rotating and translating the tetrahedron. The number of impulsive maneuvers can also be varied. As the impulse locations and times change, new arcs are computed using a differential corrections scheme that varies the impulse magnitudes and directions. The result is a continuous trajectory with velocity discontinuities. The velocity discontinuities are then used to formulate the cost function. Direct optimization techniques are employed. The procedure is applied to the NASA Goddard Magnetospheric Multi-Scale (MMS) mission to compute preliminary formation control fuel requirements.
Author
Tetrahedrons; Optimization; Space Missions; Formation Flying; Multistage Rocket Vehicles; NASA Space Programs

20040171219 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Space Technology 5: Enabling Future Micro-Sat Constellation Science Missions
Carlisle, Candace C.; Webb, Evan H.; [2004]; 7 pp.; In English; 18th Annual AIAA/USU Conference on Small Satellites, 9-12 Aug. 2004, Logan, UT, USA
Report No.(s): SSC04-VI-6; No Copyright; Avail: CASI; A02, Hardcopy

The Space Technology 5 (ST-5) Project is part of NASA s New Millennium Program. ST-5 will consist of a constellation of three micro-satellites, each approximately 25 kg in mass. The mission goals are to demonstrate the research-quality science capability of the ST-5 spacecraft; to operate the three spacecraft as a constellation; and to design, develop and flight-validate three capable micro-satellites with new technologies. ST-5 is designed to measurably raise the utility of small satellites by providing high functionality in a low mass, low power, and low volume package. The whole of ST-5 is greater than the sum of its parts: the collection of components into the ST-5 spacecraft allows it to perform the functionality of a larger scientific spacecraft on a micro-satellite platform. The ST-5 mission was originally designed to be launched as a secondary payload into a Geosynchronous Transfer Orbit (GTO). Recently, the mission has been replanned for a Pegasus XL dedicated launch into an elliptical polar orbit. A three-month flight demonstration phase, beginning in March 2006, will validate the ability to perform science measurements, as well as the technologies and constellation operations. ST- 5 s technologies and concepts will then be transferred to future micro-sat science missions.
Author
Aerospace Engineering; Payloads; Elliptical Orbits

20040171261 AeroAstro, Inc., Boston, MA, USA
An Integrated Vision-Based System for Spacecraft Attitude and Topology Determination for Formation Flight Missions
Rogers, Aaron; Anderson, Kalle; Mracek, Anna; Zenick, Ray; June 2004; 13 pp.; In English; Small Satellite Conference, Logan, UT, USA
Contract(s)/Grant(s): NNG04CA50C
Report No.(s): SSCPR-IV-4; No Copyright; Avail: CASI; A03, Hardcopy

With the space industry's increasing focus upon multi-spacecraft formation flight missions, the ability to precisely determine system topology and the orientation of member spacecraft relative to both inertial space and each other is becoming a critical design requirement. Topology determination in satellite systems has traditionally made use of GPS or ground uplink position data for low Earth orbits, or, alternatively, inter-satellite ranging between all formation pairs. While these techniques work, they are not ideal for extension to interplanetary missions or to large fleets of decentralized, mixed-function spacecraft. The Vision-Based Attitude and Formation Determination System (VBAFDS) represents a novel solution to both the navigation and topology determination problems with an integrated approach that combines a miniature star tracker with a suite of robust

processing algorithms. By combining a single range measurement with vision data to resolve complete system topology, the VBAFDS design represents a simple, resource-efficient solution that is not constrained to certain Earth orbits or formation geometries. In this paper, analysis and design of the VBAFDS integrated guidance, navigation and control (GN&C) technology will be discussed, including hardware requirements, algorithm development, and simulation results in the context of potential mission applications.
Author
Topology; Formation Flying; Systems Integration; Satellite Design; Vision; Satellite Attitude Control

20040171268 Toledo Univ., OH, USA
Advanced Concepts Research for Flywheel Technology Applications
Keith, Theo G., Jr.; Wagner, Robert; August 2004; 3 pp.; In English
Contract(s)/Grant(s): NAG3-2646; No Copyright; Avail: CASI; A01, Hardcopy

The Missile Defense Agency (MDA) (formerly the Ballistic Missile Defense Organization) is embarking on a program to employ the use of High Altitude Airships (HAAs) for surveillance of coastal areas as a part of homeland defense. It is envisioned that these HAAs will fly at 70,000 feet continuously for at least a year, therefore requiring a regenerative electric power system. As part of a program to entice the MDA to utilize the NASA GRC expertise in electric power and propulsion as a means of risk reduction, an internal study program was performed to examine possible configurations that may be employed on a HAA to meet a theoretical surveillance need. This entailed the development of a set of program requirements which were flowed down to system and subsystem level requirements as well as the identification of environmental and infrastructure constraints. Such infrastructure constraints include the ability to construct a reasonably sized HAA within existing airship hangers, as the size of such vehicles could reach in excess of 600 ft. The issues regarding environments at this altitude are similar to those that would be imposed on satellite in Low Earth Orbit. Additionally, operational constraints, due to high winds at certain times of the year were also examined to determine options that could be examined to allow year round coverage of the US coast.
Derived from text
Low Earth Orbits; Missile Defense; Flywheels; Airships

20040171274 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Role of Satellite Earth Observation Data in Monitoring and Verifying International Environmental Treaties
Johnston, Shaida; September 08, 2004; 9 pp.; In English; IAC 2004, 3-10 Oct. 2004, Vancouver, Canada; Copyright; Avail: CASI; A02, Hardcopy

The term verification implies compliance verification in the language of treaty negotiation and implementation, particularly in the fields of disarmament and arms control. The term monitoring on the other hand, in both environmental and arms control treaties, has a much broader interpretation which allows for use of supporting data sources that are not necessarily acceptable or adequate for direct verification. There are many ways that satellite Earth observation (EO) data can support international environmental agreements, from national forest inventories to use in geographic information system (GIs) tools. Though only a few references to satellite EO data and their use exist in the treaties themselves, an expanding list of applications can be considered in support of multilateral environmental agreements (MEAs). This paper explores the current uses of satellite Earth observation data which support monitoring activities of major environmental treaties and draws conclusions about future missions and their data use. The scope of the study includes all phases of environmental treaty fulfillment - development, monitoring, and enforcement - and includes a multinational perspective on the use of satellite Earth observation data for treaty support.
Author
Earth Observations (From Space); Environmental Control; International Law

20040171280 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Overview of the James Webb Space Telescope (JWST) Project
Sabelhaus, Phillip A.; June 2004; 14 pp.; In English; SPIE, 21-25 June 2004
Report No.(s): SPIE-5487-21; No Copyright; Avail: CASI; A03, Hardcopy

The JWST project at the GSFC is responsible for the development, launch, operations and science data processing for the James Webb Space Telescope. The JWST project is currently in phase B with its launch scheduled for August 2011. The project is a partnership between NASA, ESA and CSA. The U.S. JWST team is now fully in place with the recent selection of Northrop Grumman Space Technology (NGST) as the prime contractor for the telescope and the Space Telescope Science

Institute (STScI) as the mission operations and science data processing lead. This paper will provide an overview of the current JWST architecture and mission status including technology developments and risks.
Author
James Webb Space Telescope; General Overviews; Hubble Space Telescope; NASA Space Programs; Spacecraft Configurations

20040171298 NASA Marshall Space Flight Center, Huntsville, AL, USA
X-37 Orbital Vehicle Development: Overview and Status
Valentine, Peter G.; [2004]; 1 pp.; In English; National TPS Workshop VII, 31 Aug. - 2 Sep. 2004, Dayton, OH, USA; No Copyright; Avail: CASI; A01, Hardcopy

technologies that will enable the development, fabrication, and flight of the automated X-37 Orbital Vehicle (OV). With the Administration s recent announcement of the Vision for Space Exploration, NASA placed the X-37 OV design on hold (while developing detailed requirements for a Crew Exploration Vehicle), but has continued funding the development of high-risk, critical technologies for potential future space exploration vehicle applications. Hot Structure Control Surfaces (HSCS) and Wing Leading Edge (WLE) tile technology development are two of the high-priority areas being funded at this time. As NASA moves forward in realizing the Vision for Space Exploration, it will continue to invest in advanced research and development aimed at making new generations of spacecraft safer, more reliable, and more affordable. The X-37 effort ultimately will benefit the Agency s vision and mission.
Author
X-37 Vehicle; Fabrication; Leading Edges; Wings

20040171388 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mathematical Modeling of Loop Heat Pipes with Multiple Capillary Pumps and Multiple Condensers, Part 1, Stead State Stimulations
Hoang, Triem T.; OConnell, Tamara; Ku, Jentung; [2004]; 7 pp.; In English; 2nd International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; Copyright; Avail: CASI; A02, Hardcopy

Loop Heat Pipes (LHPs) have proven themselves as reliable and robust heat transport devices for spacecraft thermal control systems. So far, the LHPs in earth-orbit satellites perform very well as expected. Conventional LHPs usually consist of a single capillary pump for heat acquisition and a single condenser for heat rejection. Multiple pump/multiple condenser LHPs have shown to function very well in ground testing. Nevertheless, the test results of a dual pump/condenser LHP also revealed that the dual LHP behaved in a complicated manner due to the interaction between the pumps and condensers. Thus it is redundant to say that more research is needed before they are ready for 0-g deployment. One research area that perhaps compels immediate attention is the analytical modeling of LHPs, particularly the transient phenomena. Modeling a single pump/single condenser LHP is difficult enough. Only a handful of computer codes are available for both steady state and transient simulations of conventional LHPs. No previous effort was made to develop an analytical model (or even a complete theory) to predict the operational behavior of the multiple pump/multiple condenser LHP systems. The current research project offered a basic theory of the multiple pump/multiple condenser LHP operation. From it, a computer code was developed to predict the LHP saturation temperature in accordance with the system operating and environmental conditions.
Author
Mathematical Models; Condensers; Steady State; Spacecraft Temperature; Capillary Flow; Heat Pumps; Simulation; Heat Pipes

20040171389 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Relative Navigation Strategies for the Magnetopheric Multiscale Mission
Gramling, Cheryl; Carpenter, Russell; Lee, Taesul; Long, Anne; July 2004; 6 pp.; In English; 18th International Symposium on Space Flight Dynamics, 11-15 Oct. 2004, Munich, Germany
Contract(s)/Grant(s): NNG04DA01C; No Copyright; Avail: CASI; A02, Hardcopy

This paper evaluates several navigation approaches for the Magnetospheric Multiscale (MMS) mission, which consists of a tetrahedral formation of satellites flying in highly eccentric Earth orbits. For this investigation, inter-satellite separations of approximately 10 kilometers near apogee are used for the first two phases of the MMS mission. Navigation approaches were studied using ground station two-way Doppler measurements, Global Positioning System (GPS) pseudorange measurements, and cross-link range measurements between the members of the formation. An absolute position accuracy of 15 kilometers

or better can be achieved with most of the approaches studied, and a relative position accuracy of 100 meters or better can be achieved at apogee in several cases.
Author
Magnetospheres; Space Missions; Navigation; Formation Flying

20040171390 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Formation Flying: The Future of Remote Sensing from Space
Leitner, Jesse; January 2004; 6 pp.; In English; International Symposium on Space Flight Dynamics, 11-15 Oct. 2004, Munich, Germany; No Copyright; Avail: CASI; A02, Hardcopy

Over the next two decades a revolution is likely to occur in how remote sensing of Earth, other planets or bodies, and a range of phenomena in the universe is performed from space. In particular, current launch vehicle fairing volume and mass constraints will continue to restrict the size of monolithic telescope apertures which can be launched to little or no greater size than that of the Hubble Space Telescope, the largest aperture currently flying in space. Systems under formulation today, such as the James Webb Space Telescope will be able to increase aperture size and, hence, imaging resolution, by deploying segmented optics. However, this approach is limited as well, by our ability to control such segments to optical tolerances over long distances with highly uncertain structural dynamics connecting them. Consequently, for orders of magnitude improved resolution as required for imaging black holes, imaging planets, or performing asteroseismology, the only viable approach will be to fly a collection of spacecraft in formation to synthesize a virtual segmented telescope or interferometer with very large baselines. This paper provides some basic definitions in the area of formation flying, describes some of the strategic science missions planned in the National Aeronautics and Space Administration, and identifies some of the critical technologies needed to enable some of the most challenging space missions ever conceived which have realistic hopes of flying.
Author
Formation Flying; Remote Sensing; NASA Space Programs; Space Missions

20040171412 NASA Marshall Space Flight Center, Huntsville, AL, USA
Determine Important Nuclear Fragmentation Processes for Space Radiation Protection in Human Space Explorations
Lin, Zi-Wei; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NCC8-200; Copyright; Avail: Other Sources; Abstract Only

Space radiation from cosmic ray particles is one of the main challenges for long-term human space explorations such as a permanent moon base or a trip to Mars. Material shielding may provide significant radiation protection to astronauts, and models have been developed in order to evaluate the effectiveness of different shielding materials and to predict radiation environment inside the spacecraft. In this study we determine the nuclear fragmentation cross sections which will most affect the radiation risk behind typical radiation shielding materials. These cross sections thus need more theoretical studies and accurate experimental measurements in order for us to more precisely predict the radiation risk in human space exploration.
Author
Nuclear Physics; Fragmentation; Penetration; Radiation Protection

20040171413 NASA Marshall Space Flight Center, Huntsville, AL, USA
Analysis of Surface Charging for a Candidate Solar Sail Mission Using Nascap-2k
Neergaard, Linda F.; Davis, Victoria A.; Gardner, Barbara; Mandell, Myron; Minow, Joseph I.; August 25, 2004; 1 pp.; In English; Solar Sail Technology and Applications Conference, 28-29 Sep. 2004, Greenbelt, MD, USA; No Copyright; Avail: Other Sources; Abstract Only

The characterization of the electromagnetic interaction for a solar sail in the solar wind environment, and identification of viable charging mitigation strategies, is a critical solar sail mission design task, as spacecraft charging has important implications both for science applications and for sail lifetime. To that end, we have pexformed some preliminary surface charging calculations of a candidate 150 meter class solar sail spacecraft for the 0.5 AU solar polar orbit and a 1.0 AU L1 orbit. We construct a model of the spacecraft with candidate materials having appropriate electrical properties using Object Toolkit and perform the spacecraft charging analysis using Nascap-2k, the NASA/AFRL sponsored spacecraft charging analysis tool. We use mean and extreme solar wind environments appropriate for the 0.5 AU and 1.0 AU missions to establish current collection of solar wind ions and electrons. In addition, we include a geostationary orbit case to demonstrate a bounding example of extreme (negative) charging of a solar sail spacecraft in the geostationary orbit environment. Results from the charging analysis demonstrate that minimal differential potentials (and resulting threat of electrostatic discharge) occur when the spacecraft is constructed entirely of conducting materials, as expected. Examples with dielectric materials exposed to the

space environment exhibit differential potentials ranging from a few volts to extreme potentials in the kilovolt range. Recommendations for further analyses include calculations of wake effects, surface current densities, and environments effects on conductivities.
Author
Electromagnetic Interactions; Spacecraft Models; Solar Sails; Spacecraft Charging; Computerized Simulation

20040171491 NASA Langley Research Center, Hampton, VA, USA
Measurements from an Aerial Vehicle: A New Tool for Planetary Exploration
Wright, Henry S.; Levine, Joel S.; Croom, Mark A.; Edwards, William C.; Qualls, Garry D.; Gasbarre, Joseph F.; [2004]; 12 pp.; In English; SPIE's 4th International Asia-Pacific Symposium on Remote Sensing of the Atmosphere, Ocean, Environment, and Space, 8-11 Nov. 2004, Honolulu, HI, USA
Contract(s)/Grant(s): 090-20-KS
Report No.(s): SPIE-5660-23; No Copyright; Avail: CASI; A03, Hardcopy

Aerial vehicles fill a unique planetary science measurement gap, that of regional-scale, near-surface observation, while providing a fresh perspective for potential discovery. Aerial vehicles used in planetary exploration bridge the scale and resolution measurement gaps between orbiters (global perspective with limited spatial resolution) and landers (local perspective with high spatial resolution) thus complementing and extending orbital and landed measurements. Planetary aerial vehicles can also survey scientifically interesting terrain that is inaccessible or hazardous to landed missions. The use of aerial assets for performing observations on Mars, Titan, or Venus will enable direct measurements and direct follow-ons to recent discoveries. Aerial vehicles can be used for remote sensing of the interior, surface and atmosphere of Mars, Venus and Titan. Types of aerial vehicles considered are airplane 'heavier than air' and airships and balloons 'lighter than air'. Interdependencies between the science measurements, science goals and objectives, and platform implementation illustrate how the proper balance of science, engineering, and cost, can be achieved to allow for a successful mission. Classification of measurement types along with how those measurements resolve science questions and how these instruments are accommodated within the mission context are discussed.
Author
Mars Surface; Remote Sensing; Surveys; Airships

20040171549 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Implementing Recommendations of the Columbia Accident Investigation Board - Development of on-Orbit RCC Thermography
Ottens, Brian; Parker, Brad; Stephen, Ryan; [2005]; 1 pp.; In English; Thermosence XXVII, 28 Mar. - 1 Apr. 2005, Orlando, FL, USA; No Copyright; Avail: Other Sources; Abstract Only

One of NASA s Space Shuttle Return-to-Flight (RTF) efforts has been to develop thermography for the on-orbit inspection of the Reinforced Carbon Carbon (RCC) portion of the Orbiter Wing Leading Edge (WLE). This paper addresses the capability of thermography to detect cracks in RCC by using in-plane thermal gradients that naturally occur on-orbit. Crack damage, which can result from launch debris impact, is a detection challenge for other on-orbit sensors under consideration for RTF, such as the Intensified Television Camera and Laser Dynamic Range Imager. We studied various cracks in RCC, both natural and simulated, along with material characteristics, such as emissivity uniformity, in steady-state thermography. Severity of crack, such as those likely and unlikely to cause burn through were tested, both in-air and in-vacuum, and the goal of this procedure was to assure crew and vehicle safety during re-entry by identification and quantification of a damage condition while on-orbit. Expected thermal conditions are presented in typical shuttle orbits, and the expected damage signatures for each scenario are presented. Finally, through statistical signal detection, our results show that even at very low in-plane thermal gradients, we are able to detect damage at or below the threshold for fatality in the most critical sections of the WLE, with a confidence exceeding 1 in 10,000 probability of false negative.
Author
Space Transportation System Flights; Columbia (Orbiter); Space Shuttles; Carbon-Carbon Composites; Thermography; Reinforcing Materials

20040171604 NASA Lewis Research Center, Cleveland, OH, USA
Report of the Seasat Failure Review Board
Lundin, Bruce T.; December 21, 1978; 196 pp.; In English; 2004 MAPLD International Conference, Sep. 2004, Washington, DC, USA; No Copyright; Avail: CASI; A09, Hardcopy

The Seasat spacecraft failed on October 9, 1978, after satisfactory operation in orbit for 105 days, as a result of a loss of electrical power in the Agena bus that was used as a part of the spacecraft. This loss of power was caused by a massive and progressive short in one of the slip ring assemblies that was used to connect the rotating solar arrays into the power subsystem. The most likely cause of this short was the initiation of an arc between adjacent slip ring brush assemblies. The triggering mechanism of this arc could have been either a wire-to-brush assembly contact, a brush-to-brush contact, or a momentary short caused by a contaminant that bridged internal components of opposite electrical polarity. The slip ring assembly, as used in the Seasat spacecraft, was connected into the power subsystem in such a way that most of the adjacent brush assemblies were of opposite electrical polarity. This wiring arrangement, together with the congested nature of the design itself, made the Seasat slip ring assembly a unique, first-of-a-kind component that was particularly prone to shorting. The possibility of slip ring failures resulting from placing opposite electrical polarities on adjacent brush assemblies was known at least as early-as the summer of 1977 to other projects within the contractor's organization. Furthermore, failures of slip ring assemblies due to shorting between brushes had been experienced by the prime contractor on slip ring assemblies used by other programs. That the Seasat organization was not fully aware of these potential failure modes was due to a breakdown in communication within the contractor's organization.
Author (revised)
Seasat 1; Failure Modes; Failure Analysis; Accident Investigation; System Failures

20040171611 Busek (J.) Co., Inc., Natick, MA, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA, CrossTrac Engineering, Los Altos, CA, USA
The Space Technology-7 Disturbance Reduction Systems
ODonnell, James R., Jr.; Hsu, Oscar C.; Hanson, John; Hruby, Vlad; [2004]; 6 pp.; In English; 18th International Symposium on Space Flight Dynamics, 11-15 Oct. 2004, Munich, Germany; Copyright; Avail: CASI; A02, Hardcopy

The Space Technology 7 Disturbance Reduction System (DRS) is an in-space technology demonstration designed to validate technologies that are required for future missions such as the Laser Interferometer Space Antenna (LISA) and the Micro-Arcsecond X-ray Imaging Mission (MAXIM). The primary sensors that will be used by DRS are two Gravitational Reference Sensors (GRSs) being developed by Stanford University. DRS will control the spacecraft so that it flies about one of the freely-floating Gravitational Reference Sensor test masses, keeping it centered within its housing. The other GRS serves as a cross-reference for the first as well as being used as a reference for .the spacecraft s attitude control. Colloidal MicroNewton Thrusters being developed by the Busek Co. will be used to control the spacecraft's position and attitude using a six degree-of-freedom Dynamic Control System being developed by Goddard Space Flight Center. A laser interferometer being built by the Jet Propulsion Laboratory will be used to help validate the results of the experiment. The DRS will be launched in 2008 on the European Space Agency (ESA) LISA Pathfinder spacecraft along with a similar ESA experiment, the LISA Test Package.
Author
Aerospace Engineering; Attitude Control; Dynamic Control; Spacecraft Control

20040171645 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Geo Quick Ride (GQR) Program: Providing Inexpensive and Frequent Access to Space
Caffrey, Robert; Baniszewski, John; [2004]; 6 pp.; In English; 18th Annual AIAA/USU Conference on Small Satellites, 9-12 Aug. 2004, Logan, UT, USA
Report No.(s): SSC04-X-5; No Copyright; Avail: CASI; A02, Hardcopy

This paper examines piggybacking NASA, university, and industry payloads on commercial geosynchronous satellites. NASA's RSDO Office awarded Geo Quick Ride (GQR) study contracts in 1998 to spacecraft manufactures to examine the issues with flying secondary payloads. The study results were very promising. Commercial communication satellites have frequent flights and significant unused resources that could be used to fly secondary payloads. However, manifesting secondary payloads on a commercial revenue-generating satellite is a complex problem to solve. The solution requires multiple simultaneous approaches in order to be successful. There are business, economic, technical, schedule, and organizational issues to be resolved. This paper examines the Geo Quick Ride (GQR) concept, discusses the development issues, and describes how this concept solves many of these issues.
Author
Communication Satellites; Low Cost; NASA Programs; Manufacturing

20040171663 Swales Aerospace, Greenbelt, MD, USA

Controller of the Laser Interferometer Space Antenna

Hyde, T. T.; Maghami, P. G.; Kim, J.; [2004]; 6 pp.; In English; ISSFD Conference, 11-15 Oct. 2004, Munich, Germany; Copyright; Avail: CASI; A02, Hardcopy

The Laser Interferometer Space Antenna mission is a planned gravitational wave detector consisting of three spacecraft in heliocentric orbit. Laser interferometry is used to measure distance fluctuations between test masses aboard each spacecraft to the picometer level over a 5 million kilometer separation. The Disturbance Reduction System comprises the pointing and positioning control of the spacecraft, electrostatic suspension control of the test masses, and point-ahead and acquisition control. This paper presents a control architecture and design for the Disturbance Reduction System to meet the stringent pointing and positioning requirements. Simulations are performed to demonstrate the feasibility of the proposed architecture. Author

LISA (Observatory); Controllers; Spacecraft Design; Gravitational Waves; Pointing Control Systems

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20040161545 Houston Univ., TX, USA

Mars Radiator Characterization Experimental Program

Witte, Larry C.; Hollingsworth, D. Keith; [2004]; 27 pp.; In English

Contract(s)/Grant(s): NAG9-1421; No Copyright; Avail: CASI; A03, Hardcopy

Radiators are an enabling technology for the human exploration and development of the moon and Mars. As standard components of the heat rejection subsystem of space vehicles, radiators are used to reject waste heat to space and/or a planetary environment. They are typically large components of the thermal control system for a space vehicle or human habitation facility, and in some cases safety factors are used to oversize them when the operating environment cannot be fully characterized. Over-sizing can impose significant weight and size penalties that might be prohibitive for future missions. Radiator performance depends on the size of the radiator surface, its emittance and absorptance, the radiator temperature, the effective sky temperature surrounding the radiator, solar radiation and atmospheric irradiation levels, convection to or from the atmosphere (on Mars), and other conditions that could affect the nature of the radiator surface, such as dust accumulation. Most particularly, dust is expected to be a major contributor to the local environmental conditions on either the lunar or Martian surface. This conclusion regarding Mars is supported by measurements of dust accumulation on the Mars Sojourner Rover solar array during the Pathfinder mission. This Final Report describes a study of the effect of Martian dust accumulation on radiator performance. It is comprised of quantitative measurements of effective emittance for a range of dust accumulation levels on surfaces of known emittance under clean conditions. The test radiator coatings were Z-93P, NS-43G, and Silver Teflon (10 mil) film. The Martian dust simulant was Carbondale Red Clay. Results were obtained under vacuum conditions sufficient to reduce convection effects virtually to zero. The experiments required the development of a calorimetric apparatus that allows simultaneous measurements of the effective emittance for all the coatings at each set of experimental conditions. A method of adding dust to multiple radiator coupons was developed and shown to be capable of depositing dust on the surfaces with acceptable uniformity. In these experiments, the dust layer accumulates under earth gravity and in the presence of an earth atmosphere. An invention disclosure for the dust deposition apparatus is being filed through NASA and University of Houston.

Derived from text

Calorimeters; Convection Currents; Gravitation; Heat Radiators; Mars Surface; Safety Factors; Solar Radiation

20040161548 NASA Marshall Space Flight Center, Huntsville, AL, USA

Multi-level Simulation of a Real Time Vibration Monitoring System Component

Roberston, Bryan; Wilkerson, DeLisa; April 02, 2004; 1 pp.; In English; 7th Mil/Aerospace Applications of Programmable Logic Devices International Conference (MAPLD), 8-10 Sep. 2004, Washington, DC, USA; No Copyright; Avail: Other Sources; Abstract Only

This paper describes the development of a custom built Digital Signal Processing (DSP) printed circuit board designed

to implement the Advanced Real Time Vibration Monitoring Subsystem proposed by MSFC Transportation Directorate in 2000 for the Space Shuttle Main Engine Advanced Health Management System (AHMS). This Real Time Vibration Monitoring System (RTVMS) is being developed for ground use as part of the AHMS Health Management Computer-Integrated Rack Assembly (HMC-IRA). The HMC-IRA RTVMS design contains five DSPs which are highly interconnected through individual communication ports, shared memory, and a unique communication router that allows all the DSPs to receive digitized data from two multi-channel analog boards simultaneously. This paper will briefly cover the overall board design but will focus primarily on the state-of-the-art simulation environment within which this board was developed. This 16-layer board with over 1800 components and an additional mezzanine card has been an extremely challenging design. Utilization of a Mentor Graphics simulation environment provided the unique board and system level simulation capability to ascertain any timing or functional concerns before production. By combining VHDL, Synopsys Software and Hardware Models, and the Mentor Design Capture Environment, multiple simulations were developed to verify the RTVMS design. This multi-level simulation allowed the designers to achieve complete operability without error the first time the RTVMS printed circuit board was powered. The HMCIRA design has completed all engineering unit testing and the deliverable unit is currently under development.
Author
Vibration; Circuit Boards; Signal Processing; Environment Simulation; Management Systems; Printed Circuits; Real Time Operation

20040161582 NASA Marshall Space Flight Center, Huntsville, AL, USA
Technology Development and Demonstration Concepts for the Space Elevator
Smitherman, David V., Jr.; [2004]; 1 pp.; In English; 55th International Astronautical Congress. Symposium on the Far Future: Renewed Vision and Space Eleveator and the Future of Tethers in Space, 4-8 Oct. 2004, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

During the 1990s several discoveries and advances in the development of carbon nano-tube (CNT) materials indicated that material strengths many times greater than common high-strength composite materials might be possible. Progress in the development of this material led to renewed interest in the space elevator concept for construction of a tether structure from the surface of the Earth through a geostationary orbit (GEO) and thus creating a new approach to Earth-to-orbit transportation infrastructures. To investigate this possibility the author, in 1999, managed for NASA a space elevator work:hop at the Marshall Space Flight Center to explore the potential feasibility of space elevators in the 21 century, and to identify the critical technologies and demonstration missions needed to make development of space elevators feasible. Since that time, a NASA Institute for Advanced Concepts (NIAC) funded study of the Space Elevator proposed a concept for a simpler first space elevator system using more near-term technologies. This paper will review some of the latest ideas for space elevator development, the critical technologies required, and some of the ideas proposed for demonstrating the feasibility for full-scale development of an Earth to GEO space elevator. Critical technologies include CNT composite materials, wireless power transmission, orbital object avoidance, and large-scale tether deployment and control systems. Numerous paths for technology demonstrations have been proposed utilizing ground experiments, air structures. LEO missions, the space shuttle, the international Space Station, GEO demonstration missions, demonstrations at the lunar L1 or L2 points, and other locations. In conclusion, this paper finds that the most critical technologies for an Earth to GEO space elevator include CNT composite materials development and object avoidance technologies; that lack of successful development of these technologies need not preclude continued development of space elevator systems in general; and that the critical technologies required for the Earth to GEO space elevator are not required for similar systems at the Moon, Mars, Europa, or for orbital tether systems at GEO, Luna, and other locations.
Author
Technology Assessment; Composite Materials; Product Development; Elevators (Control Surfaces)

20040170454 NASA Marshall Space Flight Center, Huntsville, AL, USA
Specific Impulse Definition for Ablative Laser Propulsion
Herren, Kenneth A.; Gregory, Don A.; [2004]; 1 pp.; In English; Third International Symposium on Beamed Energy Propulsion, 11-13 Oct. 2004, Troy, NY, USA; No Copyright; Avail: Other Sources; Abstract Only

The term ‘specific impulse’ is so ingrained in the field of rocket propulsion that it is unlikely that any fundamental argument would be taken seriously for its removal. It is not an ideal measure but it does give an indication of the amount of mass flow (mass loss/time), as in fuel rate, required to produce a measured thrust over some time period This investigation explores the implications of being able to accurately measure the ablation rate and how the language used to describe the specific impulse results may have to change slightly, and recasts the specific impulse as something that is not a time average.

It is not currently possible to measure the ablation rate accurately in real time so it is generally just assumed that a constant amount of material will be removed for each laser pulse delivered The specific impulse dependence on the ablation rate is determined here as a correction to the classical textbook definition.
Author
Specific Impulse; Laser Propulsion; Mass Flow; Ablation; Pulsed Lasers; Spacecraft Propulsion

20040171169 AI Solutions, Inc., Lanham, MD, USA
Automated Attitude Sensor Calibration: Progress and Plans
Sedlak, Joseph; Hashmall, Joseph; [2004]; 14 pp.; In English; AIAA/AAS Astrodynamic Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): NNG04DA01C; Copyright; Avail: CASI; A03, Hardcopy

This paper describes ongoing work a NASA/Goddard Space Flight Center to improve the quality of spacecraft attitude sensor calibration and reduce costs by automating parts of the calibration process. The new calibration software can autonomously preview data quality over a given time span, select a subset of the data for processing, perform the requested calibration, and output a report. This level of automation is currently being implemented for two specific applications: inertial reference unit (IRU) calibration and sensor alignment calibration. The IRU calibration utility makes use of a sequential version of the Davenport algorithm. This utility has been successfully tested with simulated and actual flight data. The alignment calibration is still in the early testing stage. Both utilities will be incorporated into the institutional attitude ground support system.
Author
Attitude Control; Spacecraft Instruments; Automatic Control; Computer Programs; Calibrating

20040171189 NASA Goddard Space Flight Center, Greenbelt, MD, USA
In-Flight Observations of Long-Term Single-Event Effect (SEE) Performance on X-ray Timing Explorer (XTE) Solid-state Recorders (SSRs)
Poivey, Christian; Gee, George; LaBel, Kenneth A.; Barth, Janet L.; [2004]; 4 pp.; In English; 2004 IEEE Nuclear and Space Radiation Effects Conference (NSREC04), 22 Jul. 2004, Atlanta, GA, USA
Contract(s)/Grant(s): IACRO-03-40351; IACRO-04-40641; No Copyright; Avail: CASI; A01, Hardcopy

We present multi-year Single Event Upset (SEU) flight data on Solid State Recorder (SSR) memories for the X-ray Timing Explorer (XTE) NASA mission. Actual SEU rates are compared to the predicted rates based on ground test data and environment models.
Author
Spacecraft Electronic Equipment; Single Event Upsets; X Ray Timing Explorer; Memory (Computers)

20040171194 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Theoferometer for High Accuracy Optical Alignment and Metrology
Toland, Ronald; Leviton, Doug; Koterba, Seth; [2004]; 11 pp.; In English; Optical Science and Technology Annual Meeting, 2-6 Aug. 2004, Denver, CO, USA; No Copyright; Avail: CASI; A03, Hardcopy

The accurate measurement of the orientation of optical parts and systems is a pressing problem for upcoming space missions, such as stellar interferometers, requiring the knowledge and maintenance of positions to the sub-arcsecond level. Theodolites, the devices commonly used to make these measurements, cannot provide the needed level of accuracy. This paper describes the design, construction, and testing of an interferometer system to fill the widening gap between future requirements and current capabilities. A Twyman-Green interferometer mounted on a 2 degree of freedom rotation stage is able to obtain sub-arcsecond, gravity-referenced tilt measurements of a sample alignment cube. Dubbed a 'theoferometer,' this device offers greater ease-of-use, accuracy, and repeatability than conventional methods, making it a suitable 21st-century replacement for the theodolite.
Author
Metrology; Optical Measurement; Interferometers

20040171234 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Implicit and Explicit Spacecraft Gyro Calibration
Bar-Itzhack, Itzhack Y.; Harman, Richard R.; [2004]; 17 pp.; In English; AIAA/AAS Guidance, Navigation, and Control Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a comparison between two approaches to sensor calibration. According to one approach, called explicit, an estimator compares the sensor readings to reference readings, and uses the difference between the two to estimate the calibration parameters. According to the other approach, called implicit, the sensor error is integrated to form a different entity, which is then compared with a reference quantity of this entity, and the calibration parameters are inferred from the difference. In particular this paper presents the comparison between these approaches when applied to in-flight spacecraft gyro calibration. Reference spacecraft rate is needed for gyro calibration when using the explicit approach; however, such reference rates are not readily available for in-flight calibration. Therefore the calibration parameter-estimator is expanded to include the estimation of that reference rate, which is based on attitude measurements in the form of attitude-quaternion. A comparison between the two approaches is made using simulated data. It is concluded that the performances of the two approaches are basically comparable. Sensitivity tests indicate that the explicit filter results are essentially insensitive to variations in given spacecraft dynamics model parameters.
Author
Calibrating; Gyroscopes; Spacecraft Instruments; Algorithms

20040171252 NASA Goddard Space Flight Center, Greenbelt, MD, USA
AZW-LA-II White Paint on Swift: Lessons Learned from First Time Flying on Spacecraft Radiators
Choi, Michael K.; [2004]; 7 pp.; In English; 2nd International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A02, Hardcopy

AZ-Tek's AZW-LA-II low solar absorptance white paint was previously flown as a flight experiment, and is being flown as a calorimeter. However it has never been flown as a thermal coating of radiators on an operational spacecraft before. This paint has the lowest solar absorptance among all white paints, and a very small degradation. Its cost is many times more expensive than white paints that have a higher solar absorptance. To meet the thermal requirements of the Swift Burst Alert Telescope (BAT) Detector Array and X-Ray Telescope (XRT) focal plane camera assembly (FPCA) charged coupled device (CCD), AZW-LA-II is used as the thermal coating for the BAT and XRT radiators. This paper presents the lessons learned from flying this low solar absorptance white paint as a thermal coating of radiators on an operational spacecraft for the first time.
Author
Spacecraft Radiators; Space Missions; Spacecraft Instruments; Paints; X Ray Telescopes

20040171253 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The EOS-Aura Mission
Schoeberl, Mark R.; [2004]; 1 pp.; In English; International Summer School on Atmosphere and Ocean Sciences, 19-24 Sep. 2004, L'Aquila, Italy; No Copyright; Avail: Other Sources; Abstract Only

The EOS-Aura atmospheric chemistry mission is scheduled for launch in June 2004. Aura is the third of the large EOS observatories. The spacecraft carries an international instrument payload that has a planned six year lifetime. The Aura mission will collect data to help answer stratospheric and tropospheric atmospheric chemistry questions. The mission has the following four major objectives: 1) Track the ozone layer to determine if it is recovering as predicted. The four Aura instruments, HIRDLS, OMI, MLS, and TES will measure ozone, key source, radical, reservoir, tracer gases, and aerosols. Aura's unique design allows for major ozone controlling gases to be measured within the same air mass within a few minutes. The OMI instrument will continue the trends fiom NASA's TOMS series. 2) Track tropospheric pollutant sources and measure tropospheric ozone precursors. Major pollution sources include urban, industrial and biomass burning regions. Tropospheric trace gases will be measured, using TES and OMI, at an average spatial resolution of about approximately 15 km with near global coverage. 3) Measure key upper tropospheric atmospheric constituents that influence climate. The Aura instruments will monitor O3, H2O, CO, cirrus ice, and aerosols. EOS-Aura will fly in a sun-synchronous polar orbit about 15 minutes behind Aqua and make near coincident and synergistic measurements with the EOS- Aqua, Cloudsat, OCO, PARASOL and Calipso missions. Aura launched July 15,2004.
Author
Atmospheric Chemistry; Earth Observing System (EOS); Space Missions; Spacecraft Instruments

20040171467 NASA Langley Research Center, Hampton, VA, USA
Acoustic Emission Detection of Impact Damage on Space Shuttle Structures
Prosser, William H.; Gorman, Michael R.; Madaras, Eric I.; [2004]; 8 pp.; In English; 17th International Acoustic Emission Symposium, 9-11 Nov. 2004, Tokyo, Japan
Contract(s)/Grant(s): 376-70-30-05; No Copyright; Avail: CASI; A02, Hardcopy

The loss of the Space Shuttle Columbia as a result of impact damage from foam debris during ascent has led NASA to investigate the feasibility of on-board impact detection technologies. AE sensing has been utilized to monitor a wide variety of impact conditions on Space Shuttle components ranging from insulating foam and ablator materials, and ice at ascent velocities to simulated hypervelocity micrometeoroid and orbital debris impacts. Impact testing has been performed on both reinforced carbon composite leading edge materials as well as Shuttle tile materials on representative aluminum wing structures. Results of these impact tests will be presented with a focus on the acoustic emission sensor responses to these impact conditions. These tests have demonstrated the potential of employing an on-board Shuttle impact detection system. We will describe the present plans for implementation of an initial, very low frequency acoustic impact sensing system using pre-existing flight qualified hardware. The details of an accompanying flight measurement system to assess the Shuttle s acoustic background noise environment as a function of frequency will be described. The background noise assessment is being performed to optimize the frequency range of sensing for a planned future upgrade to the initial impact sensing system. Author

Space Shuttles; Impact Damage; Acoustic Emission; Impact Tests

20040171510 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Current Total Ionizing Dose Results and Displacement Damage Results for Candidate Spacecraft Electronics for NASA

Cochran, Donna J.; Kniffin, Scott D.; LaBel, Kenneth A.; OBryan, Martha V.; Reed, Robert A.; Ladbury, Ray L.; Howard, James W., Jr.; Poivey, Christian; Buchner, Stephen P.; Marshall, Cheryl J., et al.; [2004]; 7 pp.; In English; 2004 IEEE Nuclear and Space Radiation Effects Conference, 19-23 Jul. 2003, Atlanta, GA, USA

Contract(s)/Grant(s): DTRA-IACRO-03-40351; DTRA-IACRO-04-40641; Copyright; Avail: CASI; A02, Hardcopy

We present data on the vulnerability of a variety of candidate spacecraft electronics to total ionizing dose and displacement damage. Devices tested include optoelectronics, digital, analog, linear bipolar devices, hybrid devices, Analog-to-Digital Converters (ADCs), and Digital-to-Analog Converters (DACS), among others. Author

Radiation Dosage; Irradiation; Radiation Effects; Radiation Tolerance; Digital Electronics; Spacecraft Electronic Equipment

20040171520 AI Solutions, Inc., Lanham, MD, USA

Compensation for Time-Dependent Star Tracker Thermal Deformation on the Aqua Spacecraft

Hashmall, Joseph A.; Natanson, Gregory; Glickman, Jonathan; Sedlak, Joseph; [2004]; 6 pp.; In English; 18th ISSF Conference, 11-15 Oct. 2004, Munich, Germany

Contract(s)/Grant(s): NNG04DA01C; No Copyright; Avail: CASI; A02, Hardcopy

Analysis of attitude sensor data from the Aqua mission showed small but systematic differences between batch least-squares and extended Kalman filter attitudes. These differences were also found to be correlated with star tracker residuals, gyro bias estimates, and star tracker baseplate temperatures. This paper describes the analysis that shows that these correlations are all consistent with a single cause: time-dependent thermal deformation of star tracker alignments. These varying alignments can be separated into relative and common components. The relative misalignments can be determined and compensated for. The common misalignments can only be determined in special cases. Author

Deformation; Star Trackers; Time Dependence; Space Missions; Attitude (Inclination); Spacecraft Instruments

20040171522 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Swift Gamma-Ray Burst Explorer: Mission Design for Rapid, Accurate Location of Gamma-ray Bursts

Bundas, David J.; July 30, 2004; 1 pp.; In English; 2005 IEEE Aerospace Conference, 5-12 Mar. 2005, Big Sky, MT, USA; No Copyright; Avail: Other Sources; Abstract Only

The Swift Gamma-ray Burst Explorer is a NASA Mid-sized Explorer (MIDEX) with the primary mission of determining the origins of Gamma-Ray Bursts (GRBs). It will be the first mission to autonomously respond to newly-discovered GRBs and provide immediate follow-up narrow field instruments capable of multi-wavelength (UV, Optical, X-ray) observations. The characteristics of GRBs that are the key mission design drivers, are their non-repeating and brief duration bursts of multi-wavelength photons. In addition, rapid notification of the location and characteristics of the GRBs to ground-and-space-based observatories drive the end-to-end data analysis and distribution requirements. The Swift mission is managed by the GSFC, and includes an international team of contributors that each bring their unique perspective that have proven invaluable to the mission. The spacecraft bus, provided by Spectrum Astro, Inc. was procured through a Rapid Spacecraft Development Office (RSDO) contract by the GSFC. There are three instruments: the Burst Alert Telescope (BAT) provided by the GSFC;

the X-Ray Telescope (XRT) provided by a team led by the Pennsylvania State University (PSU); and the Ultra-Violet Optical Telescope (UVOT), again managed by PSU. The Mission Operations Center (MOC) was developed by and is located at PSU. Science archiving and data analysis centers are located at the GSFC, in the UK and in Italy.
Derived from text
Gamma Ray Bursts; Space Missions; NASA Space Programs; Automatic Control

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SPACECRAFT PROPULSION AND POWER

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

20040161552 Ewing Research, Nashville, TN, USA
Solar Sail Models and Test Measurements Correspondence for Validation Requirements Definition
Ewing, Anthony; Adams, Charles; September 15, 2004; 6 pp.; In English; Solar Sail Technology and Applications Conference, 26-29 Sep. 2004, Greenbelt, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy

Solar sails are being developed as a mission-enabling technology in support of future NASA science missions. Current efforts have advanced solar sail technology sufficient to justify a flight validation program. A primary objective of this activity is to test and validate solar sail models that are currently under development so that they may be used with confidence in future science mission development (e.g., scalable to larger sails). Both system and model validation requirements must be defined early in the program to guide design cycles and to ensure that relevant and sufficient test data will be obtained to conduct model validation to the level required. A process of model identification, model input/output documentation, model sensitivity analyses, and test measurement correspondence is required so that decisions can be made to satisfy validation requirements within program constraints.
Author
NASA Programs; Solar Sails; Technology Utilization; Space Missions; Spacecraft Models

20040161557 NASA Marshall Space Flight Center, Huntsville, AL, USA
Solar Sail Control Actuator Concepts
Mangus, David; Heaton, Andy; September 05, 2004; 5 pp.; In English; Solar Sail Technology and Applications Conference, 28-29 Sep. 2004, Greenbelt, MD, USA; No Copyright; Avail: CASI; A01, Hardcopy

The thrust produced by a solar sail is a direct function of its attitude. Thus, solar sail thrust vector control is a key technology that must be developed for sailcraft to become a viable form of deep-space transportation. The solar sail community has been studying various sail Attitude Control System (ACS) actuator designs for near Earth orbit as well as deep space missions. These actuators include vanes, spreader bars, two-axis gimbals, floating/locking gimbals with wheels, and translating masses. This paper documents the various concepts and performs an assessment at the highest level. This paper will only compare the various ACS actuator concepts as they stand at the publication time. This is not an endorsement of any particular concept. As concepts mature, the assessments will change.
Author
Solar Sails; Thrust Vector Control; Actuators

20040170473 NASA Marshall Space Flight Center, Huntsville, AL, USA
Technology Innovations from NASA's Next Generation Launch Technology Program
Cook, Stephen A.; Morris, Charles E. K., Jr.; Tyson, Richard W.; [2004]; 11 pp.; In English; 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada
Report No.(s): IAC-04-V5.01; No Copyright; Avail: CASI; A03, Hardcopy

NASA's Next Generation Launch Technology Program has been on the cutting edge of technology, improving the safety, affordability, and reliability of future space-launch-transportation systems. The array of projects focused on propulsion, airframe, and other vehicle systems. Achievements range from building miniature fuel/oxygen sensors to hot-firings of major rocket-engine systems as well as extreme thermo-mechanical testing of large-scale structures. Results to date have significantly advanced technology readiness for future space-launch systems using either airbreathing or rocket propulsion.
Author
Reusable Launch Vehicles; Spacecraft Propulsion; Research and Development; Technology Assessment

20040170643 Warp Drive Metrics, Las Vegas, NV
Advanced Propulsion Study
Davis, Eric W.; Feb. 2004; 103 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F04611-99-C-0025; Proj-4847
Report No.(s): AD-A426465; AFRL-PR-ED-TR-2004-0024; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study was tasked with the purpose of conducting a thorough literature and program search to carry out and document a technical assessment of the latest concepts in science and engineering that show promise of leading to a major advance in Earth-to-orbit (ETO) propulsion. The study also reviewed and evaluated a select number of credible far- term breakthrough propulsion physics concepts pertaining to R&D work done on or related to gravity/inertia modification, spacetime metric modification, and the extraction of energy from the space vacuum environment. The results of the study are presented and summarized in this report. A combined bibliography of advanced propulsion references was assembled and is presented. The report includes an overview of the recent history and present state-of-the-art of ETO launch vehicle and propulsion concepts. Also included is an outline and summary of the criteria and operative guidelines that the author used to examine, select and recommend advanced propulsion concepts. The author identified and selected five promising advanced propulsion concepts, and provides a detailed technical evaluation of their breakthrough potential for ETO propulsion.
DTIC
Propulsion; Propulsion System Configurations; Propulsion System Performance

20040171099 Texas Univ., Austin, TX, USA
Railplug Ignition System for Enhanced Engine Performance and Reduced Maintenance
2004; In English
Report No.(s): DE2004-821852; No Copyright; Avail: National Technical Information Service (NTIS)

During the first 6 months of this project, four subtasks were scheduled. Two of these commenced earlier than originally proposed. The experimental task, development of new railplug designs, was completed on schedule. The three numerical subtasks were not completed on schedule. However, this is not expected to affect the capability to complete the overall project on schedule. Because we are early in the project, no results or conclusions were generated. Our progress included development of new railplug geometries, to be tested during the second 6 months of the project, and development of an initial 3D model. Progress was also made in development of the appropriate chemical kinetics and generation of a model for the ignition circuit.
NTIS
Ignition Systems; Engine Tests

20040171272 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Propulsion Options for the LISA Mission
Cardiff, Eric H.; Marr, Gregory C.; [2004]; 12 pp.; In English; 40th AIAA/ASME/ASEE/SAE Joint Propulsion Conference, 12-14 Jul. 2004, Fort Lauderdale, FL, USA; No Copyright; Avail: CASI; A03, Hardcopy

The LISA mission is a constellation of three spacecraft operating at 1 AU from the Sun in a position trailing the Earth. After launch, a propulsion module provides the AV necessary to reach this operational orbit, and separates from the spacecraft. A second propulsion system integrated with the spacecraft maintains the operational orbit and reduces nongravitational disturbances on the instruments. Both chemical and electrical propulsion systems were considered for the propulsion module, and this trade is presented to show the possible benefits of an EP system. Several options for the orbit maintenance and disturbance reduction system are also briefly discussed, along with several important requirements that suggest the use of a FEEP thruster system.
Author
Spacecraft Orbits; Sun; Propulsion System Performance; Propulsion System Configurations

20040171369 Michigan State Univ., East Lansing, MI, USA, Tufts Univ., Medford, MA, USA
Silicon Carbide Micro-devices for Combustion Gas Sensing under Harsh Conditions
Ghosh, R. N.; Tobias, P.; Tobin, R. G.; Apr. 2004; In English
Report No.(s): DE2004-824012; No Copyright; Avail: National Technical Information Service (NTIS)

A sensor based on the wide bandgap semiconductor, silicon carbide (SiC), has been developed for the detection of combustion products in power plant environments. The sensor is a catalytic gate field effect device that can detect hydrogen containing species in chemically reactive, high temperature environments. Robust metallization and electrical contacting

techniques have been developed for device operation at elevated temperatures. To characterize the time response of the sensor responses in the millisecond range, a conceptually new apparatus has been built. Software has been developed to cope with the requirements of fast sensor control and data recording. In addition user friendly software has been developed to facilitate use of the SiC sensors for industrial process control applications.
NTIS
Combustion Products; Chemical Reactions; Semiconductors (Materials); Gas Analysis

20040171415 NASA Marshall Space Flight Center, Huntsville, AL, USA
Multidimensional Unstructured-Grid Liquid Rocket Engine Nozzle Performance and Heat Transfer Analysis
Wang, Ten-See; [2004]; 21 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this study is to conduct a unified computational analysis for computing design parameters such as axial thrust, convective and radiative wall heat fluxes for regeneratively cooled liquid rocket engine nozzles, so as to develop a computational strategy for computing those parameters through parametric investigations. The computational methodology is based on a multidimensional, finite-volume, turbulent, chemically reacting, radiating, unstructured-grid, and pressure-based formulation, with grid refinement capabilities. Systematic parametric studies on effects of wall boundary conditions, combustion chemistry, radiation coupling, computational cell shape, and grid refinement were performed and assessed. Under the computational framework of this study, it is found that the computed axial thrust performance, flow features, and wall heat fluxes compared well with those of available data and calculations, using a strategy of structured-grid dominated mesh, finite-rate chemistry, and cooled wall boundary condition.
Author
Rocket Nozzles; Propulsion System Performance; Liquid Propellant Rocket Engines; Heat Flux; Radiative Heat Transfer

20040171481 NASA Glenn Research Center, Cleveland, OH, USA
Probabilistic Physics-Based Risk Tools Used to Analyze the International Space Station Electrical Power System Output
Patel, Bhogila M.; Hoge, Peter A.; Nagpal, Vinod K.; Hojnicki, Jeffrey S.; Rusick, Jeffrey J.; October 2004; 19 pp.; In English; Second International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): WBS 336-33-01-05
Report No.(s): NASA/TM-2004-213342; AIAA Paper 2004-5502; E-14810; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes the methods employed to apply probabilistic modeling techniques to the International Space Station (ISS) power system. These techniques were used to quantify the probabilistic variation in the power output, also called the response variable, due to variations (uncertainties) associated with knowledge of the influencing factors called the random variables. These uncertainties can be due to unknown environmental conditions, variation in the performance of electrical power system components or sensor tolerances. Uncertainties in these variables, cause corresponding variations in the power output, but the magnitude of that effect varies with the ISS operating conditions, e.g. whether or not the solar panels are actively tracking the sun. Therefore, it is important to quantify the influence of these uncertainties on the power output for optimizing the power available for experiments.
Author
Space Station Power Supplies; Solar Cells; Modes

20040171483 NASA Glenn Research Center, Cleveland, OH, USA
Filtering and Control of High Speed Motor Current in a Flywheel Energy Storage System
Kenny, Barbara H.; Santiago, Walter; October 2004; 21 pp.; In English; Second International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): WBS 319-20-M1
Report No.(s): NASA/TM-2004-213343; AIAA Paper 2004-5627; E-14811; No Copyright; Avail: CASI; A03, Hardcopy

The NASA Glenn Research Center has been developing technology to enable the use of high speed flywheel energy storage units in future spacecraft for the last several years. An integral part of the flywheel unit is the three phase motor/generator that is used to accelerate and decelerate the flywheel. The motor/generator voltage is supplied from a pulse width modulated (PWM) inverter operating from a fixed DC voltage supply. The motor current is regulated through a closed loop current control that commands the necessary voltage from the inverter to achieve the desired current. The current regulation loop is the innermost control loop of the overall flywheel system and, as a result, must be fast and accurate over the entire operating speed range (20,000 to 60,000 rpm) of the flywheel. The voltage applied to the motor is a high frequency

PWM version of the DC bus voltage that results in the commanded fundamental value plus higher order harmonics. Most of the harmonic content is at the switching frequency and above. The higher order harmonics cause a rapid change in voltage to be applied to the motor that can result in large voltage stresses across the motor windings. In addition, the high frequency content in the motor causes sensor noise in the magnetic bearings that leads to disturbances for the bearing control. To alleviate these problems, a filter is used to present a more sinusoidal voltage to the motor/generator. However, the filter adds additional dynamics and phase lag to the motor system that can interfere with the performance of the current regulator. This paper will discuss the tuning methodology and results for the motor/generator current regulator and the impact of the filter on the control. Results at speeds up to 50,000 rpm are presented.
Author
Current Regulators; Directional Control; Electric Potential; Energy Storage; Flywheels

20040171484 NASA Glenn Research Center, Cleveland, OH, USA
Simulation and Analysis of Three-Phase Rectifiers for Aerospace Power Applications
Truong, Long V.; Birchenough, Arthur G.; October 2004; 15 pp.; In English; Second International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): WBS 982-10-03
Report No.(s): NASA/TM-2004-213346; AIAA Paper 2004-5665; E-14814; No Copyright; Avail: CASI; A03, Hardcopy

Due to the nature of planned planetary missions, fairly large advanced power systems are required for the spacecraft. These future high power spacecrafts are expected to use dynamic power conversion systems incorporating high speed alternators as three-phase AC electrical power source. One of the early design considerations in such systems is the type of rectification to be used with the AC source for DC user loads. This paper address the issues involved with two different rectification methods, namely the conventional six and twelve pulses. Two circuit configurations which involved parallel combinations of the six and twelve-pulse rectifiers were selected for the simulation. The rectifier s input and output power waveforms will be thoroughly examined through simulations. The effects of the parasitic load for power balancing and filter components for reducing the ripple voltage at the DC loads are also included in the analysis. Details of the simulation circuits, simulation results, and design examples for reducing risk from damaging of spacecraft engines will be presented and discussed.
Author
Ac Generators; Alternating Current; Electric Potential; Rectifiers; Rectification

20040171634 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Role of Structural Models in the Solar Sail Flight Validation Process
Johnston, John D.; [2004]; 10 pp.; In English; Solar Sail Technology Applications Conference, 28-29 Sep. 2004, Greenbelt, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy

NASA is currently soliciting proposals via the New Millennium Program ST-9 opportunity for a potential Solar Sail Flight Validation (SSFV) experiment to develop and operate in space a deployable solar sail that can be steered and provides measurable acceleration. The approach planned for this experiment is to test and validate models and processes for solar sail design, fabrication, deployment, and flight. These models and processes would then be used to design, fabricate, and operate scaleable solar sails for future space science missions. There are six validation objectives planned for the ST9 SSFV experiment: 1) Validate solar sail design tools and fabrication methods; 2) Validate controlled deployment; 3) Validate in space structural characteristics (focus of poster); 4) Validate solar sail attitude control; 5) Validate solar sail thrust performance; 6) Characterize the sail's electromagnetic interaction with the space environment. This poster presents a top-level assessment of the role of structural models in the validation process for in-space structural characteristics.
Derived from text
Solar Sails; Structural Design; Spacecraft Design; Spacecraft Models

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*.

20040164804 Massachusetts Inst. of Tech., Cambridge, MA, USA
Laboratory Studies of Heterogeneous Chemical Processes of Atmospheric Importance
Molina, Mario J.; [2004]; 19 pp.; In English
Contract(s)/Grant(s): NAG5-12707; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this study is to conduct measurements of chemical kinetics parameters for heterogeneous reactions of importance in the stratosphere and the troposphere. It involves the elucidation of the mechanism of the interaction of HCl vapor with ice surfaces, which is the first step in the heterogeneous chlorine activation processes, as well as the investigation of the atmospheric oxidation mechanism of soot particles emitted by biomass and fossil fuels. The techniques being employed include turbulent flow-chemical ionization mass spectrometry and optical ellipsometry, among others.
Author
Chemical Reactions; Reaction Kinetics; Troposphere; Stratosphere; Turbulent Flow

20040170410 Chemonics International, Inc., Washington, DC, USA
Guyana Economic Opportunities (GEO): Coconut Husk Extraction and Coir Processing: Potential Value-Added Export Products
Picha, D. H.; Dec. 2003; 22 pp.; In English
Report No.(s): PB2005-100188; No Copyright; Avail: CASI; A03, Hardcopy

Coconut is one of the most useful and important plants in Guyana. The inner portion of the fruit provides a diversity of nutritious products, including a natural coconut water beverage, edible raw pulp, and dried copra (dried endosperm), which is the source of coconut oil. The outer portion of the fruit (husk) can be dried and the fiber and pith extracted for use in the manufacture of a number of products. Coir is the term used to describe the coarse brown fiber of the coconut husk. Coir fiber is light weight, strong, elastic, and has a high durability. Coir fiber is relatively water-proof and is the only natural fiber resistant to damage by salt water and microbial degradation. The long fibers of the husk can be used to make floor mats, ropes, brooms, nets, and carpets. Coir pith, the short fibers and dust left behind after the industrially valuable long fibers of coir are extracted from the coconut husk, is widely used throughout the world as a constituent in horticultural-grade growing media for vegetables, ornamental plants, roses, cut flowers, and nursery crops. Most coir pith is obtained from the husks of mature coconuts as a by-product of copra production. The purpose of this bulletin is to provide information on coir extraction, processing techniques and equipment, and marketable products. It is intended to support the development of additional value-added coconut export products from Guyana.
NTIS
Guyana; Farm Crops; Fruits

20040170425 Department of Energy, Washington, DC
Rate Controlling Processes for Five Power Law Creep
2004; 14 pp.; In English
Report No.(s): DE2004-822659; No Copyright; Avail: Department of Energy Information Bridge

OAK-B135 Rate-Controlling Mechanisms in Five-Power-Law Creep. The initial grant emphasized the rate-controlling processes for five power-law creep. The effort has six aspects: (1) Theory of Taylor hardening from the Frank dislocation network in five power law substructures. (2) The dual dynamical and hardening nature of dislocations in five power law substructures. (3) Determination of the existence of long-range internal stress in five-power law creep dislocation substructures. (4) Dynamic recovery mechanisms associated with dislocation heterogeneities during five power law creep. (5) Versatility of five power law creep concept to other (hcp) crystal structures. (6) Writing of a book on 'Fundamental of Creep in Metals and Alloys' by M.E. Kassner and Maria-Teresa Perez-Frado (postdoctoral scholar, funded by this project) Elsevier Press, 2004, in press. These areas are consistent with the original goals of this project as delineated in the original proposal to Basic Energy Sciences. The progress in each of these areas will be discussed separately and there will be an attempt to tie

each aspect together so as to allow a summary regarding the conclusions with respect to the rate-controlling mechanisms of five power-law creep.
NTIS
Creep Properties; Alloys; Residual Stress

20040170450 NASA Marshall Space Flight Center, Huntsville, AL, USA
Crystal Growth of CdTe by Gradient Freeze in Universal Multizone Crystallizator (UMC)
Su, Ching-Hua; Lehoczky, S. L.; Li, C.; Knuteson, D.; Raghothamachar, B.; Dudley, M.; Szoke, J.; Barczy, P.; [2004]; 1 pp.; In English; 4th International Conference on Solidification and Gravity, 6-10 Sep. 2004, Miskolc, Hungary; No Copyright; Avail: Other Sources; Abstract Only

In the case of unsealed melt growth of an array of II-VI compounds, namely, CdTe, CdZnTe and ZnSe, there is a tremendous amount of experimental data describing the correlations between melt conditions and crystal quality. The results imply that the crystallinity quality can be improved if the melt was markedly superheated or long-time held before growth. It is speculated that after high superheating the associated complex dissociate and the spontaneous nucleation is retarded. In this study, crystals of CdTe were grown from melts which have undergone different thermal history by the unseeded gradient freeze method using the Universal Multizone Crystallizator (UMC). The effects of melt conditions on the quality of grown crystal were studied by various characterization techniques, including Synchrotron White Beam X-ray Topography (SWSXT), infrared microscopy, chemical analysis by glow discharge mass spectroscopy (GDMS), electrical conductivity and Hall measurements.
Author
Cadmium Tellurides; Crystal Growth; Melts (Crystal Growth); Crystallinity; Superheating

20040170717 Army Research Lab., Aberdeen Proving Ground, MD
Outdoor Exposure Results for Pretreated and Topcoated Aluminum Armor Alloys 2519, 5083, 7039
Kelly, John V.; Placzankis, Brian E.; Sep. 2004; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426755; ARL-TR-3283; No Copyright; Avail: CASI; A03, Hardcopy

Over the last few decades, it has been determined that chemical treatments containing hexavalent chromium (Cr+6) are risks to both human health and the environment. One of the mainstays in corrosion prevention of aluminum alloys has been the use of chromate conversion coatings to promote adhesion and inhibit corrosion. Because of the push to reduce the use of Cr+6, many nonchromate treatments have been evaluated over the years. This report compares the relative performance of six nonchromate pretreatments with grit-blasted and chromated control samples in outdoor exposure at Cape Canaveral, FL. Recently obtained outdoor exposure data have been analyzed to determine the effectiveness of the pretreatments, indicating a different failure mode than typically seen in accelerated corrosion chambers. Corrosion attack at the edges is prevalent in outdoor exposure, while attack at scribe is uncommon. The substrate of most concern, aluminum 2519, seemed to be less of a factor than originally anticipated when no pretreatment was used. All samples have been monitored throughout the test using electrochemical impedance spectroscopy. Adhesion tests were performed upon completion of outdoor exposure. The data is compared with earlier accelerated corrosion data performed on matching samples.
DTIC
Aluminum Alloys; Armor; Exposure

20040170807 Sandia National Labs., Albuquerque, NM
Modeling Decomposition of Unconfined Rigid Polyurethane Foam
Hobbs, Michael L.; Erickson, Kenneth L.; Chu, Tze Y.; Nov. 1999; 74 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): AD-A426907; SAND99-2758; No Copyright; Avail: Defense Technical Information Center (DTIC)

The decomposition of unconfined rigid polyurethane foam has been modeled by a kinetic bond-breaking scheme describing degradation of a primary polymer and formation of a thermally stable secondary polymer. The bond-breaking scheme is resolved using percolation theory to describe evolving polymer fragments. The polymer fragments vaporize according to individual vapor pressures. Kinetic parameters for the model were obtained from Thermal Gravimetric Analysis (TGA). The chemical structure of the foam was determined from the preparation techniques and ingredients used to synthesize the foam. Scale-up effects were investigated by simulating the response of an incident heat flux of 25 W/sq cm on a partially confined 8.8-cm diameter by 15-cm long right circular cylinder of foam which contained an encapsulated component.

Predictions of center, midradial, and component temperatures, as well as regression of the foam surface, were in agreement with measurements using thermocouples and X-ray imaging.
DTIC
Decomposition; Foams; Polyurethane Foam

20040170822 Woods Hole Oceanographic Inst., MA
Molecular and Isotopic Records of Combustion Inputs to the Environment Over the Last 250 Years
DeLima, Ana L.; Jun. 2004; 269 pp.; In English
Report No.(s): AD-A426947; MIT/WHOI-2004-04; No Copyright; Avail: CASI; A12, Hardcopy

The most ubiquitous source of polycyclic aromatic hydrocarbons (PARs) to the environment is incomplete combustion. This study generated a high-resolution historical record of pyrogenic PAR emissions since pre-industrial times from anoxic aquatic sediments, allowing for detailed comparison with energy consumption data. We show that an increase in PAR concentrations over the last decade may be due to a rise in emissions from diesel-powered vehicles. Compound- specific radiocarbon measurements demonstrated unequivocally that the proportion of PARs derived from fossil fuel combustion has increased substantially during the 20th century. delta(exp13)C and Delta(exp14)C measurements were also used to constrain the relative importance of combustion versus in situ production as sources of perylene. In addition, a comparison of the down-core concentration and isotopic profiles of black carbon (BC) generated by a combination of chemical and/or thermal oxidation methods highlighted the limitations of these methods when applied to sedimentary matrices. Finally, parallel lead and cesium isotopic records revealed two new potential stratigraphic markers in North American sedimentary records. 206Pb/207Pb profiles show a distinct peak in the mid-19th century, while a 137Cs peak was found to coincide with the 1986 Chernobyl accident.
DTIC
Combustion; Hydrocarbons; Isotopes

20040171106, National Center for Electron Microscopy, Berkeley, CA, USA
Microstructural and Conductivity Comparison of Ag Films Grown on Amorphous TiO(2) and Polycrystalline ZnO
Dannenberg, R.; Stach, E.; Glenn, D.; Sieck, P.; Hukari, K.; 2004; 46 pp.; In English
Report No.(s): DE2004-821432; No Copyright; Avail: Department of Energy Information Bridge

8 nm thick Ag films were sputter deposited onto amorphous TiO(sub 2) underlayers 25 nm thick, and also amorphous TiO(sub 2) (25 nm)/ZnO (5 nm) multiunderlayers. The substrates were back-etched Si with a 50 nm thick LPCVD Si(sub 3)N(sub 4) electron transparent membrane. The ZnO, sputtered onto amorphous TiO(sub 2), formed a continuous layer with a grain size of 5 nm in diameter, on the order of the film thickness. There are several microstructural differences in the Ag dependent on theunderlayers, revealed by TEM. First a strong(l(underline)brace) 0001(r(underline)brace) ZnO to(l(underline)brace) 111(r(underline)brace) Ag fibre-texture relationship exists. On TiO(sub 2) the Ag microstructure shows many abnormal grains whose average diameter is about 60-80 nm, whereas the films on ZnO show few abnormal grains. The background matrix of normal grains on the TiO(sub 2) is roughly 15 nm, while the normal grain size on the ZnO is about 25 nm. Electron diffraction patterns show that the film on ZnO has a strong(l(underline) brace)111(r(underline)brace) orientation, and dark field images with this diffraction condition have a grain size of about 30 nm. In a region near the center of the TEM gridwhere there is the greatest local heating during deposition, Ag films grown on amorphous TiO(sub 2) are discontinuous, whereas on ZnO, the film is continuous. When films 8 nm films are grown on solid glass substrates, those with ZnO underlayers have sheet resistances of 5.68(Omega)/, whereas those on TiO(sub 2) are 7.56(Omega)/, and when 16 nm thick, the corresponding sheet resistances are 2. 7(Omega)/ and 3.3(Omega)/. The conductivity difference is very repeatable. The improved conductivity is thought to be a combined effect of reduced grain boundary area per unit volume, the predominance of low grain boundary resistivity Coincidence Site Lattice boundaries from the Ag(l(underline)brace) 111(r(underline)brace) orientation, and Ag planarization on ZnO resulting in less groove formation on deposition, concluded from atomic force microscopy.
NTIS
Microstructure; Conductivity; Deposition

20040171110
Sealing Large-Diameter Cast-Iron Pipe Joints Under Live Conditions
Kothari, K. M.; Pittard, G. T.; Jun. 2003; In English
Report No.(s): DE2004-821197; No Copyright; Avail: National Technical Information Service (NTIS)

Utilities in the U.S. operate over 75,000 km (47,000 miles) of old cast-iron pipes for gas distribution. The bell-and-spigot joints tend to leak as these pipes age. Current repair practices are costly and highly disruptive. The objective of this program is to design, test and commercialize a robotic system capable of sealing multiple cast-iron bell and spigot joints from a single pipe entry point. The proposed system will perform repairs while the pipe remains in service by traveling through the pipe, cleaning each joint surface, and attaching a stainless-steel sleeve lined with an epoxy-impregnated felt across the joint. This approach will save considerable time and labor, avoid traffic disruption, and eliminate any requirement to interrupt service (which results in enormous expense to utilities). Technical challenges include: (1) repair sleeves must compensate for diametric variation and eccentricity of cast-iron pipes; (2) the assembly must travel long distances through pipes containing debris; (3) the pipe wall must be effectively cleaned in the immediate area of the joint to assure good bonding of the sleeve; and (4) an innovative bolt-on entry fitting is required to conduct repair operations on live mains.
NTIS
Cast Alloys; Sealing; Joints (Junctions)

20040171446 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Atmospheric Pseudohalogen Chemistry
Lary, David John; [2004]; 10 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

Hydrogen cyanide is not usually considered in atmospheric chemical models. The paper presents three reasons why hydrogen cyanide is likely to be significant for atmospheric chemistry. Firstly, HCN is a product and marker of biomass burning. Secondly, it is also likely that lightning is producing HCN, and as HCN is sparingly soluble it could be a useful long-lived 'smoking gun' marker of lightning activity. Thirdly, the chemical decomposition of HCN leads to the production of small amounts of the cyanide (CN) and NCO radicals. The NCO radical can be photolyzed in the visible portion of the spectrum yielding nitrogen atoms (N). The production of nitrogen atoms is significant as it leads to the titration of total nitrogen from the atmosphere via N+N-\gN2, where N2 is molecular nitrogen.
Author
Atmospheric Chemistry; Cyanides; Hydrogen; Hydrocyanic Acid; Atmospheric Models; Biomass Burning

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COMPOSITE MATERIALS

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

20040161575 NASA Marshall Space Flight Center, Huntsville, AL, USA
Space Environmental Effects on Candidate Solar Sail Materials
Edwards, David L.; Nehls, Mary; Semmel, Charles; Hovater, Mary; Gray, Perry; Hubbs, Whitney; Wertz, George; [2005]; 1 pp.; In English; Solar Sail Technology and Applications Conference, 28-29 Sep. 2004, Greenbelt, MD, USA; Copyright; Avail: Other Sources; Abstract Only

The National Aeronautics and Space Administration's (NASA) Marshall Space Flight Center (MSFC) continues research into the utilization of photonic materials for spacecraft propulsion. Spacecraft propulsion, using photonic materials, will be achieved using a solar sail. A solar sail operates on the principle that photons, originating from the sun, impart pressure to the sail and therefore provide a source for spacecraft propulsion. The pressure imparted ot a solar sail can be increased, up to a factor of two, if the sun-facing surface is perfectly reflective. Therefore, these solar sails are generally composed of a highly reflective metallic sun-facing layer, a thin polymeric substrate and occasionally a highly emissive back surface. Near term solar sail propelled science missions are targeting the Lagrange point 1 (L1) as well as locations sunward of L1 as destinations. These near term missions include the Solar Polar Imager and the L1 Diamond. The Environmental Effects Group at NASA's Marshall Space Flight Center (MSFC) continues to actively characterize solar sail material in preparation for these near term solar sail missions. Previous investigations indicated that space environmental effects on sail material thermo-optical properties were minimal and would not significantly affect the propulsion efficiency of the sail. These investigations also indicated that the sail material mechanical stability degrades with increasing radiation exposure. This paper will further quantify the effect of space environmental exposure on the mechanical properties of candidate sail materials. Candidate sail materials for these missions include Aluminum coated Mylar, Teonex, and CP1 (Colorless Polyimide). These materials were subjected to uniform radiation doses of electrons and protons in individual exposures sequences. Dose values ranged from 100 Mrads to over 5 Grads. The engineering performance property responses of thermo-optical and mechanical properties were

characterized. The contribution of Near Ultraviolet (NUV) radiation combined with electron and proton radiation was also investigated.
Author
Aerospace Environments; Solar Sails; NASA Space Programs; Spacecraft Propulsion; Mechanical Properties; Composite Materials

20040170448 National Academy of Sciences - National Research Council, Hampton, VA, USA
Discrete Spring Model for Predicting Delamination Growth in Z-Fiber Reinforced DCB Specimens
Ratcliffe, James G.; OBrien, T. Kevin; [2004]; 35 pp.; In English; ASC/ASTM-D30 Joint 19th Annual Technical Conference, 17-20 Oct. 2004, Atlanta, GA, USA
Contract(s)/Grant(s): 23-762-55-LC; No Copyright; Avail: CASI; A03, Hardcopy

Beam theory analysis was applied to predict delamination growth in Double Cantilever Beam (DCB) specimens reinforced in the thickness direction with pultruded pins, known as Z-fibers. The specimen arms were modeled as cantilever beams supported by discrete springs, which were included to represent the pins. A bi-linear, irreversible damage law was used to represent Z-fiber damage, the parameters of which were obtained from previous experiments. Closed-form solutions were developed for specimen compliance and displacements corresponding to Z-fiber row locations. A solution strategy was formulated to predict delamination growth, in which the parent laminate mode I critical strain energy release rate was used as the criterion for delamination growth. The solution procedure was coded into FORTRAN 90, giving a dedicated software tool for performing the delamination prediction. Comparison of analysis results with previous analysis and experiment showed good agreement, yielding an initial verification for the analytical procedure.
Author
Cantilever Beams; Delaminating; Mathematical Models; Reinforcing Fibers; Springs (Elastic)

20040170767 Kansas Univ., Lawrence, KS
Integrated Design and Analysis Tools for Reduced Weight, Affordable Fiber Steered Composites
Hale, Richard D.; Moon, Richard S.; Lim, KokSiong; Schueler, Kurt; Yoder, Andrew; Sep. 15, 2004; 503 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0415
Report No.(s): AD-A426844; KU-FRL-22480-5; No Copyright; Avail: CASI; A22, Hardcopy

This report describes geometric design tools which encompass the overall process flow for fiber placed and fiber steered structures, to allow parallel considerations for manufacturability and mechanical performance. Several methods for modeling individual tows in a fiber placed part are defined and verified. Analytical methodologies for fiber steering are demonstrated on four test models and three representative aircraft components. Weight savings of up to 30% are attainable for singularly loaded examples. Rangewise continuous layer-angle and layer-thickness contours are demonstrated, with layer thickness and fiber orientation being load-path sensitive. Weight savings on the order of 7% are demonstrated on more realistic examples. Mechanical testing illustrates that fiber steered components follow predictable trends. In particular, data demonstrates no statistically significant variation in compression stiffness or compression strength to steering radii of 46cm. Destructive and nondestructive evaluation experiments reveal higher density occurrences of tow and course edge features, such as overlaps, twists, gaps and fiber waviness.
DTIC
Design Analysis; Fiber Composites; Mathematical Models

20040170768 SRI International Corp., Menlo Park, CA
Oxidation and Catalytic Efficiency of ZrB2 and HfB2 Based Ultra-High-Temperature Ceramic (UHTC) Composites Exposed to Supersonic Air Plasma
Marschall, Jochen; Sep. 2004; 64 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-C-0026
Report No.(s): AD-A426845; AFRL-SR-AR-TR-04-0503; No Copyright; Avail: CASI; A04, Hardcopy

This report summarizes the activities and results of experimental and modeling activities performed for the Air Force Office of Scientific Research (AFOSR) under Contract F49620-01-C-0026, 'Oxidation and Catalytic Efficiency of ZrB2 and HfB2 Based Ultra-High-Temperature Ceramic (UHTC) Composites Exposed to Supersonic Air Plasma.' The goals of this project were to (1) experimentally investigate UHTC oxidation in a supersonic oxidizing flow environment, (2) develop oxidation models that could be incorporated into aerothermal heating and trajectory codes, and (3) experimentally characterize

the catalytic efficiency of UHTC samples for surface recombination of dissociated oxygen and nitrogen. Given the importance of impact damage to the leading edges of hypersonic vehicles, a task was added during the third year of the project to (4) begin preliminary high- velocity impact experiments on UHTC materials. Research efforts and accomplishments in each of these four areas are summarized below. The results of this research have led to eight presentations at various conferences and meetings, and have been written up in three technical publications 1-3. Manuscripts of these technical papers are included in this report as Appendixes I, II, and III.
DTIC
Catalysis; Ceramic Matrix Composites; High Temperature; Oxidation; Plasmas (Physics)

20040170804 Maryland Univ., College Park, MD
Theory and Modeling of Adaptive Nanocomposites
Roytburd, Alexander L.; Jan. 2004; 9 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0110
Report No.(s): AD-A426904; AFRL-SR-AR-TR-04-0496; No Copyright; Avail: CASI; A02, Hardcopy

The theory and phase-field modeling of formation and deformation of adaptive nano-composites containing polydomain martensitic and ferroelastic layers are developed. It has been shown that superplastic and superelastic deformation of heterophase and polydomain martensite structures are reversible in the composites to the contrary to bulk shape memory materials. By the engineering of constraints, the controlled polydomain structures have designed and the characteristics of superelastic and superplastic giant deformation have been optimized. The theory has been applied to the formulation of principles of actuators with enhanced efficiency and efficacy. Two new models of layer actuators were developed based on: (1) manipulating a bend curvature by using combination of passive layers with coefficient of thermal expansions and (2) bending of the films transforming by the movement of martensite/austenite interface oriented along the film.
DTIC
Austenite; Composite Materials; Elastic Properties; Martensite; Nanocomposites

20040171086 North Carolina State Univ., Raleigh, NC, USA, Michigan State Univ., East Lansing, MI, USA
Composite Polymer Electrolytes Using Fumed Silica Fillers: Synthesis, Rheology and Electrochemistry
Khan, S. A.; Fedkiw, P. S.; Jun. 28, 1999; 20 pp.; In English
Report No.(s): DE2004-761809; No Copyright; Avail: Department of Energy Information Bridge

The goal of the synthesis research was to devise routes to PEG/fumed silica/lithium salt composites that can be processed and then photochemically cross-linked to form mechanically stable electrolytes. An essential feature of the system is that the ionic conductivity and the mechanical properties must be de-coupled from each other, i.e., cross-linking of the fumed silica matrix must not cause a significant deterioration of the conductivity of the composite. We prepared a range of surface-modified fumed silicas and investigated their ability to form mechanically stable composite electrolytes.
NTIS
Composite Materials; Electrochemistry

20040171171 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Design for a Unitary Graphite Composite Instrument Boom
Alexander, Wes; Carlos, Rene; Sturm, James; Rossoni, Peter; [2004]; 10 pp.; In English; 2004 National Space and Missile Materials Symposium, 21-25 Jun. 2004, Seattle, WA, USA; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes development of a Unitary graphite composite instrument boom that incorporates carpenter-tape like hinges for stowage. While light and stiff, graphite composite is not ordinarily thought of as a flexible material. This design has taken advantage of the stiffness of the composite in tubular geometry, yet leveraged its thin- section behavior to place flexibility at the required locations. Key is the proprietary layup, which results in a tough yet flexible hinge capable of rotating over 90 degrees in each direction. When the boom deploys, there is enough torque to overcome parasitic resistance from harness, etc. It will snap to the fully extended, rigid shape. The design has addressed materials issues such as out-of-plane bending, edge cracking, and interlaminar ply separation.
Author
Booms (Equipment); Graphite; Composite Materials; Fabrication; Spacecraft Instruments

20040171372 Advanced Composite Products and Technology, Inc., Huntington Beach, CA, USA
Development and Manufacture of Cost Effective Composite Drill Pipe
Leslie, J. C.; Truong, L.; Heard, J. T.; Mar. 30, 2003; 24 pp.; In English
Report No.(s): DE2004-823294; No Copyright; Avail: Department of Energy Information Bridge

This technical report presents the engineering research and data accomplishments that have transpired to date in support of the development of Cost Effective Composite Drill Pipe (CDP). The report presents accomplishments made from October 1, 2002 through September 30, 2003. The following have been accomplished and are reported in detail herein: Metal-to-Composite Interface (MCI) redesign and testing; Successful demonstration of MCI connection for both SR and ER/DW CDP; Specifications for a 127mm (5 inch) ID by 152.4 mm (6 inch) OD composite drill pipe have been finalized for Extended Reach/Deep Water applications (ER/DW); Field testing of Short Radius CDP (SR); Sealing composite laminate to contain high pressure; Amendments; Amendment for 'Smart' feature added to ER/DW development along with time and funding to complete battery of qualification tests with option for field demonstration; and Preparation of papers for publication and conference presentations.
NTIS
Composite Materials; Cost Effectiveness

20040171493 NASA Langley Research Center, Hampton, VA, USA
An Interface Damage Model for the Simulation of Delamination Under Variable-Mode Ratio in Composite Materials
Turon, Albert; Camanho, Pedro P.; Costa, Josep; Davila, Carlos G.; October 2004; 32 pp.; In English
Contract(s)/Grant(s): BR01/09; 719-20-40-10
Report No.(s): NASA/TM-2004-213277; L-19060; No Copyright; Avail: CASI; A03, Hardcopy

A thermodynamically consistent damage model for the simulation of progressive delamination under variable mode ratio is presented. The model is formulated in the context of the Damage Mechanics (DM). The constitutive equations that result from the variation of the free energy with damage are used to model the initiation and propagation of delamination. A new delamination initiation criterion is developed to assure that the formulation can account for changes in the loading mode in a thermodynamically consistent way. Interfacial penetration of two adjacent layers after complete decohesion is prevented by the formulation of the free energy. The model is implemented into the commercial finite element code ABAQUS by means of a user-written decohesion element. Finally, the numerical predictions given by the model are compared with experimental results.
Author
Composite Materials; Delaminating; Mathematical Models; Damage; Thermodynamics; Simulation; Continuum Mechanics

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20040170446 Alabama Univ., Birmingham, AL, USA
Novel Sensor and Measurement System for Fireside Corrosion Monitoring in Coal-Fired Boilers
Ban, H.; Li, Z.; Mar. 2003; In English
Report No.(s): DE2004-820021; No Copyright; Avail: National Technical Information Service (NTIS)

Fireside corrosion in coal-fired power plants is a major obstacle to increase the overall efficiency for power producers. The increased use of opportunity fuels and low emission combustion modes have aggravated the corrosion on boiler tube walls in power plants. Corrosion-induced equipment failure could lead to catastrophic damage and inflict significant loss of production and cost for repair. Monitoring fireside corrosion in a reliable and timely manner can provide significant benefits to the plant operation. Current corrosion inspection and measurement are typically performed during scheduled maintenance outages, which is often after the damage is done. In the past, there have been many attempts to develop real time continuous corrosion monitoring technologies. However, there is still no short-term, online corrosion monitoring system commercially available for fireside corrosion to date due to the extremely harsh combustion environment. This report describes the results of a laboratory feasibility study on the development effort of a novel sensor for on-line fireside corrosion monitoring. A novel sensor principle and thin-film technologies were employed in the corrosion sensor design and fabrication.
NTIS
Corrosion; Boilers; Coal

20040170468 Department of Energy, Albany, OR, USA

Electrochemical Aging of Thermal-Sprayed Zinc Anodes on Concrete

Holcomb, G. R.; Bullard, S. J.; Covino, B. S.; Cramer, S. D.; Cryer, C. B.; 2004; 20 pp.; In English

Report No.(s): DE2004-810010; DOE/ARC-97-001; No Copyright; Avail: Department of Energy Information Bridge

Thermal-sprayed zinc anodes are used in impressed current cathodic protection systems for some of Oregon's coastal reinforced concrete bridges. Electrochemical aging of zinc anodes results in physical and chemical changes at the zinc-concrete interface. Concrete surfaces heated prior to thermal-spraying had initial adhesion strengths 80 pct higher than unheated surfaces. For electrochemical aging greater than 200 kC/m(sup 2) (5.2 A h/ft(sup 2)), there was no difference in adhesion strengths for zinc on preheated and unheated concrete. Adhesion strengths decreased monotonically after about 400 to 600 kC/m(sup 2) (10.4 to 15.6 A-h/ft(sup 2)) as a result of the reaction zones at the zinc-concrete interface. A zone adjacent to the metallic zinc (and originally part of the zinc coating) was primarily zincite (ZnO), with minor constituents of wulfingite (Zn(OH)(sub 2)), simonkolleite (Zn(sub 5)(OH)(sub 8)C(sub l2)(sup .)H(sub 2)O), and hydrated zinc hydroxide sulfates (Zn(sub 4)SO(sub 4)(OH)(sub 6)(sup .)xH(sub 2)O). This zone is the locus for cohesive fracture when the zinc coating separates from the concrete during adhesion tests. Zinc ions substitute for calcium in the cement paste adjacent to the coating as the result of secondary mineralization. The initial estimate of the coating service life based on adhesion strength measurements in accelerated impressed current cathodic protection tests is about 27 years.

NTIS

Concretes; Zinc Coatings; Cathodic Coatings

20040170469 Department of Energy, Albany, OR, USA

Atmospheric Corrosion of Aluminum Alloy 3105 in Coastal Environments

Apr. 19, 1996; 22 pp.; In English

Report No.(s): DE2004-810009; DOE/ARC-TR-96-001; No Copyright; Avail: Department of Energy Information Bridge

In May of 1994, racks of corrosion samples were installed along the Oregon coast. The aluminum alloy 3105 samples were mounted on utility poles in Astoria, Manzanita, Lincoln City, Gold Beach, Brookings, Portland, and Albany. At each coastal location, samples were placed on four different poles at various distances from the coast (from as near as 50 feet to as far as 5 miles). The inland sites (Portland and Albany) have only one pole per site and are used as control sites. Besides the 3105 alloys, 5052 and 6061 aluminum alloys were placed at all sites. Since installation, one rack was lost due to the pole being taken down by the phone company (in Lincoln City), but the rest of the poles and racks are still in place. In August of 1995, the aluminum samples were visually inspected, and the remaining six 3105 aluminum samples in Lincoln City were removed for laboratory examination. Non-destructive x-ray analysis was used on the Lincoln City samples to obtain information a bout the nature of the corrosion products. Because the analysis was performed while the corrosion products remained on the surface, aluminum peaks dominated the diffraction pattern, and relative peak-heights were different from normal. Nevertheless, some minerals were identified as part of the corrosion products.

NTIS

Corrosion; Aluminum Alloys

20040170471 Department of Energy, Albany, OR, USA

Microclimate Corrosion Effects in Coastal Environments

Holcomb, G. R.; Covino, B. S.; Bullard, S. J.; Cramer, S. D.; 2004; 16 pp.; In English

Report No.(s): DE2004-810007; DOE/ARC-96-002; No Copyright; Avail: Department of Energy Information Bridge

The Albany Research Center is conducting atmospheric corrosion research in coastal environments to improve the performance of materials in the Nation's infrastructure. The corrosion of bare metals, and of painted, thermal-sprayed, and galvanized steels are presented for one-year exposures at sites located on bridges and utility poles along the Oregon coast. The effects of microclimates (for example distance from the ocean, high wind zones, and salt-fog prone regions) are examined in conjunction with sample orientation and sheltered/unsheltered comparisons. An atmospheric corrosion model examines the growth and dissolution of corrosion product layers to arrive at a steady-state thickness and corrosion rate.

NTIS

Corrosion; Atmospheric Effects; Microclimatology

20040170710 Air Force Inst. of Tech., Wright-Patterson AFB, OH

An Evaluation of Formate as an Electron Donor to Facilitate Palladium (PD) - Catalyzed Destruction of Chlorinated Aliphatic Hydrocarbons

Welling, Matthew D.; Mar. 2004; 194 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426741; AFIT/GEM/ENV/04M-21; No Copyright; Avail: Defense Technical Information Center (DTIC)

The focus of this study was to detennine the effectiveness of using a palladium (Pd) catalyst with fonnate as a reductant to treat CAll-contaminated groundwater. TCE was used as a model CAll. Other investigato^ have focused on hydrogen gas (Hv as a reductant to treat CAll-contaminated groundwater. However, when using H2as a reductant, catalyst deactivation is observed due to the production of hydrochloric acid. In this study, fonnic acid was used as the reductant, resulting in no observed catalyst deactivation even at high contaminant concentrations. Reaction rates achieved when using 100% H2 as a reductant could be matched by using 4 rnM (184 mg/L) fonnic acid. At increased fonnic acid concentrations, system performance exceeded performance achievable when using H2. It is also noted that while hydrogen is an explosive, low solubility gas, fonnic acid can easily and safely be added to contaminated water. The aforementioned work has shown that this method for treating CAll-contaminated groundwater by using fonnic acid and a Pd-catalyst is more efficient, safe, and less costly than using hydrogen gas as a reductant.
DTIC
Aliphatic Hydrocarbons; Catalysis; Catalysts; Chlorocarbons; Contamination; Destruction; Donor Materials; Electron Transfer; Formates; Hydrocarbons; Hydrochloric Acid; Palladium; Water Pollution

20040170712 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Isomer Heat Exchanger Combustor Replacement for a Supersonic Ramjet Powered Vehicle
Cox, Jonathan C.; Jun. 2004; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426743; AFIT/GAE/ENY/04J-02; No Copyright; Avail: CASI; A04, Hardcopy

This study investigated the possibility of utilizing a Triggered Isomer Heat Exchanger (TIHE) within a ramjet engine to power a supersonic Conventional Air Launched Cruise Missile (CALCM). A computational ramjet engine was created using engine analysis software. This model was then run through a simulated cruise missile mission using AEDsys, a mission analysis and engine performance software suite. The replacement of the combustor with a TIHE led to an impressive range increase for the supersonic cruise missile.
DTIC
Air Launching; Combustion Chambers; Cruise Missiles; Heat Exchangers; Isomers; Ramjet Engines; Replacing

20040170716 Oklahoma State Univ., Stillwater, OK
Accurate Theoretical Prediction of the Properties of Energetic Materials
Thompson, Donald L.; Aug. 31, 2004; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-02-1-0176
Report No.(s): AD-A426754; ARO-43553.2-CH-MUR; No Copyright; Avail: CASI; A03, Hardcopy

This report describes the progress and accomplishments for the period June 1, 2002 to August 31, 2004 for the MURI grant 'Accurate Theoretical Predictions of the Properties of Energetic Materials' (no. DAAD19-02-1-0176). This is a multi-university, comprehensive theoretical/computational research program to develop, validate, benchmark, and apply methods and models that will provide predictive capabilities for energetic materials. The thrust of the work is the development of atomic-level models and ab initio quantum chemistry methods that are generally applicable to the chemical decomposition of condensed-phase energetic materials under extreme conditions.
DTIC
Explosives

20040170801 Ben Gurion Univ. of the Negev, Beersheva
Reversible Tuning of Optical and Electronic Properties for Component Integration in Molecular and Nano- Electronics
Kost, Daniel; Dec. 17, 2002; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F61775-02-WD083
Report No.(s): AD-A426900; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report results from a contract tasking Ben- Gurion University of the Negev as follows: The Contractor proposes to investigate the possibility of reversibly tuning the conductivity and (linear and nonlinear) optical properties of conjugated chains via protonation. Protons, the smallest chemical species, are generally mobile. and hence offer the potential for reversibility. Equally importantly the concepts proposed herein do not rely on as strongly on redox chemistry. but rather on acid-base chemistry. This may produce species more stable than those produced by addition of powerful oxidizing agents and not be as harmful to the polymer structure. Finally the principles outlined will be used to explore charge pumping and control in these materials. The principal methods to be used: synthesis of conjugated systems, their UV/Vis and NMR analysis under

various acid-dopants and conditions, and computational chemistry to support and rationalize the results.
DTIC
Computational Chemistry; Dielectric Properties; Electrical Properties; Electromagnetic Properties; Molecular Electronics; Nanotechnology; Nonlinear Optics; Optical Properties; Tuning

20040170808 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD
Swatch Test Results of Duraclean with Lycra Commercial Chemical Protective Gloves to Challenge by Chemical Warfare Agents
Lindsay, Robert S.; Procell, Suzanne A.; Harrison, Elaina H.; Jul. 2004; 40 pp.; In English
Report No.(s): AD-A426915; ECBC-TR-370; No Copyright; Avail: CASI; A03, Hardcopy

Swatches from Wiltshire Technologies, Incorporated (Carlsbad, CA), Duraclean with Lycra gloves were challenged with liquid droplets of sarin (GB) and mustard (HE)) using modifications of the static diffusion procedure described in TOP 8-2-501. The cumulative mass of each agent that permeated each swatch was determined over time, and the results for all swatches were used to determine an average cumulative mass for the gloves. From these data, a breakthrough time was calculated for each glove/agent combination for comparison purposes.
DTIC
Chemical Warfare; Fabrics; Gloves; Protective Clothing

20040170814 Commissariat a l'Energie Atomique, Paris
Organic Nanophotonics
Aug. 2002; 85 pp.; In English
Contract(s)/Grant(s): FA8655-02-M5052
Report No.(s): AD-A426930; CSP-02-5052; No Copyright; Avail: CASI; A05, Hardcopy

The Final Proceedings for Organic nanophotonics, 25 August 2002 - 29 August 2002 This is an interdisciplinary conference. Topics include the following: 1) Molecular and supra-molecular engineering for photonic applications: - Dendrimers, - Engineered DNA, - Self-assembly, 2) Nanostructured organic materials for photonics and optics; - Light Emitting Devices, - Photovoltaics, -Photonic- band-gap Materials, 3) New nanoscale photonic characterization techniques - Near-field Optical Microscopy and Spectroscopy, - Scanning Tunneling Luminescence, Single nanoscale photonic devices and quantum objects, -Nanolasers, - Single- molecule light sources,
DTIC
Optical Properties; Organic Materials; Photons; Photovoltaic Effect

20040170823 Massachusetts Inst. of Tech., Cambridge, MA
Petrologic and Microstructural Constraints on Focused Melt Transport in Dunites and Rheology of the Shallow Mantle
Braun, Michael G.; Jun. 2004; 215 pp.; In English
Report No.(s): AD-A426948; MIT/WHOI-2004-03; No Copyright; Avail: CASI; A10, Hardcopy

Observations at mid-ocean ridges indicate that magmas are focused to the ridge axis by a network of porous dunites in near chemical isolation. This thesis investigates several of the outstanding questions regarding the mechanisms of melt transport and its effects on the shallow mantle. Chapter 1 details the current understanding of melt migration from observations at mid-ocean ridges and ophiolites. Chapter 2 uses the size distribution and abundance of dunites measured in the Oman ophiolite to place limits on the potential mechanisms by which dunites form and subsequently estimate the flux of chemically unequilibrated melt which a network of dunites can supply. Chapter 3 characterizes the chemical composition of dunites and harzburgites from Oman to further constrain the process by which dunites form and relates the observed trends within dunites to variations in the time- integrated melt/rock ratio. Chapter 4 examines the microstructures of peridotites in Oman to constrain the deformation mechanisms which determine the viscosity of shallow mantle. Chapter 5 is a numerical investigation of advection beneath ridges incorporating the rheology inferred from the observed microstructures. Chapter 6 integrates the conclusions of the previous chapters, reevaluating the potential melt flux through dunites and constraining the permeability of the shallow mantle,
DTIC
Chemical Composition; Dunite; Microstructure; Petrology; Rheology

20040171098

Laboratory Evaluation of an Electrochemical Noise System for Detection of Localized and General Corrosion of Natural gas Transmission Pipelines

Bullard, S. J.; Covino, B. S.; Russell, J. H.; Holcomb, G. R.; Cramer, S. D.; 2004; 14 pp.; In English

Report No.(s): DE2004-821881; No Copyright; Avail: Department of Energy Information Bridge

Gas transmission pipelines are susceptible to both internal (gas side) and external (soil side) corrosion attack. Internal corrosion is caused by the presence of salt laden moisture, CO2, H2S, and perhaps O2 in the natural gas. Internal corrosion usually manifests itself as general corrosion. However, the presence of chlorides in entrained water also can lead to pitting corrosion damage. The electrochemical noise technique can differentiate general from localized corrosion and provide estimates of corrosion rates without external perturbation of the corroding system. It is increasingly being applied to field and industrial installations for in situ corrosion monitoring. It has been used here to determine its suitability for monitoring internal and external corrosion damage on gas transmission pipelines. Corrosion measurements were made in three types of environments: (1) aqueous solutions typical of those found within gas pipelines in equilibrium with the corrosive components of natural gas; (2) biologically-active soils typical of wetlands; and (3) a simulated, unpressurized, internal gas/liquid gas pipeline environment. Multiple sensor designs were evaluated in the simulated pipe environment. Gravimetric measurements were conducted in parallel with the electrochemical noise measurements to validate the results.

NTIS

Gas Pipes; Corrosion

20040171225 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Halogens and the Chemistry of the Free Troposphere

Lary, David John; [15 September 2004]; 8 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

The role of halogens in both the marine boundary layer and the stratosphere has long been recognized, while their role in the free troposphere is often not considered in global chemical models. However, a careful examination of free-tropospheric chemistry constrained by observations using a full chemical data assimilation system shows that halogens do play a significant role in the free troposphere. In particular, the chlorine initiation of methane oxidation in the free troposphere can contribute more than 10%, and in some regions up to 50%, of the total rate of initiation. The initiation of methane oxidation by chlorine is particularly important below the polar vortex and in northern mid-latitudes. Likewise, the hydrolysis of BrONO2 alone can contribute more than 35% of the HNO3 production rate in the free-troposphere.

Author

Halogens; Troposphere; Atmospheric Chemistry; Photochemical Reactions

20040171345 Texas Univ., Austin, TX, USA

Long-Term Post-Tensioned Column Exposure Test Specimens: Final Evaluation

Salas, R. M.; West, J. S.; Schokker, A. J.; Breen, J. E.; Kreger, M. E.; Oct. 2003; 118 pp.; In English

Report No.(s): PB2005-100964; No Copyright; Avail: CASI; A06, Hardcopy

Post-tensioned concrete piers or columns may be exposed to very severe environments affecting their long-term durability. Two main exposure conditions are of special interest: partially submerged structures in sea water and structures exposed to deicing salts. The durability study of post-tensioned columns or vertical concrete elements under these conditions has unique characteristics. In order to provide detailed observations to improve the durability design of columns under these exposure conditions, a research study was started with the dual intent to evaluate how to use post-tensioning to improve corrosion protection and how to protect the post-tensioning systems from corrosion damage.

NTIS

Corrosion Prevention; Durability

20040171346 Department of Energy, Albany, OR, USA

Role of Ash Deposits in the High Temperature Corrosion of Boiler Tubes

Covino, B. S.; Russell, J. H.; Cramer, S. D.; Holcomb, G. R.; Bullard, S. J.; 2004; 16 pp.; In English

Report No.(s): DE2004-821880; No Copyright; Avail: Department of Energy Information Bridge

Ash deposits cause accelerated corrosion of waterwall boiler tubes in waste to energy (WTE) incinerators. To study this effect, a series of experiments were planned to determine the mechanism of corrosion of carbon steel boiler tubes under ash deposits. Results reported here were for carbon steel tubes exposed to an environment consisting of O(sub 2), CO(sub 2), N(sub 2), and water vapor. Future experiments will include HCl and SO(sub 2). Test procedures included both isothermal and

thermal gradient tests. Temperatures ranged from 300 C to 510 C for the isothermal tests and a metal/gas temperature of 450/670 C for the thermal gradient test. Initial results indicated that increasing temperature caused the isothermal corrosion rates of ash-covered samples to increase.
NTIS
Ashes; Boilers; Corrosion; Deposits; High Temperature; Pipes (Tubes)

20040171349 Texas Univ., Austin, TX, USA, Texas Dept. of Transportation, Austin, TX, USA
Long-Term Post-Tensioned Beam Exposure Test Specimens: Final Evaluation
Salas, R. M.; Kotys, A. L.; West, J. S.; Schokker, A. J.; Breen, J. E.; Aug. 2003; In English
Report No.(s): PB2005-100963; No Copyright; Avail: National Technical Information Service (NTIS)

In the last few years, the effectiveness of cement grout in galvanized or polyethylene ducts, the most widely used corrosion protection system for multistrand bonded post-tensioned concrete tendons, has been under debate, due to significant tendon corrosion damage, several reported failures of individual tendons as well as a few collapses of non-typical structures. While experience in the USA has been generally good, some foreign experience has been less than satisfactory. This report is part of a comprehensive research program started in 1993, which has the objectives to examine the use of post-tensioning in bridge substructures, identify durability concerns and existing technology, develop and carry out an experimental testing program, and conclude with durability design guidelines. Three experimental programs were developed: A long term macrocell corrosion test series, to investigate corrosion protection for internal tendons in precast segmental construction; a long term beam corrosion test series, to examine the effects of post-tensioning on corrosion protection as affected by crack width; and, a long term column corrosion test series, to examine corrosion protection in vertical elements.
NTIS
Corrosion Prevention; Durability; Substructures

20040171367 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA
Heat of Dissolution Measurements for CO(2) in Mixed Alkanolamine Solvents
Kabadi, V. N.; Apr. 27, 2004; 26 pp.; In English
Report No.(s): DE2004-824043; No Copyright; Avail: Department of Energy Information Bridge

The main objective of this project is to measure heat of dissolution of CO(sub 2) in carefully selected mixed alkanolamine solvent systems, and provide such directly measured data that might be used for efficient design of CO(sub 2) capture processes, or for better understanding of thermodynamics of CO(sub 2)-alkanolamine systems. Carbon dioxide is one of the major greenhouse gases, and the need for stabilization of its composition in earth's atmosphere is vital for the future of mankind. Although technologies are available for capture and storage of CO(sub 2), these technologies are far too expensive for economical commercialization. Reduction of cost would require research for refinement of the technology. For more economical CO(sub 2) capture and regeneration, there is a need for development of more efficient solvent systems. In this project we will extend the thermodynamic database by measuring heat of solution data of CO(sub 2) in mixed solvents made of MEA (monoethanolamine), MDEA (methyldiethanolamine), piperazine, and water. Mixed solvents of different compositions will be selected and in each case data will be measured at temperatures 40 and 80 C and various partial pressures of CO(sub 2). At the end of the project, observations, conclusions, and recommendations will be derived for the choice of mixed solvents for efficient CO(sub 2) capture with potential for commercialization.
NTIS
Solvents; Carbon Dioxide; Heat of Solution

20040171477 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Temperature Dependence of the Rate Constant for the Reaction F(2P) + Cl2 -\g FCI + Cl at T = 180-360 K
Nesbitt, Fred L.; Cody, Regina J.; Dalton, Douglas A.; Riffault, Veronique; Bedjanian, Yuri; LeBras, Georges; [2004]; 1 pp.; In English; Copyright; Avail: Other Sources

No abstract available
Reaction Kinetics; Chlorine; Chlorine Compounds

20040171519 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Detecting Organic Compounds in Martian Soil Analogues Using Gas Chromatography Mass Spectrometry
Glavin, D. P.; Buch, A.; Mahaffy, P. R.; [2004]; 1 pp.; In English; International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

One of the primary objectives of the 1976 Viking missions was to determine whether organic compounds, possibly of biological origin, were present in the Martian surface soils. The Viking gas chromatography mass spectrometry (GCMS) instruments found no evidence for any organic compounds of Martian origin above a few parts per billion in the upper 10 cm of surface soil [l], suggesting the absence of a widely distributed Martian biota. However, Benner et d. have suggested that significant amounts of non-volatile organic compounds, possibly including oxidation products of bioorganic molecules (e.g. carboxylic acids) would not have been detected by the Viking GCMS [2]. Moreover, other key organic compounds important to biology, such as amino acids and nucleobases, would also likely have been missed by the Viking GCMS as these compounds require chemical derivatization to be stable in a GC column [3]. Recent pyrolysis experiments with a Mars soil analogue that had been innoculated with Escherichia coli bacteria have shown that amino acid decomposition products (amines) and nucleobases are among the most abundant products generated after pyrolysis of the bacterial cells [4,5]. At the part per billion level (Viking GCMS detection limit), these pyrolysis products generated from several million bacterial cells per gram of Martian soil would not have been detected by the Viking GCMS instruments [4]. Analytical protocols are under development for upcoming in situ lander opportunities to target several important biological compounds including amino acids and nucleobases. For example, extraction and chemical derivatization techniques [3] are being adapted for space flight use to transform reactive or fragile molecules that would not have been detected by the Viking GCMS instruments, into species that are sufficiently volatile to be detected by GCMS. Recent experiments carried out at NASA Goddard have shown that using this derivatization technique all of the targeted compounds mentioned above can be separated on a GC column and detected by MS at sub-picomole (\h 10(exp -l2 mole) levels. With these methods, the detection limit for amino acids, carboxylic acids and nucleobases is several orders of magnitude more sensitive than the Viking GCMS instruments for these compounds. Preliminary results using this analytical technique on a variety of Martian soil analogues will be presented.
Author
Organic Compounds; Mars Surface; Soils; Viking Mars Program; Carboxylic Acids; Amines

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METALS AND METALLIC MATERIALS

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

20040170411 Science Applications International Corp., Idaho Falls, ID, USA
Innovative Technology Verification Report: Field Measurement Technology for Mercury in Soil and Sediment. NITON's XLi/XLt 700 Series X-Ray Fluorescence Analyzers
Billets, S.; Niclas, J.; Evans, J.; May 2004; 98 pp.; In English; Sponsored by Environmental Protection Agency, Las Vegas, NV. National Exposure Research Lab
Report No.(s): PB2005-100119; No Copyright; Avail: CASI; A05, Hardcopy

NITON's XL-700 Series X-ray fluorescence analyzers were demonstrated under the U.S. Environmental Protection Agency Superfund Innovative Technology Evaluation Program in May 2003 at the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee. The purpose of the Demonstration was to collect reliable performance and cost data for the Xli 702 and XU 792 and four other field measurement devices for mercury in soil and sediment. The key objectives of the Demonstration were (1) determine sensitivity of each instrument with respect to a vendor-generated method detection limit (MDL) and practical quantitation limit (MDL) and practical quantitation limit (POL); (2) determine analytical accuracy associated with vendor field measurement using field samples and standard reference materials; (3) evaluate the precision of vendor field measurements; (4) measure time required to perform mercury measurements; and (5) estimate costs associated with mercury measurements for capital, labor, supplies, and investigation-derived wastes. The Demonstration involved analysis of standard reference materials (SRMs) field samples collected from four sites, and spiked field samples for mercury. The performance results for a given field measurement device were compared to those for an off-site laboratory reference method, 'Test Methods for Evaluating Solid Waste' (SW-846) Method 7471B
NTIS
Soils; Sediments; Mercury (Metal)

20040170439 Science Applications International Corp., Idaho Falls, ID, USA
Innovative Technology Verification Report: Field Measurement Technology for Mercury in Soil and Sediment Metorex's X-MET (tm) 2000 X-Ray Fluorescence Technology
Billets, S.; Nicklas, J.; Evans, J.; May 2004; 90 pp.; In English; Sponsored by Environmental Protection Agency, Las Vegas, NV. National Exposure Research Lab
Report No.(s): PB2005-100263; No Copyright; Avail: CASI; A05, Hardcopy

This research project is focused on Clarksburg Special Protection Area (CSPA) in Montgomery County, Maryland. The CSPA subwatersheds are on the outer edge of the urban development shockwave expanding outward from the Washington DC metropolitan area. This is an area of rapid development that we expect will be built out within the next five to ten years. The Montgomery County Department of Environmental Protection (DEP) has been monitoring stream biology and chemistry in the area streams and the CSPA involves special best management practices (BMPs) that are designed to limit the impact of development on water resources. This research is an example of a Federal-Local technology-transfer partnership where innovative technologies are researched at the Federal level and the results made available at a local level for neighborhood solutions. This research is a collaborative effort where local stakeholders are involved setting research goals and Federal agencies are involved offering expertise and capabilities not available at the local level.
NTIS
Mercury (Metal); Soils; Sediments

20040170440 Science Applications International Corp., Idaho Falls, ID, USA
Innovatiave Technology Verification Report: Field Measurement Technology for Mercury in Soil and Sediment. Ohio Lumex's RA-915+/RP-91C Mercury Analyzer
Billets, S.; Nicklas, J.; Evans, J.; May 2004; 90 pp.; In English; Sponsored by Environmental Protection Agency, Las Vegas, NV. National Exposure Research Lab
Report No.(s): PB2005-100262; No Copyright; Avail: CASI; A05, Hardcopy

Ohio Lumex's RA915+/91C mercury analyzer was demonstrated under the U.S. Environmental Protection Agency Superfund Innovative Technology Evaluation Program in May 2003, at the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee. The purpose of the Demonstration was to collect reliable performance and cost data for the RA915+/91C and four other field measurement devices for mercury in soil and sediment. The key objectives of the Demonstration were: (1) determine sensitivity of each instrument with respect to a vendor-generated method detection limit (MDL) and practical quantitation limit (POL); (2) determine analytical accuracy associated with vendor field measurements using field samples and standard reference materials; (3) evaluate the precision of vendor field measurements; (4) measure time required to perform mercury measurements; and (5) estimate costs associated with mercury measurements; (5) estimate costs associated with mercury measurements for capital, labor, supplies, and investigation-derived wastes. The Demonstration also involved analysis of standard reference materials (SMRs), field samples collected from four sites, and spiked field samples for mercury. The performance results for a given field measurement device were compared to those for an off-site laboratory using reference method, 'Test Methods for Evaluating Solid Waste' (SW-846) Method 7471B.
NTIS
Mercury (Metal); Sediments; Soils

20040170442 West Virginia Univ., Morgantown, WV, USA
Correlation of Point Defects in CdZnTe with Charge Transport: Application to Room-Temperature X-Ray and Gamma Ray-Detectors
Giles, N. C.; Jun. 25, 2003; 12 pp.; In English
Report No.(s): DE2004-821145; No Copyright; Avail: Department of Energy Information Bridge

The primary goal of this project has been to characterize and identify point defects (e.g., impurities, vacancies, vacancy-impurity complexes, etc.) in CdZnTe and determine the mechanisms by which these defects influence the carrier(mu)(tau)products. Special attention is given to the role of shallow donors, shallow acceptors, and deeper acceptors. There are two experimental focus areas in the project: (1) liquid-helium photoluminescence (PL) and PL excitation spectroscopy are used to identify and characterize donors and acceptors and to determine zinc molar fraction; and (2) electron paramagnetic resonance (EPR) and photoinduced EPR experiments are performed at liquid-helium temperature to identify paramagnetic point defects and to determine the concentration of these defects. Results from the two experimental focus areas are correlated with detector performance parameters (e.g., electron and hole(mu)(tau) products), crystal growth conditions, and microstructure analyses.
NTIS
Point Defects; Electron Paramagnetic Resonance; Gamma Rays

20040170443 Carnegie-Mellon Univ., Pittsburgh, PA, USA
Mechanisms of Deformation in B2 and Ruthenium Aluminides
Pollock, T. M.; 2003; 20 pp.; In English
Report No.(s): DE2004-820836; DOE/ER/45566-1; No Copyright; Avail: Department of Energy Information Bridge

This is the Final Summary of findings on deformation in B2 aluminides with emphasis on ruthenium aluminides.
NTIS
Ruthenium; Deformation

20040170687 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Fretting Fatigue Behavior of Shot-Peened Titanium Alloy TI-6AL-4V Under Seawater Conditions
Jun. 2004; 82 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426654; AFIT/GAE/ENY/04-J01; No Copyright; Avail: Defense Technical Information Center (DTIC)
The fretting fatigue behavior of the shot-peened titanium alloy, Ti-6Al-4V, was investigated under a corrosive environment of synthetic seawater. Fretting fatigue tests were performed over a wide stress range to determine the effect of seawater at high and low cycle fatigue regimes. The results from this study showed: (1) seawater significantly reduces the fretting fatigue life of shot-peened Ti-6Al-4V at both high and low cycle fatigue relative to its counterpart in ambient laboratory conditions, (2) shot peening increases the fretting fatigue life of Ti-6Al-4V when tested under dry and seawater conditions relative to its counterpart of unpeened Ti-6Al-4V, (3) surface debris from samples tested under seawater conditions contained large quantities of oxide and seawater contaminants, (4) cleaning after testing removed most of the oxide and seawater contaminants from the sample.
DTIC
Aluminum Alloys; Corrosion Prevention; Fatigue Tests; Fretting; Sea Water; Shot Peening; Titanium Alloys; Vanadium Alloys

20040171083 Bettis Atomic Power Lab., West Mifflin, PA, USA
Measuring the Fracture Toughness of TZM and ODS Molybdenum Alloys using Standard and Sub-Sized Bend Specimens
Cockeram, B. V.; 2004; In English
Report No.(s): DE2004-807260; No Copyright; Avail: National Technical Information Service (NTIS)
Oxide Dispersion Strengthened (ODS) and TZM molybdenum have excellent creep resistance and strength at high temperatures in inert atmospheres. Fracture toughness and tensile testing was performed at temperatures between -150 degrees Centigrade and 450 degrees Centigrade to characterize 6.35 mm thick plate material of ODS and TZM molybdenum. A transition from low fracture toughness values (5.8 to 29.6 MPa square root m) to values greater than 30 MPa square root m is observed for TZM molybdenum in the longitudinal orientation at 100 degrees Centigrade and in the transverse orientation at 150 degrees Centigrade. These results are consistent with data reported in literature for molybdenum.
NTIS
Molybdenum Alloys; Creep Strength; Oxide Dispersion Strengthening

20040171097 Department of Energy, Albany, OR, USA
Atmospheric Corrosion and Precipitation Runoff from Zinc and Zinc Alloy Surfaces
Matthes, S. A.; Cramer, S. D.; Bullard, S. J.; Covino, B. S.; Holcomb, G. R.; 2003; 14 pp.; In English
Report No.(s): DE2004-821882; DOE/ARC-03-003; No Copyright; Avail: Department of Energy Information Bridge
The long-term atmospheric corrosion performance of rolled zinc and three thermal-sprayed (TS) zinc materials (Zn, Zn-15Al, and Al-12Zn-0.2In) was characterized by measuring corrosion product concentrations in precipitation runoff at coastal marine and inland sites. Corrosion rates and average zinc concentrations in the runoff were greater at the site having higher annual rainfall. Higher chloride concentrations did not seem to affect either the corrosion rates or the zinc concentrations in the runoff at the coastal site compared to those of the inland site. Zinc runoff concentrations were higher for TS Zn than rolled zinc due to the greater surface area of the thermal-sprayed surface. Average cumulative zinc runoff losses for the two sites were: 64(micro)mol Zn/L for TS Zn, 37(micro)mol Zn/L for rolled Zn, 24(micro)mol Zn/L for TS Zn-15Al, and 1.8(micro)mol Zn/L for TS Al-12Zn-0.2In. Cumulative zinc runoff losses were directly related both to the precipitation rate and to the availability of Zn in metal surfaces, a consequence of surface roughness and surface chemistry properties of the metal.
NTIS
Zinc; Zinc Alloys; Corrosion

20040171101 Duquesne Univ., Pittsburgh, PA, USA
Synthesis and Characterization of New Intermetallic Compounds for the grant entitled: Laser Processing of Advanced Magnetic Materials
Sorescu, M.; May 07, 2003; 34 pp.; In English
Report No.(s): DE2004-821463; No Copyright; Avail: Department of Energy Information Bridge

This six-month work is focused mainly on the properties of novel magnetic intermetallics. In the first project, we synthesized several 2:17 intermetallic compounds, namely Nd2Fe15Si2, Nd2Fe15Al2, Nd2Fe15SiAl and Nd2Fe15SiMn, as well as several 1:12 intermetallic compounds, such as NdFe10Si2, NdFe10Al2, NdFe10SiAl and NdFe10MnAl. In the second project, seven compositions of NdxFe100-x-yBy ribbons were prepared by a melt spinning method with Nd and B content increasing from 7. 3 and 3.6 to 11 and 6, respectively. The alloys were annealed under optimized conditions to obtain a composite material consisting of the hard magnetic Nd2Fe14B and soft magnetic -Fe phases, typical of a spring magnet structure. In the third project, intermetallic compounds of the type Zr1Cr1Fe1T0.8 with T=Al, Co and Fe were subjected to hydrogenation. In the fourth project, we performed three crucial experiments. In the first experiment, we subjected a mixture of Fe3O4 and Fe (80-20 wt %) to mechanochemical activation by high-energy ball milling, for time periods ranging from 0.5 to 14 hours. In the second experiment, we ball-milled Fe3O4:Co2+ (x=0.1) for time intervals between 2.5 and 17.5 hours. Finally, we exposed a mixture of Fe3O4 and Co (80-20 wt %) to mechanochemical activation for time periods ranging from 0.5 to 10 hours. In all cases, the structural and magnetic properties of the systems involved were elucidated by X-ray diffraction (XRD), Mossbauer spectroscopy and hysteresis loop measurements. The four projects resulted in four papers, which are currently being considered for publication in Intermetallics, IEEE Transactions on Magnetics, Journal of Materials Science Letters and Journal of Materials Science. The contributions reveal for the first time in literature the effect of substitutions on the hyperfine magnetic field of neodymium-based intermetallics, the correlation between structure and magnetic properties in spring magnets, the unique effects induced by hydrogenation on the hyperfine parameters of iron-rich intermetallics and the characteristics of the ball milling process in systems containing magnetite.
NTIS
Intermetallics; Melt Spinning

20040171105 General Electric Co., Schenectady, NY, USA, Virginia Univ., Charlottesville, VA, USA
Effects of Test Temperature, Temper, and Alloyed Copper on the Hydrogen-Controlled Crack Growth Rate of an Al-Zn-Mg-(Cu) Alloy
Young, G. A.; Scully, J. R.; Sep. 17, 2000; 48 pp.; In English
Report No.(s): DE2004-821950; LM-00K082; No Copyright; Avail: Department of Energy Information Bridge

The hydrogen embrittlement controlled stage II crack growth rate of AA 7050 (6.09 wt.% Zn, 2.14 wt% Mg, 2.19 wt.% Cu) was investigated as a function of temper and alloyed copper level in a humid air environment at various temperatures. Three tempers representing the underaged, peak aged, and overaged conditions were tested in 90% relative humidity (RH) air at temperatures between 25 and 90 C. At all test temperatures, an increased degree of aging (from underaged to overaged) produced slower stage II crack growth rates. The stage II crack growth rate of each alloy and temper displayed Arrhenius-type temperature dependence with activation energies between 58 and 99 kJ/mol. For both the normal copper and low copper alloys, the fracture path was predominantly intergranular at all test temperatures (25-90 C) in each temper investigated. Comparison of the stage II crack growth rates for normal (2.19 wt.%) and low (0.06 wt.%) copper alloys in the peak aged and overaged tempers showed the beneficial effect of copper additions on stage II crack growth rate in humid air. In the 2.19 wt.% copper alloy, the significant decrease ((approx) 10 times at 25 C) in stage II crack growth rate upon overaging is attributed to an increase in the apparent activation energy for crack growth. IN the 0. 06 wt.% copper alloy, overaging did not increase the activation energy for crack growth but did lower the pre-exponential factor,(nu)(sub 0), resulting in a modest ((approx) 2.5 times at 25 C) decrease in crack growth rate. These results indicate that alloyed copper and thermal aging affect the kinetic factors that govern stage II crack growth rate. Overaged, copper bearing alloys are not intrinsically immune to hydrogen environment assisted cracking but are more resistant due to an increased apparent activation energy for stage II crack growth.
NTIS
Alloys; Crack Propagation; Humidity

20040171461 NASA Marshall Space Flight Center, Huntsville, AL, USA
Solid Rocket Booster Hydraulic Pump Port Cap Joint Load Testing
Gamwell, W. R.; Murphy, N. C.; June 2004; 46 pp.; In English
Report No.(s): NASA/TM-2004-213282; M-1114; No Copyright; Avail: CASI; A03, Hardcopy

The solid rocket booster uses hydraulic pumps fabricated from cast C355 aluminum alloy, with 17-4 PH stainless steel pump port caps. Corrosion-resistant steel, MS51830 CA204L self-locking screw thread inserts are installed into C355 pump housings, with A286 stainless steel fasteners installed into the insert to secure the pump port cap to the housing. In the past, pump port cap fasteners were installed to a torque of 33 Nm (300 in-lb). However, the structural analyses used a significantly higher nut factor than indicated during tests conducted by Boeing Space Systems. When the torque values were reassessed using Boeing's nut factor, the fastener preload had a factor of safety of less than 1, with potential for overloading the joint.

This paper describes how behavior was determined for a preloaded joint with a steel bolt threaded into steel inserts in aluminum parts. Finite element models were compared with test results. For all initial bolt preloads, bolt loads increased as external applied loads increased. For higher initial bolt preloads, less load was transferred into the bolt, due to external applied loading. Lower torque limits were established for pump port cap fasteners and additional limits were placed on insert axial deformation under operating conditions after seating the insert with an initial preload.
Author
Aluminum Alloys; Cast Alloys; Fabrication; Hydraulic Equipment; Load Tests; Pumps; Solid Propellant Rocket Engines; Mechanical Properties

20040171636 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NASA Goddard Space Flight Center Tin Whisker (and Other Metal Whisker) Homepage
Brusse, Jay; Sampson, Mike; Leidecker, Henning; Kadesch, Jong; [2004]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

This website provides information about tin whiskers and related research. The independent research performed during the past 50+ years is so vast that it is impractical to cover all aspects of tin whiskers in this one resource. Therefore, the absence of information in this website about a particular aspect of tin whiskers should NOT be construed as evidence of absence.
Derived from text
Whisker Composites; Tin

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*.

20040161577 NASA Marshall Space Flight Center, Huntsville, AL, USA
Low Gravity Rapid Thermal Analysis of Glass
Tucker, Dennis S.; Ethridge, Edwin C.; Smith, Guy A.; [2004]; 1 pp.; In English; XX International Congress on Glass, 26 Sep. 2004, Kyoto, Japan; No Copyright; Avail: Other Sources; Abstract Only

It has been observed by two research groups that ZrF4-BaF2-LaF3-AlF3-NaF (ZBLAN) glass crystallization is suppressed in microgravity. The mechanism for this phenomenon is unknown at the present time. In order to better understand the mechanism, an experiment was performed on NASA's KC135 reduced gravity aircraft to obtain quantitative crystallization data. An apparatus was designed and constructed for performing rapid thermal analysis of milligram quantities of ZBLAN glass. The apparatus employs an ellipsoidal furnace allowing for rapid heating and cooling. Using this apparatus nucleation and crystallization kinetic data was obtained leading to the construction of time-temperature-transformation curves for ZBLAN in microgravity and unit gravity.
Author
Glass; Microgravity; Crystallization; C-135 Aircraft; Time Temperature Parameter

20040166149 National Academy of Sciences - National Research Council, Hampton, VA, USA
Characterization of the Edge Crack Torsion (ECT) Test for Mode III Fracture Toughness Measurement of Laminated Composites
Ratcliffe, James G.; [2004]; 22 pp.; In English; ASC/ASTM-D30 Joint 19th Annual Technical Conference, 17-20 Oct. 2004, Atlanta, GA, USA
Contract(s)/Grant(s): 762-55-LC; No Copyright; Avail: CASI; A03, Hardcopy

The edge crack torsion (ECT) test is designed to initiate mode III delamination growth in composite laminates. An ECT specimen is a rectangular laminate, containing an edge delamination at the laminate mid-plane. Torsion load is applied to the specimens, resulting in relative transverse shear sliding of the delaminated faces. The test data reduction schemes are intended to yield initiation values of critical mode III strain energy release rate, G(sub IIIc), that are constant with delamination length. The test has undergone several design changes during its development. The objective of this paper was to determine the suitability of the current ECT test design as a mode III fracture test. To this end, ECT tests were conducted on specimens manufactured from IM7/8552 and specimens made from S2/8552 tape laminates. Several specimens, each with different delamination lengths are tested. Detailed, three-dimensional finite element analyses of the specimens were performed. The analysis results were used to calculate the distribution of mode I, mode II, and mode III strain energy release rate along the

delamination front. The results indicated that mode III-dominated delamination growth would be initiated from the specimen center. However, in specimens of both material types, the measured values of G(sub IIIc) exhibited significant dependence on delamination length. Furthermore, there was a large amount of scatter in the data. Load-displacement response of the specimens exhibited significant deviation from linearity before specimen failure. X-radiographs of a sample of specimens revealed that damage was initiated in the specimens prior to failure. Further inspection of the failure surfaces is required to identify the damage and determine that mode III delamination is initiated in the specimens.
Author
Torsion; Edge Cracks; Performance Tests; Laminates; Composite Materials

20040166640 NASA Langley Research Center, Hampton, VA, USA
Cross-Linked Nanotube Materials with Variable Stiffness Tethers
Frankland, Sarah-Jane V.; Odegard, Gregory M.; Herzog, Matthew N.; Gates, Thomas S.; Fay, Catherine C.; [2004]; 15 pp.; In English; ASC/ASTM-D30 Joint 19th Annual Technical Conference, 17-20 Oct. 2004, Atlanta, GA, USA
Contract(s)/Grant(s): 762-55-LC; No Copyright; Avail: CASI; A03, Hardcopy

The constitutive properties of a cross-linked single-walled carbon nanotube material are predicted with a multi-scale model. The material is modeled as a transversely isotropic solid using concepts from equivalent-continuum modeling. The elastic constants are determined using molecular dynamics simulation. Some parameters of the molecular force field are determined specifically for the cross-linker from ab initio calculations. A demonstration of how the cross-linked nanotubes may affect the properties of a nanotube/polyimide composite is included using a micromechanical analysis.
Author
Tetherlines; Stiffness; Carbon Nanotubes

20040170412 Swedish National Testing and Research Inst., Tsoras, Sweden
Plastic Piping for Sprinkler Systems
2004; 66 pp.; In Swedish
Report No.(s): PB2005-100101; SP-RAPP-2004:01; No Copyright; Avail: CASI; A04, Hardcopy

There are several proven thermoplastic piping systems on the Swedish market for tap water, domestic hot water and space heating and cooling systems in materials such as PE, PEX, PP, PB, ABS, or CPVC that could be used as sprinkler pipes. The objective of this project was to determine which plastic piping systems could be suitable for use in sprinkler systems. The report concentrates on pipes intended for tap water systems, as pipes for heating systems are not generally suitable for the higher pressures needed for sprinkler systems. It includes details such as the type of material, pipe sizes, pressure class, methods of jointing, support systems, etc. This subsection also describes the type of plastic sprinkler pipe used in the USA.
NTIS
Pipes (Tubes); Thermoplasticity; Cooling Systems; Heating Equipment

20040170819 Polytechnic Univ., Brooklyn, NY
Dielectric Non-Destructive Analysis of Adhesive Bonded Structures
Mijovic, Jovan; Sep. 28, 2004; 148 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0320
Report No.(s): AD-A426943; AFRL-SR-AR-TR-04-0515; No Copyright; Avail: CASI; A07, Hardcopy

An investigation was conducted aimed at developing dielectric spectroscopy as a non-destructive inspection tool to assess aging of adhesive bonded structures. Dielectric spectroscopy was found to be a sensitive tool capable of detecting defects and absorbed moisture in adhesive bonded structures. The highlights of the research performed are: l) The defects in adhesive joints decrease the real and imaginary dielectric permittivity in the frequency domain and induce additional peaks in the time domain spectra; 2) The dielectric spectra of dry epoxy-amine networks are characterized by two Arrhenius-like local relaxations: the beta process, associated with hydroxyl groups and the gamma process, associated with primary and secondary amine, and glycidyl ether groups; 3) Dynamics of beta and gamma processes are affected by short time aging. New relaxation processes appear in both model and commercial epoxy-amine adhesives after long term exposure to moisture. 4) Time domain reflectometry (TDR) traces shift to longer time with water ingress in the early stages of aging, but this trend is reversed at some critical time, which is possibly a signature of disbonding.
DTIC
Adhesive Bonding; Adhesives; Aging (Materials); Bonded Joints; Dielectrics; Inspection; Spectroscopy; Structural Analysis

20040171060 Department of the Navy, Washington, DC

High Strain Piezo-Polymer

Ramotowski, Thomas, Inventor; Nov. 21, 2003; 24 pp.; In English

Patent Info.: Filed 21 Nov. 2003; US-Patent-Appl-SN-10719852

Report No.(s): AD-D020142; No Copyright; Avail: Defense Technical Information Center (DTIC)

The present invention is a new class of terpolymers for use as high strain electrostrictive polymer films. More particularly, the invention is a class of electrostrictive terpolymers comprising vinylidene fluoride (vDF), trifluoroethylene (TrFE) and at least one monomer having at least one halogen atom side group. The monomer is preferably an ethylene-based monomer and preferably selected to favor gauche- type linkage along the polymer backbone. The halogen atom side group is preferably large enough to move or cause adjacent polymer chains to be farther apart from or away from each other than in the absence of such side group, but not so large that it would inhibi% polymer crystallites from forming. The monomer is preferably a chloro-monomer such as chlorofluoroethylene (CFE). The chiorofluoroethylene (CFE) is preferably l-chloro-2- fluoroethylene or l-chloro-l- fluoroethylene. The chlorofluoroethylene (CFE) favors gauche- type linkage which favors high electrostrictive strains.

DTIC

High Polymers; Patent Applications

20040171063 Department of the Navy, Washington, DC

Broadband and Wide Field of View Composite Transducer Array

Benjamin, Kim C., Inventor; Sep. 23, 2004; 12 pp.; In English

Patent Info.: Filed 24 Dec. 2003; US-Patent-Appl-SN-10748916

Report No.(s): AD-D020145; No Copyright; Avail: Defense Technical Information Center (DTIC)

A composite transducer array comprises a piezoelectric polymer composite panel, a continuous electrode coupled to a first surface of the composite panel, and a plurality of electrically-isolated electrode segments coupled to a second surface of the composite panel. Each electrode segment is shaped as an angular segment of a circular ring. The electrode segments are arranged to define an array of concentric circular rings of electrode segments.

DTIC

Broadband; Field of View; Patent Applications; Transducers

20040171145 NASA Marshall Space Flight Center, Huntsville, AL, USA

Characterization of Space Shuttle External Tank Thermal Protection System (TPS) Materials in Support of the Columbia Accident Investigation

Wingard, Charles D.; [2004]; 1 pp.; In English; North American Thermal Analysis Society Conference, 4-6 Oct. 2004, Williamsburg, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA suffered the loss of the seven-member crew of the Space Shuttle Columbia on February 1, 2003 when the vehicle broke apart upon re-entry to the Earth's atmosphere. The final report of the Columbia Accident Investigation Board (CAIB) determined that the accident was caused by a launch ascent incident-a suitcase-sized chunk of insulating foam on the Shuttle's External Tank (ET) broke off, and moving at almost 500 mph, struck an area of the leading edge of the Shuttle s left wing. As a result, one or more of the protective Reinforced Carbon-Carbon (RCC) panels on the wing leading edge were damaged. Upon re-entry, superheated air approaching 3,000 F breached the wing damage and caused the vehicle breakup and loss of crew. The large chunk of insulating foam that broke off during the Columbia launch was determined to come from the so-called bipod ramp area where the Shuttle s orbiter (containing crew) is attached to the ET. Underneath the foam in the bipod ramp area is a layer of TPS that is a cork-filled silicone rubber composite. In March 2003, the NASA Marshall Space Flight Center (MSFC) in Huntsville, Alabama received cured samples of the foam and composite for testing from the Michoud Assembly Facility (MAF) in New Orleans, Louisiana. The MAF is where the Shuttle's ET is manufactured. The foam and composite TPS materials for the ET have been well characterized for mechanical property data at the super-cold temperatures of the liquid oxygen and hydrogen fuels used in the ET. However, modulus data on these materials is not as well characterized. The TA Instruments 2980 Dynamic Mechanical Analyzer (DMA) was used to determine the modulus of the two TPS materials over a range of -145 to 95 C in the dual cantilever bending mode. Multi-strain, fixed frequency DMA tests were followed by multi-frequency, fixed strain tests to determine the approximate bounds of linear viscoelastic behavior for the two materials. Additional information is included in the original extended abstract.

Author (revised)

Accident Investigation; Columbia (Orbiter); External Tanks; Foams

20040171299 NASA Marshall Space Flight Center, Huntsville, AL, USA

H and RT Lightweight Non-Metallic Thermal Protection Materials Technology

Valentine, Peter G.; Lawrence, Timothy W.; Gubert, Michael K.; Milos, Frank S.; Levine, Stanley R.; Ohlhorst, Craig W.; Koenig, John R.; [2004]; 1 pp.; In English; National TPS Workshop VII, 31 Aug. - 2 Sep. 2004, Dayton, OH, USA; No Copyright; Avail: CASI; A01, Hardcopy

To fulfill the Vision for Space Exploration-successful human and robotic missions to and from other solar system bodies to explore their atmospheres and surfaces-NASA must reduce trip time, cost, and vehicle weight so that payload and scientific experiments capabilities are maximized. As a collaboration among NASA Centers for the Human and Robotic Technology (H and RT) Program, this project will generate products that will enable greater fidelity in mission/vehicle design trade studies, support risk reduction for material selections, assist in optimization of vehicle weights, and provide the materials and processes templates for development of human-rated qualification and certification Thermal Protection System (TPS) plans. Missions performing aerocapture or direct entry rely on technologies that reduce vehicle weight by minimizing the need for propellant. These missions use the destination planet s atmosphere to slow the spacecraft. Such mission profiles induce heating environments on the spacecraft that demand thermal protection heat shields. This program offers NASA essential products needed to develop new lightweight non-metallic TPS materials for critical thermal protection heat shields for future spacecraft. The products will directly enhance the Advanced Space Technology Program, specifically the Advanced Materials and Structural Concepts research and development area, in its development of advanced thermal management technologies. These products include: A TPS material technology roadmap early in the new exploration process. An improved, streamlined building-block approach to develop, characterize, and qualify the new TPS materials for a space rating and/or human rating and to minimize life cycle costs and time to market, drawing upon lessons learned in earlier programs. Creation and characterization of improved methodology plans, flowcharts, and procedures for TPS material development for space exploration applications. Identification of key parameters and properties of TPS materials for use in steering the development correctly and maximizing return on development costs. Relevant environments screening for TPS materials that test these key parameters and properties in relevant space environments, advancing the materials to Technology Readiness Level (TRL) 4 or 5.

Author

Heat Shielding; Life Cycle Costs; Structural Design; Structural Members; Technology Assessment; Thermal Protection

28
PROPELLANTS AND FUELS

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

20040170574 Instituto Politecnico de Setubal, Setubal, Portugal

A Multiagent System Applied To The Design Of Petroleum Off-Shore Platforms

Piacca, Jose Avelino; Garcia, Ana Cristina Bicharra; ICEIS 2001; [2001], pp. 20-21; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents a model for cooperative multi-agents that interact in a closed environment, i.e., an environment where the rules are well known by the agents and do not change dynamically. In a computational environment where several different software agents share resources to reach their goals, the occurrence of conflicts is inevitable. Therefore it is of highest importance to have an efficient mechanism to solve such conflicts. While other models in the literature present solutions for conflict resolution based on centralized and distributed algorithms, our proposal is to solve the conflicts in a hierarchical manner. The proposed model is based on the application of Social Laws and it was inspired by the, theory of Jean Jacques Rousseau's Social Contract, being denominated Tri-Coord Model, that is, of Triple Coordination. We implemented a prototype based on the Tri-Coord Model, and applied to the task of oil and gas process floor-plan design in a petroleum off-shore platform. In that domain the project is divided in several subsystems, with an agent being responsible for each sub-system. Our experiments indicate that the Tri-Coord Model can indeed yield a better performance in the development of a project. First, because it decreases the interruptions for accomplishment of meetings to solve conflicts related to customization of sub-system's parameters. Second, because it removes the bottleneck associated to a centralized model for conflict resolution. Third, because through the regulator environment of Tri- Coord the agents behavior can be controlled implicitly by the

environment. In that way the agents learn how to interact correctly and the independence between the environment and the agents turns the system more flexible.
Author
Closed Ecological Systems; Prototypes; Platforms; Crude Oil; Design Analysis

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*.

20040170665 Air Force Inst. of Tech., Wright-Patterson AFB, OH
An Analysis of Electromagnetic Interference (EMI) of Ultra Wideband(UWB) and IEEE 802.11A Wireless Local Area Network (WLAN) Employing Orthogonal Frequency Division Multiplexing (OFDM)
Lopez, Juan, Jr.,; Mar. 2004; 158 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426577; AFIT/GIR/ENG/04-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Military communications require the rapid deployment of mobile, high-bandwidth systems. These systems must provide anytime, anywhere capabilities with minimal interference to existing military, private, and commercial communications. Ultra Wideband (UWB) technology is being advanced as the next generation radio technology and has the potential to revolutionize indoor wireless communications. The ability of UWB to mitigate multipath fading, provide high- throughput data rates (e.g., greater than 100 Mbps), provide excellent signal penetration (e.g., through walls), and low implementation costs makes it an ideal technology for a wide range of private and public sector applications. Preliminary UWB studies conducted by The Institute for Telecommunications Science (ITS) and the Defense Advanced Research Projects Agency (DARPA) have discovered that potential exists for harmful interference to occur. While these studies have provided initial performance estimates, the interference effects of UWB transmissions on coexisting spectral users are largely unknown. This research characterizes the electromagnetic interference (EMI) effects of UWB on the throughput performance of an IEEE 802.11a ad-hoc network. Radiated measurements in an anechoic chamber investigate interference performance using three modulation schemes (BPSK, BPPM, and OOK) and four pulse repetition frequencies over two Unlicensed National Information Infrastructure (U-NII) channels. Results indicate that OOK and BPPM can degrade throughput performance by up to 20% at lower pulse repetition frequencies (PRFs) in lower U-NII channels. Minimal performance degradation (less than one percent) due to interference was observed for BPSK at the lower PRFs and higher U-NII channels.
DTIC
Deployment; Electromagnetic Interference; Frequency Division Multiplexing; Local Area Networks

20040170666 Naval Research Lab., Bay Saint Louis, MS
Validation Test Report for the Simulating Waves Nearshore Model (SWAN): cycle III, Version 40.11
Allard, Richard; Rogers, W. E.; Carroll, Suzanne N.; Rushing, Kate V.; Sep. 2, 2004; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426578; NRL/FR/7320-04-10; 070; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Simulating Waves Nearshore (SWAN) wave model represents a significant improvement for the U.S. Navy s nearshore wave modeling capability. SWAN is a full-plane model allowing wave propagation from any direction. Features include variable boundary conditions, multiple coordinate system options, refraction, wave-current interaction, nesting, and numerous output options. The OpenMP version of SWAN allows the model to be run on multiple processors on shared memory platforms, greatly reducing run times. This report validates SWAN version 40.11 with nine test cases that examine the wide- ranging features and modes through which the model can be operated.
DTIC
Ocean Models; Ocean Surface; Simulation; Water Waves

20040171320 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
Journal of The Chinese Institute of Engineers, Volume 27, No. 5
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.; September 2004; ISSN 0253-3839; 128 pp.; In English; Copyright; Avail: Other Sources

Contents include the following: Personalizing for network marketing. Edge-Preserving Color Image Interpolation Using

Spatial and Spectral Correlations. Plated RC Beam-Column Joints under Cyclic Loading. Studies of Newmark Method for Solving Nonlinear Systems: (I) Basic Analysis. Studies of Newmark Method for Solving Nonlinear Systems: (II) Verification and Guideline. Development of Cooling Load Temperature Differential Values for Building Envelopes in Thailand. An Orientation-Varying Consideration in the Least-Squares Ambiguity Decorrelation Adjustment. Evaluation of Dynamic Vehicle Load on Bridge Decks. Development of 3-D Finite Element Model for Flexible Pavements. A Model and a Solution Algorithm for Airline Line Maintenance Manpower Supply Planning with Multiple Aircraft Type Maintenance Certificates.
Derived from text
Airline Operations; Algorithms; Dynamic Loads; Maintenance; Mathematical Models

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*.

20040170429 General Accounting Office, Washington, DC
Homeland Security: Communication Protocols and Risk Communication Principles Can Assist in Refining the Advisory System
Jun. 2004; 140 pp.; In English
Report No.(s): PB2005-100931; GAO-04-682; No Copyright; Avail: CASI; A07, Hardcopy

Established in March 2002, the Homeland Security Advisory System was designed to disseminate information on the risk of terrorist acts to federal agencies, states, localities, and the public. However, these entities have raised questions about the threat information they receive from the Department of Homeland Security (DHS) and the costs they incurred as a result of responding to heightened alerts. This report examines (1) the decision making process for changing the advisory system national threat level; (2) information sharing with federal agencies, states, and localities, including the applicability of risk communication principles; (3) protective measures federal agencies, states, and localities implemented during high (codeorange) alert periods; (4) costs federal agencies reported for those periods; and (5) state and local cost information collected by DHS.
NTIS
Communication Networks; Standards

20040170645 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Throughput Performance Evaluation and Analysis of Unmodified Bluetooth Devices
Taylor, Steven J.; Mar. 2004; 86 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426467; AFIT/GCS/ENG/04-20; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Air Force relies on the application of new technologies to support and execute its mission. As new technologies develop, the integration of that technology is studied to determine the costs and benefits it may provide to the war fighter. One such emergent technology is the Bluetooth wireless protocol, used to connect a small number of devices over a short distance. The short distance is a feature that makes using the protocol desirable. However short, there is still a vulnerability to interception. This research identifies ranges at which several commercially available Bluetooth devices are usable. Various combinations of both distance and orientation are varied to determine a 360 degree map of the Bluetooth antenna. The map identifies distances at which certain throughput thresholds are available. This research shows that baseline 1 mW Bluetooth antennas are capable of throughput levels of 100 kbps at over 40 meters, which is four times the minimum distance specified in the protocol standard. The 3Com PC card was the best performing PC card, capable of throughputs at or near 100 kbps out to 40 meters. The other PC Cards tested had similar performance. The Hawking USB dongle was the best USB antenna tested, achieving throughputs of over 200 kbps in three of the four orientation, and over 150 kbps at the fourth. The 3Com dongle was a close second, the Belkin dongle a distant third, while the DLink antenna was not able to achieve 100 kbps at any distance tested.
DTIC
Communication Networks; Evaluation; Interception; Performance Tests; Protocol (Computers)

20040170681 National Defense Univ., Washington, DC

Joint Warfare and the Army-Air Force Team

Reimer, Dennis J.; Fogleman, Donald R.; Jan. 1996; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426644; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Army and Air Force are natural partners in the conduct of combat operations on and over land. Since day-to- day operations are intertwined, particularly in areas of service support, they often take this partnership for granted. It was forged during World War II, Korea, Vietnam, and most recently in the Gulf War. The most important teamwork occurs on the battlefield, where their combined capabilities produce a synergistic increase in joint combat power that provides a decisive advantage over an adversary. The Army-Air Force team is robust and forward looking, unequalled among the armed forces of the world. They intend to strengthen that partnership as they work together in the future. This article reviews issues discussed at the Army-Air Force Warfighter Talks of 1994 and 1995. Areas of concern that senior leadership of the services identified in December of 1995, using the working group as a point of departure, also are discussed. These issues are as follows: the role of the Joint Targeting Coordination Board (JTCB), joint control measures, command and control arrangements for air and missile defense, offensive counter-air and Theater Missile Defense (TMD) attack operations, and dual hatting of Joint Force Commanders. The Army-Air Force Warfighter Talks, as well as working group and interservice efforts, are each small steps towards greater understanding between the services. Improving connectivity, strengthening command relationships, and developing trust are key elements in ensuring the Army and Air Force remain the premier air-land team. DTIC

Command and Control; Military Operations; Warfare

20040170708 National Defense Univ., Washington, DC

Delivering Joint Information Superiority

Cardinal, Charles N.; Jan. 2000; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426733; No Copyright; Avail: CASI; A01, Hardcopy

Joint tactical C4ISR architecture -- or the integration of command, control, communications, computers, intelligence surveillance, and reconnaissance assets -- has long been a focus of defense visionaries. They picture systems linking assets, enabling the Armed Forces to detect and strike targets with blinding speed. Such architecture has broader implications. It can enable Joint Vision 2010 and ultimately a revolution in military affairs. An advanced concept technology demonstration (ACTD) by U.S. Pacific Command (PACOM) represents progress in realizing such visionary concepts. The Under Secretary of Defense for Acquisition and Technology testified before Congress that, 'We must achieve an interoperable and integrated, secure, and smart C4ISR infrastructure that encompasses both strategic and tactical needs. Enhanced situation awareness and information assurance are. . .the backbone of the revolution in military affairs.' That potential was realized in part during the Persian Gulf War. U.S. forces could see targets faster with airborne warning and control and joint surveillance target attack systems. And they could hit them with greater precision. But operations are often far from perfect. The old problem remained: getting the right information to the right place at the right time. A fully integrated C4ISR architecture is the solution. It can bind the services together with defense, intelligence, and other governmental agencies. It will synchronize the unique strengths of organizations and enable the more seamless integration of service capabilities sought by JV 2010. This system of systems can link all sensors -- strategic, theater, and tactical -- within an enhanced command and control framework. Information will be fused with other friendly information and distributed as a common operational picture to users. Just as the computer and Internet have empowered individuals, shared information from an integrated C4ISR architecture may do the same for small units.7

DTIC

Command and Control; Communication Networks; Intelligence; Military Operations; Reconnaissance; Surveillance

20040170783 RAND Corp., Santa Monica, CA

Network-Based Operations for the Swedish Defence Forces: An Assessment Methodology

Perry, Walter; Gordon, John, IV; Boito, Michael; Kingston, Gina; Jun. 2004; 111 pp.; In English

Report No.(s): AD-A426872; RAND/TR-119-FOI; No Copyright; Avail: CASI; A06, Hardcopy

The Swedish government is undertaking efforts to reorient Swedish Defence Forces from homeland defence to a wider suite of missions, including operations far from Sweden- a significant change in the way Sweden is willing to employ its armed forces. Such missions include expeditionary operations with coalition partners. Therefore, a decision was made to move towards network-based operations linking sensors, decisionmakers, and combat systems to achieve shared awareness, increased speed of command, higher operational tempo, greater lethality, and increased survivability. The methodology proposed in this report suggests several operational functions, such as air and missile defense or joint force command and

control, that are representative of the type of missions future Swedish forces may have to perform. Once these operational functions have been prioritised and networks have been designed that connect the elements or forces that will participate in that function, the operational functions are then grouped into interaction categories. These categories include (1)-specialized interaction, with low to medium requirements for access, timeliness, and security; (2) ubiquitous interaction, which involves a large number of organizations; (3) secure interaction, for which participants and the information exchanged must be secured both physically and electronically; and (4) real-time interaction, extremely time-sensitive combat actions requiring that very few participants have access to critical real-time data and are able to share that data, even when network connections and nodes have failed. These interaction categories support the identification of common subnetworks and analogous systems or components in the cost-estimation process, which may draw on several cost-estimation methods.
DTIC
Armed Forces; Command and Control; Communication Networks; Information Systems; Military Operations; Sweden

20040170798 National Defense Univ., Washington, DC
Jointness Begins at Home - Responding to Domestic Incidents
Brown, Alan L.; Jan. 1999; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426895; No Copyright; Avail: Defense Technical Information Center (DTIC)

Floods in the Midwest, hurricanes in Florida, and oil spills along the coast of Rhode Island are recent catastrophic natural phenomena that have made headline news. Each one has involved responses by the Armed Forces, who are increasingly being asked to operate in domestic contingencies. This involves working alongside governmental agencies, nongovernmental organizations, and other private groups. With the Cold War over, there is a growing realization that national security is underpinned by more than military strength and is influenced by factors other than warfare. It can suffer when the economy is disrupted, social fabric is strained, or the international environment is threatened. Absent a superpower threat, the Armed Forces have turned to other roles, and with mixed results have participated in peace operations, drug interdiction, and disaster relief. This has sometimes led to activities within our own borders. Yet little attention has been given to the unique roles the military can play in domestic security threats or the demands confronting joint forces in this arena. This article reviews standard joint staff organization and proposes the use of another standard model for managing domestic events: the Incident Command System (ICS). Developed during the 1970s to coordinate firefighting in California, ICS has been adapted to a wide range of contingencies. ICS is built in modular fashion so that responders can create large or small organizations, and can flex and reorganize during a crisis. A comparison of domestic incidents illustrates the challenges that confront joint forces and the value of ICS in organizing the response. Both events involved oil spills resulting from vessel groundings off the coast of Rhode Island: the tank vessel World Prodigy in June 1989 and the tank barge North Cape in January 1996. A Coast Guard officer led each response, but ICS was only used in response to the second oil spill. These case studies are described and compared.
DTIC
Command and Control; Disasters; Emergencies; Management Methods; Military Operations; Security

20040171339 National Council on Disability, Washington, DC, USA
Design for Inclusion: Creating a New Marketplace
Oct. 28, 2004; 288 pp.; In English
Report No.(s): PB2005-100992; No Copyright; Avail: CASI; A13, Hardcopy

This report aims to educate designers and manufacturers about the way electronic and information technology (E&IT) intersects with the needs of individuals with disabilities, and how designing with access in mind can significantly increase the size of targeted markets for E&IT. Designing with access in mind can be accomplished through Universal design. Universal design is a process to ensure that electronic and information technology is inclusive, accessible, and usable by everyone, including people with disabilities. Incorporating universal design processes when developing E&IT is one solution to accommodating people with disabilities that also improves the usability of the products for the rest of the population. NCD's research attempts to understand the market for universally designed mainstream consumer products and services, document successful universal design development processes, understand consumer needs, understand universal design facilitators and barriers, and identify and address current issues in universal design. As part of this research, six product lines were analyzed from the telecommunications, software, consumer electronics, and digital services industries for both accessibility and usability. We estimated how useful these products are to people with disabilities and whether the products conformed to section 508 standards and section 255 guidelines. We were able to present recommendations for improving such products.
NTIS
Information Systems; Electronics; Market Research; Disabilities; Consumers

20040171398 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Prototype Test Results for the Single Photon Detection SLR2000 Satellite Laser Ranging System

Zagwodzki, Thomas W.; McGarry, Jan F.; Degnan, John J.; Cheek, Jack W.; Dunn, Peter J.; Patterson, Don; Donovan, Howard; [2004]; 1 pp.; In English; 2004 AMOS Technical Conference, 13-17 Sep. 2004, Maui, HI, USA; Copyright; Avail: Other Sources; Abstract Only

NASA's aging Satellite Laser Ranging (SLR) network is scheduled to be replaced over the next few years with a fully automated single photon detection system. A prototype of this new system, called SLR2000, is currently undergoing field trials at the Goddard Space Flight Center in Greenbelt, Maryland to evaluate photon counting techniques and determine system hardware, software, and control algorithm performance levels and limitations. Newly developed diode pumped microchip lasers and quadrant microchannel plate-based photomultiplier tubes have enabled the development of this high repetition rate single photon detection SLR system. The SLR2000 receiver threshold is set at the single photoelectron (pe) level but tracks satellites with an average signal level typically much less than 1 pe. The 2 kHz laser fire rate aids in satellite acquisition and tracking and will enable closed loop tracking by accumulating single photon count statistics in a quadrant detector and using this information to correct for pointing errors. Laser transmitter beamwidths of 10 arcseconds (FWHM) or less are currently being used to maintain an adequate signal level for tracking while the receiver field of view (FOV) has been opened to 40 arcseconds to accommodate point ahead/look behind angular offsets. In the near future, the laser transmitter point ahead will be controlled by a pair of Risley prisms. This will allow the telescope to point behind and enable closure of the receiver FOV to roughly match the transmitter beam divergence. Bandpass filters (BPF) are removed for night tracking operations while 0.2 nm or 1 nm filters are used during daylight operation. Both day and night laser tracking of Low Earth Orbit (LEO) satellites has been achieved with a laser transmitter energy of only 65 microjoules per pulse. Satellite tracking is presently limited to LEO satellites until the brassboard laser transmitter can be upgraded or replaced. Simultaneous tracks have also been observed with NASA s SLR standard, MOBLAS 7, for the purposes of data comparison and identification of biases. Work continues to optimize the receive optics; upgrade or replace the laser transmitter; calibrate the quadrant detector, the point ahead Risley prisms, and event timer verniers; and test normal point generation with SLR2000 data. This paper will report on the satellite tracking results to date, issues yet to be resolved, and future plans for the SLR2000 system.

Author

Detection; Lasers; Photoelectrons; Prototypes; Satellite Laser Ranging; Photons

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*.

20040170470 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Virtex-II Pro SEE Test Methods and Results

Petrick, David; Powell, Wesley; Howard, James; September 02, 2004; 18 pp.; In English; 2004 MAPLD International Conference, Sep. 2004, Washington, DC, USA; No Copyright; Avail: CASI; A03, Hardcopy

The Xilinx Virtex-II Pro is a platform FPGA that embeds multiple microprocessors within the fabric of an SRAM-based reprogrammable FPGA. The variety and quantity of resources provided by this family of devices make them very attractive for spaceflight applications. However, these devices will be susceptible to single event effects (SEE), which must be mitigated. To use the Virtex-II Pro reliably in space applications, these devices must first be tested to determine if they are susceptible to single event latchup (SEL), the degree to which they are susceptible to single event upsets (SEU) and single event transients (SET), and how these effects are manifested in the device. With this information, mitigations schemes can be developed and tested that address the specific susceptiblities of these devices. This initial SEE test uses a commercial off the shelf Virtex-II Pro evaluation board, with a single processor XC2VP7 FPGA. The FPGA on this board is an acid etched device, which can be partially covered with a shield. The shield covers a portion of the logic, routing, and memory resources along with some of the RocketIO transceivers. The processor, along with a large portion of logic, routing, memory, and transceivers are left exposed. This test will be performed at the Cyclotron Laboratories at Texas A&M University and Michigan State University using ions of varying energy levels and fluencies.

Author

Field-Programmable Gate Arrays; Commercial Off-the-Shelf Products; Electronic Equipment Tests

20040170646 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Demonstrating Optothermal Actuators for an Autonomous Mems Microrobot

Szabo, Francis R.; Mar. 2004; 230 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426469; AFIT/GE/ENG/04-23; No Copyright; Avail: Defense Technical Information Center (DTIC)

There are numerous applications for microrobots which are beneficial to the Air Force. However, the microrobotics field is still in its infancy, and will require extensive basic research before these applications can be fielded. The biggest hurdle to be solved, in order to create autonomous microrobots, is generating power for their actuator engines. Most present actuators require orders of magnitude more power than is presently available from micropower sources. To enable smaller microrobots, this research proposed a simplified power concept that eliminates the need for on-board power supplies and control circuitry by using actuators powered wirelessly from the environment. This research extended the basic knowledge of methods required to power Micro-Electro-Mechanical Systems (MEMS) devices and reduce MEMS microrobot size. This research demonstrated optothermal actuators designed for use in a wirelessly propelled autonomous MEMS microrobot, without the need of an onboard power supply, through the use of lasers to directly power micrometer scale silicon thermal actuators. Optothermal actuators, intended for use on a small MEMS microrobot, were modeled, designed, fabricated and tested, using the PolyMUMPs silicon-metal chip fabrication process. Prototype design of a MEMS polysilicon-based microrobot, using optothermal actuators, was designed, fabricated and tested. Each of its parts was demonstrated to provide actuation using energy from an external laser. The optothermal actuators provided 2 m of deflection to the microrobot drive shaft, with 60 mW of pulsed laser power. The results of these experiments demonstrated the validity of a new class of wireless silicon actuators for MEMS devices, which are not directly dependant on electrical power for actuation.

DTIC

Actuators; Autonomy; Lasers; Microelectromechanical Systems; Robotics

20040170648 State Univ. of New York, Buffalo, NY

Terahertz Time Domain Spectroscopy of Conformational Dynamics of Sensor Proteins: Basic Research and Pathogen Sensor Development

Markelz, Andrea G.; Aug. 31, 2004; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-02-1-0271

Report No.(s): AD-A426482; ARO-44005.1-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

We report on the research funded in part by this ARO grant towards developing an all-optical terahertz biosensor. This program is motivated by the need for fast and adaptable biosensors that do not require probe labeling. Our sensors are based on an intrinsic change in the probe molecule's physical characteristics upon target binding, namely the THz absorption. The proposed sensor consists of a compact THz spectroscopy system based on electro-optic imaging of a sample matrix. The sample matrix made from xerogel would have defined regions of probe molecules as well as regions for referencing. This sample substrate would allow for both high THz optical density and easy access of airborne targets to bind to the embedded probe molecules. The stated goals in the original proposal for this first funding period were as follows: (1) spectral benchmarking of probes: free and complexed focusing on benign targets to establish sample protocols, (2) initial xerogel array development and(3) initial construction of EO imaging system. All three of these initial goals have been achieved. We will discuss spectral benchmarking for lysozymelN-acetylglucosamine, anti- lysozymellysozyme, deoxy cytochrome doxygen and deoxy myoglobinloxygen binding. We will also present our xerogel characterization as a function of hydration. In all cases we see a significant change in the THz absorbance with ligand binding, supporting the suggested strategy of using THz absorbance as a labeless method of biodetection. In the coming year we will attempt to print a xerogel with different proteins and then expose the gel to aerosols of target molecules to determine binding efficiency for this sample prep. We will attempt to detect the binding both with standard THz spectroscopy as well as using THz imaging.

DTIC

Biological Effects; Detection; Pathogens; Research; Spectroscopy

20040170683 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Electrostatic Radio Frequency (RF) Microelectromechanical Systems (MEMS) switches With Metal Alloy Electric Contacts

Coutu, Ronald A.; Sep. 2004; 197 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426649; AFIT/DS/ENG/04-05; No Copyright; Avail: Defense Technical Information Center (DTIC)

RF MEMS switches are paramount in importance for improving current and enabling future USAF RF systems. Electrostatic micro-switches are ideal for RF applications because of their superior performance and low power consumption. The primary failure mechanisms for micro-switches with gold contacts are becoming stuck closed and increased contact

resistance with increasing switch cycles. This dissertation reports on the design, fabrication, and testing of micro-switches with sputtered bi-metallic (i.e., gold (Au)- on-Au-(6.3at%) platinum (Pt)), binary alloy (i.e., Au-(3. 7at%)palladium (Pd) and Au-(6.3at%)Pt) , and ternary alloy (i. e., Au-(5at%)Pt-(0.5at%)copper (Cu)) contact metals. Performance was evaluated, in-part, using measured contact resistance and lifetime results. The micro-switches with bi- metallic and binary alloy contacts exhibited contact resistance between 1 - 2 ohms and, when compared to micro- switches with sputtered gold contacts, showed an increase in lifetime. The micro-switches with tertiary alloy contacts showed contact resistance between 0. 2-1.8 and also showed increased lifetime. Overall, the results presented in this dissertation indicate that micro-switches with gold alloy electric contacts exhibit increased lifetimes in exchange for a small increase in contact resistance.
DTIC
Electric Contacts; Electrostatics; Microelectromechanical Systems; Radio Frequencies; Switches

20040170700 Army Research Lab., Aberdeen Proving Ground, MD
Ba1xSrxTiO3 Based Thin Films for Next Generation Devices
Ngo, Eric; Nothwang, William d.; Hubbard, Clifford; Hirsch, Samuel; Cole, Melaine W.; Sep. 2004; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-AH84
Report No.(s): AD-A426708; ARL-TN-228; No Copyright; Avail: CASI; A03, Hardcopy

Over the past several years. there has been a tremendous growth and development of thin film deposition technology in the electronics industry. Ferroelectric thin films have been recognized for their unique dielectric properties and appear to be desirable for tunable microwave device applications. Among the most promising candidates for such applications are Ba(1-x)Sr(x)TiO(3) (BST) and BST-based thin films. In this work, pure BST and acceptor doped BST- based thin films were fabricated on (100) MgO substrates via pulsed laser deposition. X-ray diffraction. in conjunction with the atomic force microscope. was used to analyze the film crystallinity and surface morphology. The dielectric properties were characterized at both 100 kHz and 20 GHz. The metal-insulator-metal capacitor configuration was used to attain the dielectric properties at 100 kHz, and the microwave measurements, $11 reflection parameters. were achieved via interdigitated capacitor design with Au/Ag top electrodes. The parallel resistor-capacitor models were used to determine the microwave capacitance and Q factors, and the permittivity was calculated using a modified conformal-mapping partial- capacitance method using the dimension of the capacitors. Our results demonstrated that the low frequency and microwave frequency dielectric properties were strongly influenced by the film composition. Specifically. the Mg doping served to lower the dissipation factor. permittivity. and tunability of the BST based films at both frequencies. This work demonstrates that the BST based thin films possessed excellent microstructural. structural. and dielectric properties. The structure-process-property correlations of the pulsed laser deposited BST and acceptor doped BST-based thin films are discussed in detail.
DTIC
Ferroelectric Materials; Microwave Equipment; Thin Films

20040170744 University of Southern California, Marina del Rey, CA
RATS: Reactive Architectures
Christensen, Marc; Kiamelev, Fouad; Haney, Michael; Kuznia, Charlie; Crago, Stephen; Sep. 2004; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-1-0511; DARPA ORDER-J897; Proj-JRAT
Report No.(s): AD-A426807; AFRL-IF-RS-TR-2004-250; No Copyright; Avail: CASI; A04, Hardcopy

This project had two goals: To build an emulation prototype board for a tiled architecture and to demonstrate the utility of a global inter-chip free-space photonic interconnection fabric for polymorphous computer architectures (PCA). The free-space optics part of the project focused on two critical issues to validate the use of ultra-high-capacity global free- space interconnection fabrics for polymorphous computing architectures. These issues fell into the categories of interface issues and internal switch issues. The VCSEL- based free-space optical system was shown to be tolerant of misalignments, although electrical packaging problems prevented a full-performance demonstration. The optical links for the free-space system were demonstrated at 2.5 Gbps each with an inter-chip distance of about 10 cm. The project successfully demonstrated an optical inter-board fiber-based interconnect and intra-board free-space interconnect. The project also developed a prototype board that was demonstrated with an emulator of a tiled architecture.
DTIC
Photonics; Reactivity

20040170774 Army Research Lab., Adelphi, MD

Microelectromechanical System Pressure Sensor for Projectile Applications

Zakar, Eugene; Sep. 2004; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426855; ARL-TR-3323; No Copyright; Avail: CASI; A03, Hardcopy

A miniaturized high pressure sensor for cannon- launched munitions was fabricated, based on microelectromechanical system (MEMS) technology. It uses a 0.5 microns thin film of lead zirconate titanate (PZT) material for producing an electrical charge that is directly proportional to the pressure. The sensor was mounted on a customized stainless steel housing, placed into a high pressure vessel, and tested to a maximum pressure of 40,000 psi. The shape and configuration of the platinum (Pt)/PZT/Pt layered structure has been redesigned to reduce the complexity of wire interconnections and to increase the charge output of the device.

DTIC

Microelectromechanical Systems; Microinstrumentation; Pressure Measurement; Pressure Sensors; Projectiles; Sensors

20040171132 Jacobs Sverdrup Technology, Inc., Huntsville, AL, USA

Microtechnology in Space: NASA's Lab-on-a-Chip Applications Development Program

Monaco, Lisa; Spearing, Scott; Jenkins, Andy; Symonds, Wes; Mayer, Derek; Wainwright, Norm; Fries, Marc; Maule, Jake; Toporski, Jan, et al.; [2004]; 1 pp.; In English; 11th Annual International Congress Chips to Hits, 19-23 Sep. 2004, Boston, MA, USA; Copyright; Avail: Other Sources; Abstract Only

NASA's Marshall Space Flight Center (MSFC) Lab on a Chip Application Development (LOCAD) team has worked with microfluidic technology for the past few years in an effort to support NASA's Mission. In that time, such microfluidic based Lab-on-a-Chip (LOC) systems have become common technology in clinical and diagnostic laboratories. The approach is most attractive due to its highly miniaturized platform and ability to perform reagent handling (i.e., dilution, mixing, separation) and diagnostics for multiple reactions in an integrated fashion. LOCAD, along with Caliper Life Sciences has successfully developed the first LOC device for macromolecular crystallization using a workstation acquired specifically for designing custom chips, the Caliper 42. LOCAD uses this, along with a novel MSFC-designed and built workstation for microfluidic development. The team has a cadre of LOC devices that can be used to perform initial feasibility testing to determine the efficacy of the LOC approach for a specific application. Once applicability has been established, the LOCAD team, along with the Army's Aviation and Missile Command microfabrication facility, can then begin to custom design and fabricate a device per the user's specifications. This presentation will highlight the LOCAD team's proven and unique expertise that has been utilized to provide end to end capabilities associated with applying microfluidics for applications that include robotic life detection instrumentation, crew health monitoring and microbial and environmental monitoring for human Exploration.

Author

NASA Programs; Microfluidic Devices; Technology Utilization; Miniaturization; Fabrication; Chips (Electronics); Airborne Equipment

20040171168

Testing of Environmental Satellite Bus-Instrument Interfaces Using Engineering Models

Gagnier, Don; Hayner, Rick; Roza, Michael; Nosek, Thomas; Razzaghi, Andrea; [2004]; 2 pp.; In English; AIAA Space 2004 Conference and Exposition, 28-30 Sep. 2004, San Diego, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

This paper discusses the formulation and execution of a laboratory test of the electrical interfaces between multiple atmospheric science instruments and the spacecraft bus that carries them. The testing, performed in 2002, used engineering models of the instruments that will be flown on the Aura s p a c m and of the Aura spacecraft bus electronics. Aura is one of NASA's Earth Observing System @OS) Program missions managed by the Goddard Space Flight Center. The test was designed to evaluate the complex interfaces in the spacecraft and instrument command and data handling (C&DH) subsystems prior to integration of the complete flight instruments on the spacecraft. A problem discovered during (and not before) the flight hardware integration phase can cause significant cost and schedule impacts. The testing successfully surfaced problems and led to their resolution before the full-up integration phase, saving significant cost and schedule time. This approach could be used on future environmental satellite programs involving multiple, complex scientific instruments being integrated onto a bus.

Author

Spacecraft Instruments; Satellite Instruments; Bus Conductors

20040171177 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Current Single Event Effects Results for Candidate Spacecraft Electronics for NASA

OBryan, Martha V.; Seidleck, Christina M.; Carts, Martin A.; LaBel, Kenneth A.; Marshall, Cheryl J.; Reed, Robert A.; Sanders, Anthony B.; Hawkins, Donald K.; Cox, Stephen R.; Kniffin, Scott D., et al.; [2004]; 8 pp.; In English; 2004 IEEE Nuclear and Space Radiation Effects Conference, 19-23 Jul. 2004, Atlanta, GA, USA

Contract(s)/Grant(s): DTRA-IACRO-03-40351; DTRA-IACRO-04-40641; Copyright; Avail: CASI; A02, Hardcopy

We present data on the vulnerability of a variety of candidate spacecraft electronics to proton and heavy ion induced single event effects. Devices tested include digital, analog, linear bipolar, and hybrid devices, among others.

Author

Spacecraft Electronic Equipment; Single Event Upsets; Vulnerability; Electronic Equipment Tests

20040171246 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Printed Circuit Board Design with HDL Designer

Winkert, Thomas K.; LaFourcade, Teresa; [2004]; 8 pp.; In English; MARLUG (Mid-Atlantic Region Local Users Group), 5 Oct. 2004, Laurel, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy

Staying up to date with the latest CAD tools both from a cost and time perspective is difficult. Within a given organization there may be experts in Printed Circuit Board Design tools and experts in FPGA/VHDL tools. Wouldn't it be great to have someone familiar with HDL Designer be able to design PCBs without having to learn another tool? This paper describes a limited experiment to do this.

Author

Circuit Boards; Field-Programmable Gate Arrays; Hardware Description Languages; Printed Circuits; Systems Engineering; Vhsic (Circuits)

20040171281 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Radio Frequency Interference (RFI) in Digital Microwave Radiometers

Piepmeier, Jeffrey R., et al.; June 30, 2004; 4 pp.; In English; International Geoscience and Remote Sensing Symposium (IGARSS) 2004, 2004 Sep. 2004, Anchorage, AK, Afghanistan

Contract(s)/Grant(s): WBS 258-70-20; No Copyright; Avail: CASI; A01, Hardcopy

Here we developed a model for determining the effects of narrowband RFI on low resolution digital correlators. Low resolution correlators rely on a theoretical inversion to obtain the input correlation coefficient from the digital output. This inversion is based on the Gaussian statistics of the input signals. In the presence of narrow-band interference, the statistics are not Gaussian and the theoretical inversion is no longer valid. The result is an error in the correlator output. We studied this phenomena for four correlator resolutions: 1, 1.5, 2, and 4 bits. The errors are significant for 1, 1.5, and 2-bit systems. We found in the presence of relatively strong interference (INR approximately greater than 0 dB) the errors can be ten's of percent. The error reduces to less than 0.03% for INR less than -16 dB. For the four-bit correlators, the errors are less than 0.03% for all cases studied. The error is also nonlinearly dependent upon input correlation coefficient.

Author

Digital Systems; Microwave Radiometers; Radio Frequency Interference; Mathematical Models

20040171285 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Pre-Hardware Optimization and Implementation Of Fast Optics Closed Control Loop Algorithms

Kizhner, Semion; Lyon, Richard G.; Herman, Jay R.; Abuhassan, Nader; [2004]; 8 pp.; In English; SPIE 2004 4th International Symposium on Remote Sensing of the Atmosphere, Ocean, Environment and Space, 8-12 Nov. 2004, Honolulu, HI, USA; No Copyright; Avail: CASI; A02, Hardcopy

One of the main heritage tools used in scientific and engineering data spectrum analysis is the Fourier Integral Transform and its high performance digital equivalent - the Fast Fourier Transform (FFT). The FFT is particularly useful in two-dimensional (2-D) image processing (FFT2) within optical systems control. However, timing constraints of a fast optics closed control loop would require a supercomputer to run the software implementation of the FFT2 and its inverse, as well as other image processing representative algorithm, such as numerical image folding and fringe feature extraction. A laboratory supercomputer is not always available even for ground operations and is not feasible for a night project. However, the computationally intensive algorithms still warrant alternative implementation using reconfigurable computing technologies (RC) such as Digital Signal Processors (DSP) and Field Programmable Gate Arrays (FPGA), which provide low cost compact super-computing capabilities. We present a new RC hardware implementation and utilization architecture that significantly

reduces the computational complexity of a few basic image-processing algorithm, such as FFT2, image folding and phase diversity for the NASA Solar Viewing Interferometer Prototype (SVIP) using a cluster of DSPs and FPGAs. The DSP cluster utilization architecture also assures avoidance of a single point of failure, while using commercially available hardware. This, combined with the control algorithms pre-hardware optimization, or the first time allows construction of image-based 800 Hertz (Hz) optics closed control loops on-board a spacecraft, based on the SVIP ground instrument. That spacecraft is the proposed Earth Atmosphere Solar Occultation Imager (EASI) to study greenhouse gases CO2, C2H, H2O, O3, O2, N2O from Lagrange-2 point in space. This paper provides an advanced insight into a new type of science capabilities for future space exploration missions based on on-board image processing for control and for robotics missions using vision sensors. It presents a top-level description of technologies required for the design and construction of SVIP and EASI and to advance the spatial-spectral imaging and large-scale space interferometry science and engineering.
Author
Algorithms; Feedback Control; Optimization; Reconfigurable Hardware; Optics

20040171451 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Quantifying Wrinkle Features of Thin Membrane Structures
Jacobson, Mindy B.; Iwasa, Takashi; Naton, M. C.; [2004]; 10 pp.; In English; CANEUS 2004, 1-5 Nov. 2004, Monterey, CA, USA; Copyright; Avail: CASI; A02, Hardcopy

For future micro-systems utilizing membrane based structures, quantified predictions of wrinkling behavior in terms of amplitude, angle and wavelength are needed to optimize the efficiency and integrity of such structures, as well as their associated control systems. For numerical analyses performed in the past, limitations on the accuracy of membrane distortion simulations have often been related to the assumptions made. This work demonstrates that critical assumptions include: effects of gravity, supposed initial or boundary conditions, and the type of element used to model the membrane. In this work, a 0.2 m x 02 m membrane is treated as a structural material with non-negligible bending stiffness. Finite element modeling is used to simulate wrinkling behavior due to a constant applied in-plane shear load. Membrane thickness, gravity effects, and initial imperfections with respect to flatness were varied in numerous nonlinear analysis cases. Significant findings include notable variations in wrinkle modes for thickness in the range of 50 microns to 1000 microns, which also depend on the presence of an applied gravity field. However, it is revealed that relationships between overall strain energy density and thickness for cases with differing initial conditions are independent of assumed initial conditions. In addition, analysis results indicate that the relationship between wrinkle amplitude scale (W/t) and structural scale (L/t) is independent of the nonlinear relationship between thickness and stiffness.
Author
Quantitative Analysis; Membrane Structures; Wrinkling; Mathematical Models

20040171469 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Effects of Heavy Ion Exposure on Nanocrystal Nonvolatile Memory
Oldham, Timothy R.; Suhail, Mohammed; Kuhn, Peter; Prinz, Erwin; Kim, Hak; LaBel, Kenneth A.; [2004]; 6 pp.; In English; Non-Volatile Memory Technology Symposium 2004, 15-17 Nov. 2004, Orlando, FL, USA; Copyright; Avail: CASI; A02, Hardcopy

We have irradiated engineering samples of Freescale 4M nonvolatile memories with heavy ions. They use Silicon nanocrystals as the storage element, rather than the more common floating gate. The irradiations were performed using the Texas A&M University cyclotron Single Event Effects Test Facility. The chips were tested in the static mode, and in the dynamic read mode, dynamic write (program) mode, and dynamic erase mode. All the errors observed appeared to be due to single, isolated bits, even in the program and erase modes. These errors appeared to be related to the micro-dose mechanism. All the errors corresponded to the loss of electrons from a programmed cell. The underlying physical mechanisms will be discussed in more detail later. There were no errors, which could be attributed to malfunctions of the control circuits. At the highest LET used in the test (85 MeV/mg/sq cm), however, there appeared to be a failure due to gate rupture. Failure analysis is being conducted to confirm this conclusion. There was no unambiguous evidence of latchup under any test conditions. Generally, the results on the nanocrystal technology compare favorably with results on currently available commercial floating gate technology, indicating that the technology is promising for future space applications, both civilian and military.
Author
Computer Storage Devices; Electronic Equipment Tests; Nanocrystals; Nanostructures (Devices); Radiation Effects

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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*.

20040161544 NASA Langley Research Center, Hampton, VA, USA
Velocity Vector Analysis of a Juncture Flow Using a Three-Component Laser Velocimeter
Meyers, James F.; Hepner, Timothy E.; [1984]; 19 pp.; In English; Second International Symposium on Applications of Laser Anemometry to Fluid Mechanics, 2-4 Jul. 1984, Lisbon, Portugal; No Copyright; Avail: CASI; A03, Hardcopy

A specialized single-axis, five-beam three-component laser velocimeter was constructed and used to study the flow field in a juncture. The juncture was defined by a blunt leading, edged vertical splitter plate and a sharp leading edged horizontal plate. The investigations were conducted in the Low Turbulence Pressure Tunnel at a Mach number of 0.1 and a Reynolds number of 2.2 x 10(exp 6) per meter over the model. The three-component velocity flow field in the juncture was measured, Reynolds stresses calculated and the velocity vector analysis performed.
Author
Laser Doppler Velocimeters; Leading Edges; Flow Velocity; Flow Distribution

20040170657 Army Research Lab., Aberdeen Proving Ground, MD
Multispecies Reacting Flow Model for the Plasma Efflux of an ETC Igniter-Application to an Open-Air-Plasma Jet Impinging on an Instrumented Plate
Nusca, Michael J.; Anderson, William R.; McQuaid, Michael J.; Aug. 2004; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426565; ARL-TR-3275; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Army Research Laboratory (ARL) is investigating the electrothermal-chemical (ETC) gun concept. As part of this program, ARL has undertaken a comprehensive study on the interaction of the plasma efflux from an ETC igniter with solid propellant grains. The goal of this work is to elucidate the physical, mechanical, and chemical mechanisms that underlie the observed ballistic effects in ETC guns that lead to performance gains. This report describes the first phase of the modeling effort in support of this plasma- propellant interaction project. A time-accurate computational fluid dynamics code is used that includes high-temperature thermodynamics, variable specific heats and transport properties (viscosity and thermal conductivity), and finite- rate (nonequilibrium) chemical kinetics. Validation of this code uses a series of experiments with an ETC igniter fired into open air, generating an unsteady flowfield in which an instrumented plate is placed. Computer simulations reveal important gas dynamic and chemical details of the plasma jet as the jet mixes with air and interacts with the plate, representing a unique model of the ETC plasmas.
DTIC
Air Jets; Efflux; Igniters; Impingement; Multiphase Flow; Plasmas (Physics); Reacting Flow

20040170672 Air Force Inst. of Tech., Wright-Patterson AFB, OH
A Study of a Skirtless Hovercraft Design
Kelleher, Edward A.; May 2004; 70 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426596; AFIT/GAE/ENY/04-J05; No Copyright; Avail: Defense Technical Information Center (DTIC)

Initial study into three possible skirtless hovercraft designs. The designs utilize Coanda nozzles and a Coanda wing surface to generate lift and create a pressure cushion below the craft. The pressure cushion is to be maintained by an air curtain created by flow spill from the Coanda wing surface. Three proposed skirtless hovercraft designs were analyzed via computational fluid dynamics to ascertain their lift generation capabilities. The three designs were adaptations from William Walter's hybricraft primer and his patent for a fan driven lift generation device. Each design featured Coanda nozzles, or nozzles that utilize the Coanda effect, to redirect air flow to aid in the generation of an air curtain around a central air flow. The designs also utilized a Coanda wing as a lifting body to aid in lift generation. Each design was set at a height above ground of one foot and a radius of two feet. The craft was assumed to be axisymmetric around a central axis for a perfectly circular craft, much like a flying saucer. The craft can be divided into several parts, the core, the nozzles, the plenum chamber (for designs 2 and 3), and the wing. Flow is generated from rotor blades situated one foot above the top of the core of the craft. The nozzles are located at the edges of the craft below the wing. In designs two and three the plenum chamber is the region between the core and the wing. For each design three cases were performed where t was increased for each case. This resulted in a total of nine cases, three cases for three designs. For each case the ratio of nozzle thickness to the radius of the curved

plate, t/R, was set to 0.344 and t was increased while R was calculated to maintain the ratio.
DTIC
Coanda Effect; Computational Fluid Dynamics; Ground Effect Machines

20040170680 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Aerodynamic Analysis of Lattice Grid Fins in Transonic Flow
Orthner, Karl S.; Jun. 2004; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426637; AFIT/GAE/ENY/04-J09; No Copyright; Avail: Defense Technical Information Center (DTIC)

Lattice grid fins have been studied for missile tail control for several years. A lattice grid fin can be described as an unconventional missile control surface comprised of an outer frame supported by an inner lattice grid of lifting surfaces. This unconventional fin design offers favorable lift characteristics at high angle of attack as well as almost zero hinge moments allowing the use of small and light actuators. In addition, they promise good storability for potential tube-launched and internal carriage dispenser- launched applications. The drawback for the lattice grid fins is the high drag and potentially poor radar cross section performance produced by this unconventional control surface configuration. Current research at the United State Air Force's Aeroballistic Research Facility (ARF) at Eglin Air Force Base in Florida has indicated there is a critical transonic Mach number where normal shock waves are believed to be present within some of the grid cells. At this particular Mach number, there is a dynamic instability with severe variations of the pitch moment coefficient. A computational fluid dynamics (CFD) study was conducted to investigate these findings and elucidate the flowfield in the grid fin region. The missile model was numerically modeled in Gridgen and computational tests were run in Fluent. Finally, another fin configuration was developed that produced less drag and similar dynamic stability that the other lattice grid fin configurations tested.
DTIC
Aerodynamic Characteristics; Aerodynamics; Design Analysis; Fins; Lattice Vibrations; Missiles; Transonic Flow

20040170800 American Univ., Beirut
Supersonic Turbulent Fuel-Air Mixing and Evaporation
Moukalled, Fadi; Oct. 20, 2003; 70 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8655-02-M4078
Report No.(s): AD-A426899; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report results from a contract tasking American University of Beirut as follows: The contractor will numerically investigate turbulent fuel- air mixing in a supersonic stream. The fuel injection angle will be varied from 0 to go degrees (relative to the air stream) and the air stream Mach number will be varied from 2 to 5. A finite volume pressure based method capable of modeling turbulent multi- phase flow at all speeds will be developed and used. The convergence rate will be accelerated using a full non-linear multi-grid method. The discretization will use a second order scheme for diffusion and a pseudo-third order bounded scheme for convection. Turbulence will be modeled using two-equation models (k-e. k-w, and SST) with suitable modifications to account for interaction between the phases. A comparison with available experimental and numerical results will be performed.
DTIC
Evaporation; Fuel Injection; Multiphase Flow; Numerical Analysis; Supersonic Flow; Turbulent Flow; Turbulent Mixing

20040170815 Army Engineer Research and Development Center, Vicksburg, MS
J. T. Myers Lock Outlet Study, Ohio River. Hydraulic Model Investigation
Hite, John E., Jr; Aug. 2004; 84 pp.; In English
Report No.(s): AD-A426934; ERDC/CHLTR-04-9; No Copyright; Avail: CASI; A05, Hardcopy

Navigation improvements are planned at J. T. Myers Locks and Dam on the Ohio River main stem. The existing project consists of a navigation dam a 1,200-ft-long by 110-ft- wide main lock chamber adjacent to a 600-ft-long by 110-ft- wide auxiliary lock chamber. One of the improvements includes developing a 1, 200-ft long lock chamber from the existing 600-ft-long lock chamber. The outlet design proposed for the filling and emptying system in the extended lock section was a manifold type diffuser located within the landside guide wall monolith and discharging toward the right (looking downstream) bank. A landside diffuser would help minimize closure of the main lock during construction of the lock extension. A 1:25- scale model was used to evaluate the outlet design. Modifications to the original design were made to improve the hydraulic conditions at the outlet. The vanes in the original design outlet were angled down-stream to direct the jets away from the right bank. This design was the type 2 outlet diffuser. A stilling basin with two rows of baffle blocks and an end sill was developed to help dissipate the energy of the outlet discharge and reduce the potential for scour. The banks were also reshaped to direct

the outlet flow downstream. The size riprap required to protect the area surrounding the outlet was determined. Hawser forces were also measured on tows moored at various locations in the lower approach with solid and floating guide walls.
DTIC
Dams; Hydraulic Analogies; Rivers; Waterways

20040171065 Department of the Navy, Washington, DC
Multi-Hull Surface Vessel with Drag Reduction on Lateral Hulls
Philips, Richard B., Inventor; Feb. 9, 2004; 13 pp.; In English
Patent Info.: Filed 9 Feb. 2004; US-Patent-Appl-SN-10774642
Report No.(s): AD-D020147; No Copyright; Avail: Defense Technical Information Center (DTIC)

This patent application discloses a marine surface vessel having a main hull and at least two lateral hulls disposed respectively on opposite sides of the main hull. The vessel includes an engine disposed in the main hull producing exhaust gas and cooling air, microbubble injectors disposed in subsurface areas of each of the lateral hulls, and conduits in fluid communication with the microbubble injectors. Upon operation of the engine, the exhaust and/or cooling air produced by the engine is directed by the conduits to the injectors to effect generation of microbubbles on the subsurface areas of the lateral hulls to occasion microbubble drag reduction on the lateral hulls. (3 figures)
DTIC
Air Flow; Bubbles; Drag Reduction; Gas Flow; Hulls (Structures); Patent Applications; Ship Hulls; Surface Effect Ships

20040171084 Bettis Atomic Power Lab., West Mifflin, PA, USA
Two-Phase Flow Pressure Drop of High Quality Steam
Curtis, J. M.; Coffield, R. D.; 2004; In English
Report No.(s): DE2004-807253; No Copyright; Avail: National Technical Information Service (NTIS)

Two-phase pressure drop across a straight test pipe was experimentally determined for high Reynolds (Re) number steam flow for a flow quality range of 0.995 to 1.0. The testing described has been performed in order to reduce uncertainties associated with the effects of two-phase flow on pressure drop. Two-phase flow develops in steam piping because a small fraction of the steam flow condenses due to heat loss to the surroundings. There has been very limited two-phase pressure drop data in open literature for the tested flow quality range. The two-phase pressure drop data obtained in this test has enabled development of a correlation between friction factor, Reynolds number, and flow quality.
NTIS
Steam Flow; Two Phase Flow; Pipes (Tubes)

20040171210 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Performance of a Multi-Evaporator Loop Heat Pipe with Thermal Masses and Thermoelectric Coolers
Ku, Jen-Tung; Ottenstein, Laura; Birur, Gajanana; [2004]; 8 pp.; In English; 13th International Heat Pipe Conference, 21-25 Sep. 2004, Shanghai, China; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes thermal performance of a loop heat pipe (LHP) with two evaporators and two condensers in ambient testing. Each evaporator has an outer diameter of 15mm and a length of 76mm, and has an integral compensation chamber (CC). An aluminum mass of 500 grams is attached to each evaporator to simulate the instrument mass. A thermoelectric cooler (TEC) is installed on each CC to provide heating as well as cooling for CC temperature control. A flow regulator is installed in the condenser section to prevent vapor from going back to the evaporators in the event that one of the condensers is fully utilized. Ammonia was used as the working fluid. Tests conducted included start-up, power cycle, heat load sharing, sink temperature cycle, operating temperature control with TECs, and capillary limit tests. Experimental data showed that the loop could start with a heat load of less than 10W even with added thermal masses. The loop operated stably with even and uneven evaporator heat loads, and even and uneven condenser sink temperatures. The operating temperature could be controlled within +/- 0.5K of the set point temperature using either or both TECs, and the required TEC control heater power was less than 2W under most test conditions. Heat load sharing between the two evaporators was also successfully demonstrated. The loop had a heat transport capability of 120W to 140W, and could recover from a dry-out when the heat load was reduced. The 500-gram aluminum mass on each evaporator had a negligible effect on the loop operation. Existing LHPs servicing orbiting spacecraft have a single evaporator with an outer diameter of about 25mm. Important performance characteristics demonstrated by this LHP included: 1) Operation of an LHP with 15mm diameter evaporators; 2) Robustness and reliability of an LHP with multiple evaporators and multiple condensers under various test conditions; 3) Heat load sharing among LHP

evaporators; 4) Effectiveness of TECs in controlling the LHP operating temperature; and 5) Effectiveness of the flow regulator in preventing vapor from going back the evaporators.
Author
Temperature Effects; Temperature Control; Heat Pipes; Evaporators; Thermoelectricity; Coolers; Loops

20040171362 Texas A&M Univ., College Station, TX, USA
Preferred Waterflood Management Practices for the Spraberry Trend Area
Schechter, D. S.; Mar. 01, 2002; In English
Report No.(s): DE2004-824684; No Copyright; Avail: National Technical Information Service (NTIS)
The objective of this project is to significantly increase field-wide production in the Spraberry Trend in a short time frame by application of preferred practices for managing and optimizing water injection. A secondary and synergistic objective is purification and injection of produced water into Spraberry reservoirs.
NTIS
Water Injection; Reservoirs

20040171371 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Radiation Shielding Calculations for MuCool Test Area at Fermilab
Rakhno, I.; Johnstone, C.; May 2004; In English
Report No.(s): DE2004-824355; FERMILAB-TM-2248; No Copyright; Avail: National Technical Information Service (NTIS)
The MuCool Test Area (MTA) is an intense primary beam facility derived directly from the Fermilab Linac to test heat deposition and other technical concerns associated with the liquid hydrogen targets being developed for cooling intense muon beams. In this shielding study the results of Monte Carlo radiation shielding calculations performed using the MARS14 code for the MuCool Test Area and including the downstream portion of the target hall and berm around it, access pit, service building, and parking lot are presented and discussed within the context of the proposed MTA experimental configuration.
NTIS
Radiation Shielding; Targets; Muons

20040171425 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Method of Generating Transient Equivalent Sink and Test Target Temperatures for Swift BAT
Choi, Michael K.; [2004]; 8 pp.; In English; 2nd International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A02, Hardcopy
The NASA Swift mission has a 600-km altitude and a 22 degrees maximum inclination. The sun angle varies from 45 degrees to 180 degrees in normal operation. As a result, environmental heat fluxes absorbed by the Burst Alert Telescope (BAT) radiator and loop heat pipe (LHP) compensation chambers (CCs) vary transiently. Therefore the equivalent sink temperatures for the radiator and CCs varies transiently. In thermal performance verification testing in vacuum, the radiator and CCs radiated heat to sink targets. This paper presents an analytical technique for generating orbit transient equivalent sink temperatures and a technique for generating transient sink target temperatures for the radiator and LHP CCs. Using these techniques, transient target temperatures for the radiator and LHP CCs were generated for three thermal environmental cases: worst hot case, worst cold case, and cooldown and warmup between worst hot case in sunlight and worst cold case in the eclipse, and three different heat transport values: 128 W, 255 W, and 382 W. The 128 W case assumed that the two LHPs transport 255 W equally to the radiator. The 255 W case assumed that one LHP fails so that the remaining LHP transports all the waste heat from the detector array to the radiator. The 382 W case assumed that one LHP fails so that the remaining LHP transports all the waste heat from the detector array to the radiator, and has a 50% design margin. All these transient target temperatures were successfully implemented in the engineering test unit (ETU) LHP and flight LHP thermal performance verification tests in vacuum.
Author
Telescopes; Heat Sinks; Radiators; Temperature Control

20040171444 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Vacuum/Balance Test Results of Swift BAT with Loop Heat Pipe Thermal System
Choi, Michael K.; [2004]; 11 pp.; In English; 2nd International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A03, Hardcopy
The Swift Burst Alert Telescope (BAT) Detector Array is thermally well coupled to eight constant conductance heat pipes

(CCHPs) embedded in the Detector Array Plate PAP), and two loop heat pipes (LHPs) transport heat from the CCHPs to a radiator. The CCHPs have ammonia as the working fluid and the LHPs have propylene as the working fluid. Precision heater controllers, which have adjustable set points in flight, are used to control the LHP compensation chamber and Detector Array xA1 ASIC temperatures. The radiator has AZ-Tek's AZW-LA-II low solar absorptance white paint as the thermal coating, and is located on the anti-sun side of the spacecraft. A thermal balance (T/B) test on the BAT was successfully completed. It validated that the thermal design satisfies the temperature requirements of the BAT in the flight thermal environments. Instrument level and observatory level thermal vacuum (TN) cycling tests of the BAT Detector Array by using the LHP thermal system were successfully completed. This paper presents the results of the T/B test and T N cycling tests.
Author
Thermal Vacuum Tests; Balance; Heat Pipes; Conductive Heat Transfer

20040171485 NASA Glenn Research Center, Cleveland, OH, USA
Micro-Scale Regenerative Heat Exchanger
Moran, Matthew E.; Stelter, Stephan; Stelter, Manfred; October 2004; 13 pp.; In English; Canada-Europe-USA-Asia (CANEUS) 2004 Conferece on Micro-Nano-Technologies for Aerospace Applications, 30 Oct. - 5 Nov. 2004, Monterey, CA, USA
Contract(s)/Grant(s): WBS 319-20-X1
Report No.(s): NASA/TM-2004-213353; AIAA Paper 2004-6730; E-114821; No Copyright; Avail: CASI; A03, Hardcopy

A micro-scale regenerative heat exchanger has been designed, optimized and fabricated for use in a micro-Stirling device. Novel design and fabrication techniques enabled the minimization of axial heat conduction losses and pressure drop, while maximizing thermal regenerative performance. The fabricated prototype is comprised of ten separate assembled layers of alternating metal-dielectric composite. Each layer is offset to minimize conduction losses and maximize heat transfer by boundary layer disruption. A grating pattern of 100 micron square non-contiguous flow passages were formed with a nominal 20 micron wall thickness, and an overall assembled ten-layer thickness of 900 microns. Application of the micro heat exchanger is envisioned in the areas of micro-refrigerators/coolers, micropower devices, and micro-fluidic devices.
Author
Heat Exchangers; Design Analysis; Fabrication; Refrigerators; Conductive Heat Transfer

20040171548 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Rapid Turnaround Cryogenic Detector Characterization System
Benford, Dominic j.; Dipirro, Michael J.; Forgione, Joshua B.; Jackson, Clifton E.; Jackson, Michael L.; Kogut, Al; Moseley, S. Harvey; Shirron, Peter J.; [2004]; 3 pp.; In English; Millimeter and Sumillimeter Detectors, 21-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

Upcoming major NASA missions such as the Einstein Inflation Probe and the Single Aperture Far-Infrared Observatory require arrays of detectors with thousands of elements, operating at temperatures near l00 mK and sensitive to wavelengths from approx. 100 microns to approx. 3 mm. Such detectors represent a substantial enabling technology for these missions, and must be demonstrated soon in order for them to proceed. In order to make rapid progress on detector development, the cryogenic testing cycle must be made convenient and quick. We have developed a cryogenic detector characterization system capable of testing superconducting detector arrays in formats up to 8 x 32, read out by SQUID multiplexers. The system relies on the cooling of a two-stage adiabatic demagnetization refrigerator immersed in a liquid helium bath. This approach permits a detector to be cooled from 300K to 50 mK in about 4 hours, so that a test cycle begun in the morning will be over by the end of the day. Tine system is modular, with two identical immersible units, so that while one unit is cooling, the second can be reconfigured for the next battery of tests. We describe the design, construction, and performance of this cryogenic detector testing facility.
Author
Cryogenics; Detectors; Sensitivity; Operating Temperature

20040171563 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Investigation of Enhanced Surface Spray Cooling
Silk, Eric A.; Kim, Jungho; Kiger, Ken; [2004]; 6 pp.; In English; Proceedings of IMECE2004: ASME International Mechanical Engineering Congress, 13-19 Nov. 2004, Anaheim, CA, USA
Contract(s)/Grant(s): N00014-04-10314
Report No.(s): IMECE2004-61753; Copyright; Avail: Other Sources

Experiments were conducted to study the effects of enhanced surfaces on heat transfer during spray cooling. The surface enhancements consisted of cubic pin fins, pyramids, and straight fins (uniform cross sectional straight fins) machined on the top surface of copper heater blocks. Each had a cross-sectional area of 2.0 square cm. Measurements were also obtained on a heater block with a flat surface for baseline comparison purposes. A 2x2 nozzle array was used with PF-5060 as the working fluid. Thermal performance data was obtained under nominally degassed (chamber pressure of 41.4 kPa) and gassy conditions (chamber with N2 gas at 101 kPa). The results show that the straight fins had the largest enhancement in heat flow. Critical heat flux (CHF) for this surface showed an increase of 55% in comparison to the flat surface for the nominally degassed condition. The cubic pin finned and pyramid surfaces provided slightly more than half the heat flux enhancement (30% - 40% greater than the flat surface) of the straight fins. The gassy case showed that the straight fins again provided the largest enhancement (48%) in CHF relative to the flat surface. This was followed by the cubic pin fins, and pyramids which had increases of 31% and 18% respectively. No significant effect was observed in the surface temperature at which CHF occurs for either portion of the study.
Author
Finned Bodies; Heat Transfer; Surface Cooling; Heat Exchangers; Cooling Fins

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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*.

20040170455 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Analytical Calibration Approach for the Polarimetric Airborne C Band Radiometer
Pham, Hanh; Kim, Edward J.; [2004]; 4 pp.; In English; IGARSS 2004, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: CASI; A01, Hardcopy

Passive microwave remote sensing is sensitive to the quantity and distribution of water in soil and vegetation. During summer 2000, the Microwave Geophysics Group at the University of Michigan conducted the 7th Radiobrightness Energy Balance Experiment (REBEX-7) over a corn canopy in Michigan. Long time series of brightness temperatures, soil moisture and micrometeorology on the plot scale were taken. This paper addresses the calibration of the NASA GSFC polarimetric airborne C band microwave radiometer (ACMR) that participated in REBEX-7. Passive polarimeters are typically calibrated using an end-to-end approach based upon a standard artificial target or a well-known geophysical target. Analyzing the major internal functional subsystems offers a different perspective. The primary goal of this approach is to provide a transfer function that not only describes the system in its entirety but also accounts for the contributions of each subsystem toward the final modified Stokes parameters. This approach also serves as a realistic instrument simulator, a useful tool for future designs. The ACMR architecture can be partitioned into several functional subsystems. Each subsystem was extensively measured and the estimated parameters were imported into the overall system model. We will present the results of polarimetric antenna measurements, the instrument model as well as four Stokes observations from REBEX-7 using a first order inversion.
Author
Airborne Equipment; Microwave Radiometers; Remote Sensing; C Band; Calibrating; Polarimetry; Mathematical Models

20040170662 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Forward Looking Radar: Interference Modelling, Characterization, and Suppression
Caldwell, James T.; Mar. 2004; 112 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426574; AFIT/GE/ENG/04-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research characterizes forward looking radar performance while noting differences with traditionally examined sidelooking radar. The target detection problem for forward looking radar is extremely difficult due to the severe, heterogeneous and range dependent ground clutter. Consequently, forward looking radar detection represents an important but overlooked topic because of the increased difficulty compared to sidelooking radar. This void must be filled since most fighter aircraft use forward looking radar, making this topic intensely interesting to the Air Force. After characterizing forward looking radar performance, basic radar concepts along with advanced adaptive interference suppression techniques improve the output Signal-to- Interference-plus-Noise Ratio (SINR) and target detection rates using fixed false alarm for linear arrays. However, target detection probabilities and output SINR do not improve enough. Although the methods considered are adaptive in azimuth and Doppler, effective range ambiguous clutter mitigation requires elevation adaptivity, a feature not

offered by linear arrays. The research continues by examining planar arrays. Elevation adaptivity combined with azimuth and Doppler adaptivity allows suppressing range ambiguous clutter and significantly increasing output SINR, detection probability, and maximum detection range. Specifically, three- dimensional Space-Time Adaptive Processing (3D STAP) techniques with adaptivity in elevation, azimuth, and Doppler achieve detection probability improvements of over 10 dB in required input SINR compared to two-dimensional (2D) STAP processing. Additionally, 3D STAP improves detection probability versus input SINR curves over 30 dB when compared to 2D conventional processing techniques. As a result, forward looking radars using 3D STAP have the capacity to detect targets that conventio
DTIC
Characterization

20040170670 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Controlling the Primary Mirror in a Space-Based Telescope Utilizing an Eigenstructure Assignment Technique
Kyongsoo, Kim; Mar. 2004; 103 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426592; AFIT/GAE/ENY/04-M10; No Copyright; Avail: Defense Technical Information Center (DTIC)

The feasibility of using a sparse array of mirrors in a satellite system is being evaluated. This study focuse; on the control laws necessary for achieving the minimization of the effect of vibration which happens at the primary mirror of the satellite, by using the eigenstructure assignment technique. White Gaussian noise was assumed as the external input. AFRL has developed a 79 state model with 9 control inputs and 9 outputs, 3 sparse array mirrors, and a base. To extend the theory, a simplified model with 2 mirrors and a base which has 12 states, 4 control inputs and 8 outputs was developed. The system is not completely controllable nor observable because there are 4 rigid body modes. The control law starts from realizing the states which are controllable or uncontrollable. Then only for the controllable states, the eigenstructure assignment technique is applied. The closed- loop eigenstructure was determined by analyzing the open-loop modes. To find the best value for the eigenstructure, Newton's line search method was applied. The relative motions of the primary and secondary mirrors were described by wave reflection dynamics. Results show that this technique achieves a reasonable amount of control use for the objective and relates these result to those obtained from linear quadratic regulator (LQR) technique.
DTIC
Mirrors; Telescopes

20040170705 International Society for Optical Engineering, Bellingham, WA
Tribute to Emil Wolf: Science and Engineering Legacy of Physical Optics
Jannson, Tomasz P.; Sep. 23, 2004; 507 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0241
Report No.(s): AD-A426727; PM139; ARO-45455.1-PH-CF; No Copyright; Avail: Defense Technical Information Center (DTIC)

An icon in the world of optics, Emil Wolf laid the foundations of contemporary physical optics by documenting the concept of spatial coherence before lasers were introduced. This powerful concept has influenced many areas of optical science and engineering, several of which are discussed in this book and are intended to pay homage to one of the great minds of physical optics. The material is presented by major experts in the field, many of them closely connected to Emil Wolfs Institute of Optics at University of Rochester.
DTIC
Infrared Lasers; Physical Optics

20040170718 Army Test and Evaluation Command, Aberdeen Proving Ground, MD
Standardized UXO Technology Demonstration Site Blind Grid scoring Record NO. 197
Overbay, Larry; Aug. 2004; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-DTC-8-CO-160-UXO-021
Report No.(s): AD-A426756; ATC-8771; No Copyright; Avail: CASI; A04, Hardcopy

This scoring record documents the efforts of Shaw, Inc. to detect and discriminate inert unexploded ordnance (UXO) utilizing the APG Standardized UXO Technology Demonstration Site Blind Grid. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental, Security Technology Certification Program, the

Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center.
DTIC
Ammunition; Ordnance; Scoring; Standardization; Target Recognition

20040170743 Army Test and Evaluation Command, Aberdeen Proving Ground, MD
Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 216
Overbay, Larry; Jul. 2004; 70 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-8-CO-160-UXO-021
Report No.(s): AD-A426804; ATC-8826; No Copyright; Avail: CASI; A04, Hardcopy

This scoring record documents the efforts of U.S. Army Corps of Engineers Engineering Research and Development Center (ERDC) to detect and discriminate inert unexploded ordnance (UXO) utilizing the YPG Standardized UXO Technology Demonstration Site Blind Grid. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental, Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center.
DTIC
Ammunition; Coordinates; Ordnance; Scoring; Standardization

20040170765 Systems View, Highlands Ranch, CO
Model Identification and Optimization for Operational Simulation
Popken, Douglas A.; Cox, Louis A.; Aug. 2004; 56 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-C-0167; Proj-459S
Report No.(s): AD-A426842; AFRL-IF-RS-TR-2004-237; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this research effort was to develop and test frameworks and algorithms for use in air warfare planning systems. Developing planning systems for this problem domain is particularly challenging due to their great complexity and uncertainty. The effort focused on predictive simulation models for generating potential outcomes of proposed operational plans. The planning process was organized as a hierarchy of decisions, with those at the top being broadest and longest term. The algorithms at the highest level of planning use a hill-climbing approach, wherein proposed Blue plans are evaluated, and the average marginal benefits of alternative force reallocations are computed. Evaluation and measurement of each proposed Blue plan is accomplished via a Stochastic Evaluator that draws multiple samples of potential outcomes and Red force levels for a given Blue force structure and a combined target composition. The evaluation metric is the net discounted value from enemy targets hit. Within the evaluator, linear programming and simulation generate optimized Red responses, assumed outcomes, and relative marginal force values. This project successfully demonstrated automated plan optimization, practical embedding of optimization algorithms into an operational planning cycle operating over a multi-period conflict, and use of hierarchical decisionmaking to decomposed planning and on-line optimization problems into computationally practical tasks.
DTIC
Simulation; Warfare

20040171080 Army Test and Evaluation Command, Aberdeen Proving Ground, MD
Standardized UXO Technology Demonstration Site
Overbay, Larry; Aug. 2004; 69 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-DTC-8-CO-160-UXO-021
Report No.(s): AD-A426875; ATC-8831; No Copyright; Avail: CASI; A04, Hardcopy

This scoring record documents the efforts of G-TEK Australia Pty united to detect and discriminate inert unexploded ordnance (UXO) utilizing the APG standardized UXO Technology Demonstration Site Blind Grid. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Center, and the U.S. Army Aberdeen Test Center.
DTIC
Ammunition; Ordnance; Standardization

20040171114 NASA Marshall Space Flight Center, Huntsville, AL, USA

Transient Torque Method: A Fast and Nonintrusive Technique to Simultaneously Determine Viscosity and Electrical Conductivity of Semiconducting and Metallic Melts

Li, C.; Ban, H.; Lin, B.; Scripa, R. N.; Su, C.-H.; Lehoczky, S. L.; Zhu, S.; Review of Scientific Instruments; September 2004; ISSN 0034-6748; Volume 75, No. 9, pp. 2810-2816; In English; Copyright; Avail: Other Sources

A transient torque method was developed to rapidly and simultaneously determine the viscosity and electrical conductivity of liquid metals and molten semiconductors. The experimental setup of the transient torque method is similar to that of the oscillation cup method. The melt sample is sealed inside a fused silica ampoule, and the ampoule is suspended by a long quartz fiber to form a torsional oscillation system. A rotating magnetic field is used to induce a rotating flow in the conductive melt, which causes the ampoule to rotate around its vertical axis. A sensitive angular detector is used to measure the deflection angle of the ampoule. Based on the transient behavior of the deflection angle as the rotating magnetic field is applied, the electrical conductivity and viscosity of the melt can be obtained simultaneously by numerically fitting the data to a set of governing equations. The transient torque viscometer was applied successfully to measure the viscosity and electrical conductivity of high purity mercury at 53.4 C. The results were in excellent agreement with published data. The method is nonintrusive; capable of rapid measurement of the viscosity of toxic, high vapor pressure melts at elevated temperatures. In addition, the transient torque viscometer can also be operated as an oscillation cup viscometer to measure just the viscosity of the melt or as a rotating magnetic field method to determine the electrical conductivity of a melt or a solid if desired.

Author

Torque; Viscometers; Electrical Resistivity; Nonintrusive Measurement; Mercury (Metal); Semiconductors (Materials)

20040171138 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Purpose of the Sensor Web

Schoeberl, Mark R.; [2004]; 1 pp.; In English; International Summer School on Atmosphere and Ocean Sciences, 19-24 Sep. 2004, L'Aquila, Italy; No Copyright; Avail: Other Sources; Abstract Only

The Sensor Web concept emerged as the number of Earth Science Satellites began to increase in the recent years. The idea, part of a vision for the future of earth science, was that the sensor systems would be linked in an active way to provide improved forecast capability. This means that a system that is nearly autonomous would need to be developed to allow the satellites to re-target and deploy assets for particular phenomena or provide on board processing for real time data. This talk will describe several elements of the sensor web.

Author

Earth Sciences; Sensors; Autonomy; Satellite Instruments

20040171175 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Navigator GPS Receiver for Fast Acquisition and Weak Signal Space Applications

Winternitz, Luke; Moreau, Michael; Boegner, Gregory J.; Sirotzky, Steve; [2004]; 7 pp.; In English; ION GNSS 2004, 2004, Long Beach, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy

NASA Goddard Space Flight Center (GSFC) is developing a new space-borne GPS receiver that can operate effectively in the full range of Earth orbiting missions from Low Earth Orbit (LEO) to geostationary and beyond. Navigator is designed to be a fully space flight qualified GPS receiver optimized for fast signal acquisition and weak signal tracking. The fast acquisition capabilities provide exceptional time to first fix performance (TIFF) with no a priori receiver state or GPS almanac information, even in the presence of high Doppler shifts present in LEO (or near perigee in highly eccentric orbits). The fast acquisition capability also makes it feasible to implement extended correlation intervals and therefore significantly reduce Navigator s acquisition threshold. This greatly improves GPS observability when the receiver is above the GPS constellation (and satellites must be tracked from the opposite side of the Earth) by providing at least 10 dB of increased acquisition sensitivity. Fast acquisition and weak signal tracking algorithms have been implemented and validated on a hardware development board. A fully functional version of the receiver, employing most of the flight parts, with integrated navigation software is expected by mid 2005. An ultimate goal of this project is to license the Navigator design to an industry partner who will then market the receiver as a commercial product.

Author

Global Positioning System; Signal Detection; Navigators; Receivers

20040171203 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Habitat Inspection Scanner, Bio-Structure Scanner, and In Situ Sub-Surface Composition Sensor

VanSteenberg, Michael; May 20, 2004; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The extension of dielectric and inductive spectroscopy into in situ observations represents a significant exploration-enabling tool. This technology can be widely applied from microscopic to macroscopic. Dielectrometry and inductometry can measure sub-surface composition and its distribution. The primary environment that we cannot easily explored is the sub-surface of solid bodies. Weather as part of our equipment that we bring with us, or the locations we are exploring. These fundamental questions lie at the core of the exploration Initiative. To answer them we must use a whole host of complimentary tools including those that allow us to practically examine the sub-surface environment. A nondestructive approach offers significant advantages for both the initial identification of likely samples but also the monitoring of ecosystems and crew health. These include materials characterization, nondestructive inspection, and process quality control, damage monitoring, and hidden object detection and identification. The identification of natural resources such as water on the Moon or Mars is of great importance to the utilization of local resource in the support of human exploration crews. On the macroscopic scale, the understanding of what resources are available and how they are distributed is of primary importance to their productive utilization. Even if initial explorations do not require the use of local resources to succeed, eventual settlement and commercial development will. The routine examination of the structural integrity (micro cracks, leaks) of hi.inafi habitats in harsh envkmments ww!d also be enabled.
Author
In Situ Measurement; Nonintrusive Measurement; Dielectrics; Spectroscopy

20040171205 NASA Goddard Space Flight Center, Greenbelt, MD, USA, Swales Aerospace, Beltsville, MD, USA
Wide Field Collimator 2 (WFC2) for GOES Imager and Sounder
Etemad, Shahriar; Bremer, James C.; Zukowski, Barbara J.; Pasquale, Bert A.; zukowski, Tmitri J.; Prince, Robert E.; O'Neill, Patrick A.; Ross, Robert W.; [2004]; 5 pp.; In English; SPIE International Symposiumon Optical Science and Technology Conference on Earth Observing Systems, 2-6 Aug. 2004, Denver, CO, USA
Contract(s)/Grant(s): NAS5-01090; No Copyright; Avail: CASI; A01, Hardcopy

Two of the GOES instruments, the Imager and the Sounder, perform scans of the Earth to provide a full disc picture of the Earth. To verify the entire scan process, an image of a target that covers an 18 deg. circular field-of-view is collimated and projected into the field of regard of each instrument. The Wide Field Collimator 2 (WFC2) has many advantages over its predecessor, WFC1, including lower thermal dissipation higher fir field MTF, smaller package, and a more intuitive (faster) focusing process. The illumination source is an LED array that emits in a narrow spectral band centered at 689 nm, within the visible spectral bands of the Imager and Sounder. The illumination level can be continuously adjusted electronically. Lower thermal dissipation eliminates the need for forced convection cooling and minimizes time to reach thermal stability. The lens system has been optimized for the illumination source spectral output and athernalized to remain in focus during bulk temperature changes within the laboratory environment. The MTF of the lens is higher than that of the WFC1 at the edge of FOV. The target is focused in three orthogonal motions, controlled by an ergonomic system that saves substantial time and produces a sharper focus. Key words: Collimator, GOES, Imager, Sounder, Projector
Author
Collimators; Field of View; Images; Projectors

20040171230 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Integrated Modeling Activities for the James Webb Space Telescope: Optical Jitter Analysis
Hyde, T. Tupper; Ha, Kong Q.; Johnston, John D.; Howard, Joseph M.; Mosier, Gary E.; [2004]; 13 pp.; In English; SPIE Conference on Astronomical Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: CASI; A03, Hardcopy

This is a continuation of a series of papers on the integrated modeling activities for the James Webb Space Telescope(JWST). Starting with the linear optical model discussed in part one, and using the optical sensitivities developed in part two, we now assess the optical image motion and wavefront errors from the structural dynamics. This is often referred to as 'jitter: analysis. The optical model is combined with the structural model and the control models to create a linear structural/optical/control model. The largest jitter is due to spacecraft reaction wheel assembly disturbances which are harmonic in nature and will excite spacecraft and telescope structural. The structural/optic response causes image quality degradation due to image motion (centroid error) as well as dynamic wavefront error. Jitter analysis results are used to predict imaging performance, improve the structural design, and evaluate the operational impact of the disturbance sources.
Author
Dynamic Structural Analysis; Optical Control; Performance Prediction; Mathematical Models

20040171231 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Integrated Modeling Activities for the James Webb Space Telescope: Structural-Thermal-Optical Analysis

Johnston, John D.; Howard, Joseph M.; Mosier, Gary E.; Parrish, Keith A.; McGinnis, Mark A.; Bluth, Marcel; Kim, Kevin; Ha, Kong Q.; [2004]; 11 pp.; In English; SPIE Astronomical Telescopes Meeting, 21-25 Jun. 2004, Glasgow, Scotland; Copyright; Avail: CASI; A03, Hardcopy

The James Web Space Telescope (JWST) is a large, infrared-optimized space telescope scheduled for launch in 2011. This is a continuation of a series of papers on modeling activities for JWST. The structural-thermal-optical, often referred to as STOP, analysis process is used to predict the effect of thermal distortion on optical performance. The benchmark STOP analysis for JWST assesses the effect of an observatory slew on wavefront error. Temperatures predicted using geometric and thermal math models are mapped to a structural finite element model in order to predict thermally induced deformations. Motions and deformations at optical surfaces are then input to optical models, and optical performance is predicted using either an optical ray trace or a linear optical analysis tool. In addition to baseline performance predictions, a process for performing sensitivity studies to assess modeling uncertainties is described.

Author

Mathematical Models; James Webb Space Telescope; Thermal Analysis; Structural Analysis; Optical Measurement

20040171244 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Antarctic Stratospheric Ozone from the Assimilation of Occultation Data

Stajner, Ivanka; Wargan, Krzysztof; [2004]; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

Ozone data from the solar occultation Polar Ozone and Aerosol Measurement (POAM) III instrument are included in the ozone assimilation system at NASA's Global Modeling and Assimilation Office, which uses Solar Backscatter UItraViolet/2 (SBUV/2) instrument data. Even though POAM data are available at only one latitude in the southern hemisphere on each day, their assimilation leads to more realistic ozone distribution throughout the Antarctic region, especially inside the polar vortex. Impacts of POAM data were evaluated by comparisons of assimilated ozone profiles with independent ozone sondes. Major improvements in ozone representation are seen in the Antarctic lower stratosphere during austral Winter and spring in 1998. Limitations of assimilation of sparse occultation data are illustrated by an example.

Author

Antarctic Regions; Occultation; Ozone; Stratosphere; Data Acquisition; Satellite-Borne Instruments

20040171254 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Note on the Effect of Horizontal Gradients for Nadir-Viewing Microwave and Infrared Sounders

Joiner, J.; Poli, P.; Quarterly Journal of the Royal Meteorological Society; 2004; Volume 128, pp. 1-10; In English; Copyright; Avail: CASI; A03, Hardcopy

Passive microwave and infrared nadir sounders such as the Advanced Microwave Sounding Unit A (AMSU-A) and the Atmospheric InfraRed Sounder (AIRS), both flying on NASA s EOS Aqua satellite, provide information about vertical temperature and humidity structure that is used in data assimilation systems for numerical weather prediction and climate applications. These instruments scan cross track so that at the satellite swath edges, the satellite zenith angles can reach approx. 60 deg. The emission path through the atmosphere as observed by the satellite is therefore slanted with respect to the satellite footprint s zenith. Although radiative transfer codes currently in use at operational centers use the appropriate satellite zenith angle to compute brightness temperature, the input atmospheric fields are those from the vertical profile above the center of the satellite footprint. If horizontal gradients are present in the atmospheric fields, the use of a vertical atmospheric profile may produce an error. This note attempts to quantify the effects of horizontal gradients on AIRS and AMSU-A channels by computing brightness temperatures with accurate slanted atmospheric profiles. We use slanted temperature, water vapor, and ozone fields from data assimilation systems. We compare the calculated slanted and vertical brightness temperatures with AIRS and AMSU-A observations. We show that the effects of horizontal gradients on these sounders are generally small and below instrument noise. However, there are cases where the effects are greater than the instrument noise and may produce erroneous increments in an assimilation system. The majority of the affected channels have weighting functions that peak in the upper troposphere (water vapor sensitive channels) and above (temperature sensitive channels) and are unlikely t o significantly impact tropospheric numerical weather prediction. However, the errors could be significant for other applications such as stratospheric analysis. Gradients in ozone and tropospheric temperature appear to be well captured by the analyses. In contrast, gradients in upper stratospheric and mesospheric temperature as well as upper tropospheric humidity are less well captured. This is likely due in part to a lack of data to specify these fields accurately in the analyses. Advanced new sounders, like AIRS, may help to better specify these fields in the future.

Author

Temperature Distribution; Vertical Distribution; Humidity; Atmospheric Temperature; Advanced Microwave Sounding Unit

20040171256 Remote Sensing Systems, Inc., Santa Rosa, CA, USA
Sensor Calibration and Ocean Products for TRMM Microwave Radiometer
Lawrence, Richard J., Technical Monitor; Wentz, Frank J.; October 28, 2003; 47 pp.; In English
Contract(s)/Grant(s): NAS5-00217
Report No.(s): RSS-TR-102803; No Copyright; Avail: CASI; A03, Hardcopy

During the three years of fundin& we have carefully corrected for two sensor/platform problems, developed a physically based retrieval algorithm to calculate SST, wind speed, water vapor, cloud liquid water and rain rates, validated these variables, and demonstrated that satellite microwave radiometers can provide very accurate SST retrievals through clouds. Prior to this, there was doubt by some scientists that the technique of microwave SST retrieval from satellites is a viable option. We think we have put these concerns to rest, and look forward to making microwave SSTs a standard component of the Earth science data sets. Our TMI SSTs were featured on several network news broadcasts and were reported in Science magazine. Additionally, we have developed a SST algorithm for VIRS to facilitate IR/MW inter-comparisons and completed research into diurnal cycles and air-sea interactions.
Derived from text
Calibrating; Sensors; Microwave Radiometers; Wind Velocity; Water Vapor

20040171303 NASA Goddard Space Flight Center, Greenbelt, MD, USA
JWST: A New Kind of Space Telescope
Keski-Kuha, Ritva; October 07, 2004; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Contents include the following: Why are the mirrors segmented? Why lightweight segmented mirrors? Why cold (cryogenic) mirrors? Why a space telescope? How did NASA go about developing the mirror technology to enable this? Why was beryllium selected for JWST s mirrors? How are the Beryllium mirrors made? What happens to the mirrors once they are complete?
Author
Spaceborne Telescopes; Segmented Mirrors

20040171317 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Microshutter Arrays for James Webb Space Telescope
Li, Mary J.; Acuna, Nadine; Beamesderfer, Michael; Ewin, Audrey; Fettig, Rainer; Franz, Dave; Hess, Larry; Hu, Ron; Kelly, Dan; King, Todd, et al.; [2004]; 1 pp.; In English; SPIE International Symposium Smart Materials, Nano and Micro-Smart Systems, 12-15 Dec. 2004, Sydney, Australia; No Copyright; Avail: Other Sources; Abstract Only

Two-dimensional MEMS microshutter arrays are being developed at NASA Goddard Space Flight Center for use in the near-infrared region on the James Webb Space Telescope (JWST). The microshutter arrays are designed for the selective transmission of light with high efficiency and high contrast. The JWST environment requires cryogenic operation at 35K. Microshutter arrays are fabricated out of silicon-oxide-insulated (SOI) silicon wafers. Arrays are close-packed silicon nitride membranes with a pixel size of 100x200 p. Individual shutters are patterned with a torsion flexure permitting shutters to open 90 degrees with a minimized mechanical stress concentration. The mechanical shutter arrays are fabricated using MEMS technologies. The processing includes a multi- layer metal deposition and patterning of shutter electrodes and magnetic pads, reactive ion etching (NE) of the front side to form shutters out of the nitride membrane, an anisotropic back-etch for wafer thinning, followed by a deep RIE (DRIE) back-etch down to the nitride shutter membrane to form W e s and relieve shutters from the silicon substrate. An additional metal deposition and patterning is used to form back electrodes. Shutters are actuated using a magnetic force and latched using an electrostatic force. . . . KEYWORDS: microshutter, MEMS, RIE, DRIE, micro-optics, near inbred, space telescope
Author
Microelectromechanical Systems; Two Dimensional Models; Shutters; Arrays; Light Transmission

20040171401 NASA Goddard Space Flight Center, Greenbelt, MD, USA
CHARMS: The Cryogenic, High-Accuracy Refraction Measuring System
Frey, Bradley; Leviton, Douglas; [2004]; 10 pp.; In English; SPIE Conference, 19-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: CASI; A02, Hardcopy

The success of numerous upcoming NASA infrared (IR) missions will rely critically on accurate knowledge of the IR refractive indices of their constituent optical components at design operating temperatures. To satisfy the demand for such data, we have built a Cryogenic, High-Accuracy Refraction Measuring System (CHARMS), which, for typical 1R materials.

can measure the index of refraction accurate to (+ or -) 5 x 10sup -3 . This versatile, one-of-a-kind facility can also measure refractive index over a wide range of wavelengths, from 0.105 um in the far-ultraviolet to 6 um in the IR, and over a wide range of temperatures, from 10 K to 100 degrees C, all with comparable accuracies. We first summarize the technical challenges we faced and engineering solutions we developed during the construction of CHARMS. Next we present our 'first light,' index of refraction data for fused silica and compare our data to previously published results.
Author
Refractometers; Accuracy

20040171422 Jacobs Sverdrup Technology, Inc., Huntsville, AL, USA
Microtechnology in Space: NASA's Lab-on-a-Chip Applications Development Program
Monaco, Lisa; Spearing, Scott; Jenkins, Andy; Symonds, Wes; Mayer, Derek; Gouldie, Edd; Wainwright, Norm; Fries, Marc; Maule, Jake; Toporski, Jan, et al.; [2004]; 12 pp.; In English; Chips to Hits 2004 Conference, 20-23 Sep. 2004, Boston, MA, USA
Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: CASI; A03, Hardcopy

NASA's Marshall Space Flight Center (MSFC) Lab on a Chip Application Development LOCAD) team has worked with microfluidic technology for the past few years in an effort to support NASA's Mission. In that time, such microfluidic based Lab-on-a-Chip (LOC) systems have become common technology in clinical and diagnostic laboratories. The approach is most attractive due to its highly miniaturized platform and ability to perform reagent handling (i-e., dilution, mixing, separation) and diagnostics for multiple reactions in an integrated fashion. LOCAD, along with Caliper Life Sciences has successfully developed the first LOC device for macromolecular crystallization using a workstation acquired specifically for designing custom chips, the Caliper 42. LOCAD uses this, along with a novel MSFC-designed and built workstation for microfluidic development. The team has a cadre of LOC devices that can be used to perform initial feasibility testing to determine the efficacy of the LOC approach for a specific application. Once applicability has been established, the LOCAD team, along with the Army's Aviation and Missile Command microfabrication facility, can then begin to custom design and fabricate a device per the user's specifications. This presentation will highlight the LOCAD team's proven and unique expertise that has been utilized to provide end to end capabilities associated with applying microfluidics for applications that include robotic life detection instrumentation, crew health monitoring and microbial and environmental monitoring for human Exploration.
Author
Miniaturization; Microfluidic Devices

20040171448 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Constellation-X Spectroscopy X-Ray Telescope
Petre, Robert; Content, David; Lehan, John; O'Dell, Stephen; Owens, Scott; Podgorsky, William; Stewart, Jeff; Zhang, William; [2004]; 10 pp.; In English; SPIE Meeting, 21-24 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: CASI; A02, Hardcopy

The status of technology development for the Constellation-X Spectroscopy X-ray Telescope (SXT) mirror is presented. The SXT mirror combines a large (1.6 m) aperture with modest (12 arc sec half power diameter) angular resolution and low mass (750 kg). The overall collecting area, larger than 9,600 square cm at 0.25 keV, requires high throughput, and thus nesting of a substantial number of thin reflectors. A phased development program is underway to develop reflectors, mounting and alignment approaches, and metrology techniques for components and the mirror has a whole. The latest results in all these areas are summarized, along with an overview of results of optical testing of reflector performance.
Author
Spectroscopy; X Ray Telescopes; NASA Space Programs; Segmented Mirrors

20040171450 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Photon Counting Detectors for the 1.0 - 2.0 Micron Wavelength Range
Krainak, Michael A.; [2004]; 7 pp.; In English; 2004 Earth Science Technology Conference, 22-24 Jun. 2004, Palo Alto, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy

We describe results on the development of greater than 200 micron diameter, single-element photon-counting detectors for the 1-2 micron wavelength range. The technical goals include quantum efficiency in the range 10-70%; detector diameter greater than 200 microns; dark count rate below 100 kilo counts-per-second (cps), and maximum count rate above 10 Mcps.
Author
Photons; Detectors; Wavelengths; Radiation Counters

20040171459 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Direct Measurement of Large, Diffuse, Optical Structures

Saif, Babak N.; Keski-Kuha, Ritva; Feinberg, Lee; Wyant, J. C.; Atkinson, C.; [2004]; 16 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Digital Speckle Pattern Interferometry (DSPI) is a well-established method for the measurement of diffuse objects in experimental mechanics. DSPIs are phase shifting interferometers. Three or four bucket temporal phase shifting algorithms are commonly used to provide phase shifting. These algorithms are sensitive to vibrations and can not be used to measure large optical structures far away from the interferometer. In this research a simultaneous phase shifted interferometer, PhaseCam product of 4D Technology Corporation in Tucson Arizona, is modified to be a Simultaneous phase shifted Digital Speckle Pattern Interferometer (SDSPI). Repeatability, dynamic range, and accuracy of the SDSPI are characterized by measuring a 5 cm x 5 cm carbon fiber coupon.

Author

Interferometers; Speckle Patterns; Digital Systems; Optical Measuring Instruments

20040171478 NASA Glenn Research Center, Cleveland, OH, USA

A Method of Estimating Low Turbulence Levels in Near Real Time Using Laser Anemometry

Goldman, Louis J.; Seasholtz, Richard G.; September 2004; 44 pp.; In English

Contract(s)/Grant(s): WBS 22-714-30-10

Report No.(s): NASA/TP-2004-212903; E-14326; No Copyright; Avail: CASI; A03, Hardcopy

Laser anemometry was used to make two independent measurements of the flow velocity by capturing individual Doppler signals with high-speed digitizing boards. The two independent measurements were cross-correlated to reduce the contribution of photo detector shot noise on the frequency determination and subsequently on the turbulence estimate. In addition, criteria were developed to eliminate 'bad' Doppler bursts from the data set, which then allowed reasonable low turbulence estimates to be made. The laser anemometer measurements were obtained at the inlet of an annular cascade and at the exit of a flow calibration nozzle and were compared with hot-wire data.

Author

Laser Anemometers; Low Turbulence

20040171501 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Asymmetric, Dual-Michelson Wavefront Corrector: High Precision Correction of Amplitude and Phase for Coronagraphy

Bowers, Charles; Woodgate, Bruce; Lyon, Richard; [2004]; 2 pp.; In English; SPIE Meeting, June 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

To detect extra-solar planets by coronography will require unprecedented levels of wavefront correction of both phase and amplitude. To achieve this, we propose a dual Michelson interferometer arrangement, incorporating two deformable mirrors (DM) and a third, fixed mirror (all at pupils) and two beamsplitters: one with unequal (asymmetric) beam splitting and one with symmetric beamsplitting. This design allows high precision correction of phase and amplitude using DMs with relatively coarse steps and is relatively insensitive to small changes in the DMs. We are constructing such an apparatus incorporating two MEMS devices and will report on features of the design and performance.

Author

Asymmetry; Coronagraphs; Michelson Interferometers; Wave Fronts; Amplitudes; Precision

20040171513 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA/NOAA Electronic Theater: An Hour of Spectacular Visualization

Hasier, A. F.; [2004]; 1 pp.; In English; IGARRS 2004, 24 Sep. - 2 Oct. 2004, Salt Lake City, UT, Logan, UT, Anchorage, AK and Saint Louis, MO, USA; No Copyright; Avail: Other Sources; Abstract Only

The NASA/NOAA Electronic Theater presents Earth science observations and visualizations from space in a historical perspective. Fly in from outer space to Utah, Logan and the USU Agriculture Station. Compare zooms through the Cosmos to the sites of the 2004 Summer and 2002 Winter Olympic games using 1 m IKONOS 'Spy Satellite' data. Contrast the 1972 Apollo 17 'Blue Marble' image of the Earth with the latest US and International global satellite images that allow us to view our Planet from any vantage point. See the latest spectacular images h m NASA/NOAA remote sensing missions like Terra, GOES, TRMM, SeaWiF!3,& Landsat 7, of storms & fires like Hurricanes Charlie & Isabel and the LA/San Diego Fire Storms of 2003. See how High Definition Television (HDTV) is revolutionizing the way we do science communication. Take the pulse

of the planet on a daily, annual and 30-year time scale. See daily thunderstorms, the annual greening of the northern hemisphere land masses and oceans, fires in Africa, dust storms in Iraq, and carbon monoxide exhaust from global burning. See visualizations featured on Newsweek, TIME, National Geographic, Popular Science covers & National & International Network TV. Spectacular new global visualizations of the observed and simulated atmosphere & oceans are shown. See the currents and vortexes in the oceans that bring up the nutrients to feed tiny plankton and draw the fish, whales and fishermen. See the how the Ocean blooms in response to El Nino/La Nina climate changes. The E-theater will be presented using the latest High Definition TV and video projection technology on a large screen. See the global city lights, and the great NE US blackout of August 2003 observed by the 'night-vision' DMSP satellite.
Author
High Definition Television; Remote Sensing; Satellite Imagery; Climate Change

20040171521 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Upgrade of the Goddard Space Flight Center's Mass Properties Measuring Facility
Ross, Brian P.; McLeod, Christopher; [2004]; 7 pp.; In English; 23rd Space Simulation Conference, 8-10 Nov. 2004, Annapolis, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy

Goddard Space Flight Center has a Mass Properties Measuring Facility (MPMF), which is used to measure weight, center of gravity, moment of inertia, and product of inertia of satellites and space flight hardware. The system was originally purchased more than 30 years ago. While the MPMF was still in good mechanical condition, the measurement and control subsystem had begun to experience more frequent component failures. Many of the outdated, discrete components in the system are no longer available for replacement. A decision was made to upgrade the measurement and control subsystem of the MPMF to improve its reliability and reduce the chance of component failures leading to extended facility outages. This paper will describe details of the upgraded subsystems and summarize the new performance capabilities of the system.
Author
Failure; Replacing; Measuring Instruments; Laboratory Equipment; Mass; Weight (Mass)

20040171528 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Finding Our Origins with the Hubble and James Webb Space Telescopes
Gardner, Jonathan P.; [2003]; 1 pp.; In English; Talk at IBM Innovation Days, 17 Sep. 2003, Yorktown, NY, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA's Origins program is a series of space telescopes designed to study the origins of galaxies, stars, planets and life in the universe. In this talk, I will concentrate on the origin and evolution of galaxies, beginning with the Big Bang and tracing what we have learned with the Hubble Space Telescope through to the present day. I will introduce several of the tools that astronomers use to measure distances, measure velocities, and look backwards in time. I will show that results from studies with Hubble have led to plans for its successor, the James Webb Space Telescope, which is designed to find the first galaxies that formed in the distant past. I will finish with a short discussion of other missions in the Origins theme, including the Terrestrial Planet Finder.
Author
Hubble Space Telescope; James Webb Space Telescope; NASA Programs; Galactic Evolution

20040171538 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The BESS Program
Mitchell, J. W.; Abe, K.; Anraku, K.; Fuke, H.; Haino, S.; Hams, T.; Imori, M.; Itazaki, A.; Izumi, K.; Kumazawa, T.; [2004]; 8 pp.; In English
Contract(s)/Grant(s): RTOP 188-05-10-01; Copyright; Avail: Other Sources

In nine flights between 1993 and 2002, the Balloon Borne Experiment with a Superconducting Spectrometer (BESS) has measured the energy spectrum of cosmic-ray antiprotons between 0.18 and 4.20 GeV, and the spectra of protons and helium to several hundred GeV. BESS has also placed stringent upper limits on the existence of antihelium and antiduterons. Above about 1 GeV, models in which antiprotons are secondary products of the interactions of primary cosmic rays with the ISM agree with the BESS spectrum. Below 1 GeV, BESS data suggest the presence of an additional source of antiprotons. The antiproton/proton ratios measured between 1993 and 1999, during the Sun's positive-polarity phase, are consistent with simple models of solar modulation. Results from the 2000 flight, following the solar magnetic field reversal, show a sudden increase in the antiproton/proton ratio and tend to favor a charge-sign-dependent drift model. To extend BESS measurements to lower

energies, a new instrument, BESS-Polar, is under construction for a flight from Antarctica in 2004.
Author
Balloon-Borne Instruments; Spectrometers; Superconductivity

20040171566 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The James Webb Space Telescope Integrated Science Instrument Module
Greenhouse, Matthew A.; Sullivan, Pamela C.; Boyce, Leslye A.; Glazer, Stuart D.; Johnson, Eric L.; McCloskey, John C.; Voyton, Mark F.; [2004]; 11 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The Integrated Science Instrument Module of the James Webb Space Telescope is described from a systems perspective with emphasis on unique and advanced technology aspects. The major subsystems of this flight element are described including: structure, thermal, command and data handling, and software.
Author
James Webb Space Telescope; Modules; Instruments

20040171568 Purdue Univ., West Lafayette, IN, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
Formation Control of the MAXIM L2 Libration Orbit Mission
Folta, David; Hartman, Kate; Howell, Kathleen; Marchand, Belinda; [2004]; 18 pp.; In English; AIAA Astrodynamics Conference, 16-19 Aug. 2004, Providence, RI, USA; Copyright; Avail: CASI; A03, Hardcopy

The Micro-Arcsecond X-ray Imaging Mission (MAXIM), a proposed concept for the Structure and Evolution of the Universe (SEU) Black Hole Imager mission, is designed to make a ten million-fold improvement in X-ray image clarity of celestial objects by providing better than 0.1 micro-arcsecond imaging. Currently the mission architecture comprises 25 spacecraft, 24 as optics modules and one as the detector, which will form sparse sub-apertures of a grazing incidence X-ray interferometer covering the 0.3-10 keV bandpass. This formation must allow for long duration continuous science observations and also for reconfiguration that permits re-pointing of the formation. To achieve these mission goals, the formation is required to cooperatively point at desired targets. Once pointed, the individual elements of the MAXIM formation must remain stable, maintaining their relative positions and attitudes below a critical threshold. These pointing and formation stability requirements impact the control and design of the formation. In this paper, we provide analysis of control efforts that are dependent upon the stability and the configuration and dimensions of the MAXIM formation. We emphasize the utilization of natural motions in the Lagrangian regions to minimize the control efforts and we address continuous control via input feedback linearization (IFL). Results provide control cost, configuration options, and capabilities as guidelines for the development of this complex mission.
Author
X Ray Imagery; Space Missions; Black Holes (Astronomy); Imaging Techniques; Interferometers; Lagrangian Function

20040171576 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Designs for a Solar Orbiter EUV Imager
Thomas, Roger J.; [2003]; 1 pp.; In English; Solar Orbiter Imager Meeting, 15-16 Oct. 2003, UK; No Copyright; Avail: Other Sources; Abstract Only

An EUV Imager is baselined as one of the remote sensing instruments onboard the Solar Orbiter mission now being planned by ESA. The performance goals for this instrument may be achieved by a specialized 'slitless spectrograph' design, which could offer EUV spectroscopic information as an added bonus. I will discuss my studies of such a design, tailored for the Solar Orbiter scientific objectives and scaled to the available payload envelope. Some of the trade-offs required in terms of sensitivity, field-of-view, and spatial resolution will be described, so that the science team can make optimized choices from the full range of possible optical-design solutions.
Author
Ultraviolet Spectrometers; Far Ultraviolet Radiation; Ultraviolet Astronomy; Imaging Spectrometers; Solar Spectrometers

20040171583 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GEO Sounding Using Microwave Instruments
Shiue, James; Krimchansky, Sergey; Susskind, Joel; Krimchansky, Alexander; Chu, Donald; Davis, Martin; [2004]; 1 pp.; In English; 11th SPIE International Symposium on Remote Sensing, 13-17 Sep. 2004, Maspalomas, Gran Canaria, Spain; No Copyright; Avail: Other Sources; Abstract Only

There are several microwave instruments in low Earth orbit (LEO) that are used for atmospheric temperature and

humidity sounding in conjunction with companion IR sounders as well as by themselves. These instruments have achieved a certain degree of maturity and undergoing a redesign to minimize their size, mass, and power from the previous generation instruments. An example of these instruments is the AMSU-A series, now flying on POES and AQUA spacecraft with the IR sounders HIRS and AIRS. These older microwave instruments are going to be replaced by the ATMS instruments that will fly on NPP and NPOESS satellites with the CrIS sounder. A number of techniques learned from the ATMS project in instrument hardware design and data processing are directly applicable to a similar microwave sounder on a geosynchronous platform. These techniques can significantly simplify the design of a Geostationary orbit (GEO) microwave instrument, avoiding costly development and minimizing the risk of not being able to meet the scientific requirements. In fact, some of the 'enabling' technology, such as the use of MMIC microwave components (which is the basis for the ATMS' much reduced volume) can be directly applied to a GEO sounder. The benefits of microwave sounders are well known; for example, they penetrate non-precipitating cloud cover and allow for use of colocated IR observations in up to 80% cloud cover. The key advantages of a microwave instrument in GEO will be the ability to provide high temporal resolution as well as uniform spatial resolution and extend the utility of a colocated advanced IR sounder to cases in which partial cloud cover exists. A footprint of the order of 100 km by 100 km resolution with hemispherical coverage within one hour can be easily achieved for sounding channels in the 50 to 59 GHz range. A GEO microwave sounder will also allow mesoscale sampling of select regions.
Author
Microwave Sensors; Microwave Sounding; Remote Sensors

20040171621 NASA Langley Research Center, Hampton, VA, USA
Laboratory Calibration and Characterization of Video Cameras
Burner, A. W.; Snow, W. L.; Shortis, M. R.; Goad, W. K.; [1989]; 8 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

Some techniques for laboratory calibration and characterization of video cameras used with frame grabber boards are presented. A laser-illuminated displaced reticle technique (with camera lens removed) is used to determine the camera/grabber effective horizontal and vertical pixel spacing as well as the angle of non-perpendicularity of the axes. The principal point of autocollimation and point of symmetry are found by illuminating the camera with an unexpanded laser beam, either aligned with the sensor or lens. Lens distortion and the principal distance are determined from images of a calibration plate suitable aligned with the camera. Calibration and characterization results for several video cameras are presented. Differences between these laboratory techniques and test range and plumb line calibration are noted.
Author
Calibrating; Characterization; Video Equipment; Cameras

20040171642 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Design and Fabrication of a Two-Dimensional Superconducting Pop-up Bolometer Array
Benford, Dominic J.; Staguhn, Johannes G.; Chervenak, James A.; Allen, Christine A.; Moseley, S. Harvey; Irwin, Kent D.; Stacey, Gordon J.; Page, Lyman A.; [2004]; 3 pp.; In English; Millimeter and Submillimeter Detectors Conference, 21-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

We have been developing an architecture for producing large format, two dimensional arrays of close-packed bolometers, which will enable submillimeter cameras and spectrometers to obtain images and spectra orders of magnitude faster than present instruments. The low backgrounds achieved in these instruments require very sensitive detectors with NEPs of order 5 x 10(exp -18) W/square root of Hz. Superconducting transition edge sensor bolometers can be close-packed using the Pop-up Detector (PUD) format, and SQUID multiplexers operating at the detector base temperature can be intimately coupled to them. The array unit cell is 8 x 32 pixels, using 32- element detector and multiplexer components. We have fabricated an engineering model array with this technology which features a very compact, modular approach for large format arrays. We report on the production of the 32-element components for the arrays. Planned instruments using this array architecture include the Submillimeter and Far-InfraRed Experiment (SAFIRE) on the SOFIA airborne observatory, the South Pole Imaging Fabry-Perot Interferometer (SPIFI) for the AST/RO observatory, the Millimeter Bolometer Camera for the Atacama Cosmology Telescope (MBC/ACT), and the Redshift (Z) Early Universe Spectrometer (ZEUS j.
Author
Bolometers; Architecture (Computers); Two Dimensional Models; Arrays; Galactic Clusters

20040171644 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Comparison of Measurements: Cal/Val
Newman, P.; [2004]; 1 pp.; In English; ISSAOS 2004, 19-24 Sep. 2004, L'Aquilla, Italy; No Copyright; Avail: Other Sources; Abstract Only

Calibration and validation of satellite instruments is vital to long-term trend estimates of ozone and other trace species. A satellite instrument is calibrated by comparing it against a particular standard on the ground prior to launch or against know standards in flight. An instrument is validated by making a comparison of the same measurable or measurement. Validation is performed in a number of ways. In particular, measurements by ground, balloon, aircraft, and other satellite instruments are used to provide validation.
Author
Calibrating; Satellite Instruments

20040171646 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Planar Two-Dimensional Superconducting Bolometer Array for the Green Bank Telescope
Benford, Dominic; Staguhn, Johannes G.; Chervenak, James A.; Chen, Tina C.; Moseley, S. Harvey; Wollack, Edward J.; Devlin, Mark J.; Dicker, Simon R.; Supanich, Mark; [2004]; 3 pp.; In English; SPIE Conference, 21-24 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

In order to provide high sensitivity rapid imaging at 3.3mm (90GHz) for the Green Bank Telescope - the world's largest steerable aperture - a camera is being built by the University of Pennsylvania, NASA/GSFC, and NRAO. The heart of this camera is an 8x8 close-packed, Nyquist-sampled detector array. We have designed and are fabricating a functional superconducting bolometer array system using a monolithic planar architecture. Read out by SQUID multiplexers, the superconducting transition edge sensors will provide fast, linear, sensitive response for high performance imaging. This will provide the first ever superconducting bolometer array on a facility instrument.
Author
Bolometers; Arrays; Radio Telescopes; Superconducting Devices

20040171650 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Exploring scaling issues by using NASA Cold Land Processes Experiment(CLPX-1, IOP3) radiometric data
Tedesco, Marco; Kim, Edward J.; Cline, Don; Graf, Tobias; Koike, Toshio; Armstrong, Richard; Brodzik, Mary; Stankov, Boba; Gasiewski, Al; Klein, Marian; [2004]; 4 pp.; In English; IGARSS 04, 20-24 Sept. 2004, Anchorage, AK, USA; Copyright; Avail: CASI; A01, Hardcopy

The NASA Cold-land Processes Field Experiment-1 (CLPX-1) involved several instruments in order to acquire data at different spatial resolutions. Indeed, one of the main tasks of CLPX-1 was to explore scaling issues associated with microwave remote sensing of snowpacks. To achieve this task, microwave brightness temperatures collected at 18.7, 36.5, and 89 GHz at LSOS test site by means of the University of Tokyo s Ground Based Microwave Radiometer-7 (GBMR-7) were compared with brightness temperatures recorded by the NOAA Polarimetric Scanning Radiometer (PSR/A) and by SSM/I and AMSR-E radiometers. Differences between different scales observations were observed and they may be due to the topography of the terrain and to observed footprints. In the case of satellite and airborne data, indeed, it is necessary to consider the heterogeneity of the terrain and the presence of trees inside the observed scene becomes a very important factor. Also when comparing data acquired only by the two satellites, differences were found. Different acquisition times and footprint positions, together with different calibration and validation procedures, can be responsible for the observed differences.
Author
Brightness Temperature; Footprints; Microwave Imagery; Snow; Topography

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20040170650 Air Force Research Lab., Wright-Patterson AFB, OH
Computational Fluid Dynamics (CFD) of Chemical Oxygen/Iodine Laser (COIL) Flowfields
Miller, James H.; Mar. 2004; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-A04W
Report No.(s): AD-A426493; AFRL-VA-WP-TM-2004-3019; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes an overview of the research efforts undertaken to develop a computational fluid dynamics (CFD)

tool to analyze flow fields relevant to chemical oxygen/iodine lasers (COIL). In the listed references, computations of the three-dimensional nozzle flow fields with transverse jet injection are described in addition to several two-dimensional computational results, verifying the implementation of the model equations. Improvement in the efficiency of the computations was demonstrated by the use of a grid sequencing approach. (7 refs.)
DTIC
Chemical Lasers; Chemical Oxygen-Iodine Lasers; Computational Fluid Dynamics; Flow Distribution; Gas Dynamics

20040170656 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Using Time-Resolved Photoluminescence to Measure the Excitation and Temperature Dependence of Carrier Relaxation in Mid-Wave Infrared Semiconductors
Cumblidge, Kevin; Jun. 2004; 62 pp.; In English
Report No.(s): AD-A426564; AFIT/GAP/ENP/04-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

Research in the field of mid-wave infrared (MWIR) semiconductor photonic devices has led to applications in a variety of disciplines including atmospheric monitoring, optical communications, non-invasive glucose testing for diabetics, and infrared (IR) countermeasures. One of the limiting factors for improving the modulation rates of MWIR devices is the carrier relaxation time. This is the time required for energetic carriers to cool to the edge of their respective bands in a bulk semiconductor material, or to the bottom of a well through inter- and intra-sub-band scattering in a quantum well (QW) structure. From these lower energy states, they can then recombine radiatively in photonic devices. This investigation utilized the nonlinear optical technique of frequency upconversion to perform time-resolved luminescence spectroscopy on epitaxial bulk InAs, InAsSb/InAlAsSb type I QW structure, and InAs/GaInSb type II QW samples to calculate carrier relaxation times in each as a function of excitation irradiance and sample temperature.
DTIC
Carrier Waves; Excitation; Infrared Radiation; Photoluminescence; Semiconductor Lasers; Semiconductors (Materials); Temperature Dependence

20040170688 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Cold Flow Testing of a Modified Subscale Model Exhaust System for a Space Based Laser
Jarrett, David B.; Jun. 2004; 64 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426656; AFIT/GAE/ENY/04-J04; No Copyright; Avail: Defense Technical Information Center (DTIC)

The aim of this research was a continued study of gas-dynamic phenomena that occurred in a set of stacked nozzles as reported by Captains Ian Bautista in 2003 and Scott Bergren in 2002. The arrangement of the stacked nozzles was a modified version of a 1/5th scale-model of one quadrant of the conceptual Space Based Laser Integrated Flight Experiment (SBL IFX) gas dynamic laser. Rather than cylindrical rings of nozzles, the stacked nozzles were flat and able to be rotated about a vector normal to the nozzle exits. This set of stacked flat nozzles was installed on a blow-down/vacuum wind tunnel, which in addition to the nozzles, consisted of a stilling chamber, centerbody, supersonic diffuser, and transition structure to join the vacuum and test sections. The goals of this research were two fold; first, modify the original scale- model of the stacked cylindrical rings of nozzles so schlieren photography could be used to visualize an average flow field across the nozzles. Secondly, using the schlieren photographs, in conjunction with pressure data, observe the interactions between the individual nozzles. Results have shown that the modified nozzle array produces a vastly complex flow field as well as a highly supersonic flow r gime, with Mach numbers that reach as high as 5.6.
DTIC
Exhaust Nozzles; Exhaust Systems; Gasdynamic Lasers; Lasers

20040170690 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Optimization of a Quantum Cascade Laser Operating in the Terahertz Frequency Range Using a Multiobjective Evolutionary Algorithm
Keller, Traci A.; Jun. 2004; 125 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426659; AFIT/GCE/ENG/04-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

A quantum cascade (QC) laser is a specific type of semiconductor laser that operates through principles of quantum mechanics. In less than a decade QC lasers are already able to outperform previously designed double heterostructure semiconductor lasers. Because there is a genuine lack of compact and coherent devices which can operate in the far- infrared region the motivation exists for designing a terahertz QC laser. A device operating at this frequency is expected to be more efficient and cost effective than currently existing devices. It has potential applications in the fields of spectroscopy, astronomy,

medicine and free-space communication as well as applications to near-space radar and chemical/biological detection. The overarching goal of this research was to find QC laser parameter combinations which can be used to fabricate viable structures. To ensure operation in the THz region the device must conform to the extremely small energy level spacing range from ^10-15 meV. The time and expense of the design and production process is prohibitive, so an alternative to fabrication was necessary. To accomplish this goal a model of a QC laser, developed at Worchester Polytechnic Institute with sponsorship from the Air Force Research Laboratory Sensors Directorate, and the General Multiobjective Parallel Genetic Algorithm (GenMOP), developed at the Air Force Institute of Technology, were integrated to form a computer simulation which stochastically searches for feasible solutions.
DTIC
Algorithms; Computerized Simulation; Frequency Ranges; Laser Outputs; Quantum Cascade Lasers; Quantum Well Lasers

20040170771 Naval Research Lab., Washington, DC
Optimization and Stability Control of Relativistic and Ponderomotive Self-Channeling of Ultra-Powerful Pulses in Underdense Plasma
Davis, J.; Borisov, A.; Rhodes, C. K.; Aug. 9, 2004; 27 pp.; In English
Report No.(s): AD-A426851; NRL/MR/6705-04-8778; No Copyright; Avail: CASI; A03, Hardcopy

Stable formation of multi-PW relativistic channels in underdense plasma, with the power exceeding 10,000 critical powers and the peak channel intensity in the 1O to the 23rd power W/cm2 range, can be established using an appropriate gradient of electron density at the first stage of the self- channeling, which initiates the process of stable multi-stage relativistic and ponderomotive self-channeling.
DTIC
Laser Beams; Plasmas (Physics); Stability

20040171161 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Laser Sounder for Global Measurement of CO2 Concentrations in the Troposphere from Space: Progress
Abshire, J. B.; Krainak, M.; Riris, H. J.; Sun, X.; Riris, H.; Andrews, A. E.; Collatz, J.; [2004]; 1 pp.; In English; 2004 Fall American Geophysical Union Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

We describe progress toward developing a laser-based technique for the remote measurement of the tropospheric CO2 concentrations from orbit. Our goal is to demonstrate a lidar technique and instrument technology that will permit measurements of the CO2 column abundance in the lower troposphere from aircraft at the few ppm level, with a capability of scaling to permit global CO2 measurements from orbit. Accurate measurements of the tropospheric CO2 mixing ratio from space are challenging due to the many potential error sources. These include possible interference from other trace gas species, the effects of temperature, clouds, aerosols & turbulence in the path, changes in surface reflectivity, and variability in dry air density caused by changes in atmospheric pressure, water vapor and topographic height. Some potential instrumental errors include frequency drifts in the transmitter, small transmission and sensitivity drifts in the instrument. High signal-to-noise ratios and measurement stability are needed for mixing ratio estimates at the few ppm level. We have been developing a laser sounder approach as a candidate for a future space mission. It utilizes multiple different laser transmitters to permit simultaneous measurement of CO2 and O2 extinction, and aerosol backscatter in the same measurement path. It directs the narrow co-aligned laser beams from the instrument's fiber lasers toward nadir, and measures the energy of the strong laser echoes reflected from the Earth's land and water surfaces. During the measurement its narrow linewidth lasers are rapidly tuned on- and off- selected CO2 line near 1572 nm and an O2 absorption line near 770 nm. The receiver measures the energies of the laser echoes from the surface and any clouds and aerosols in the path with photon counting detectors. Ratioing the on- to off-line echo pulse energies for each gas permits the column extinction and column densities of CO2 and O2 to be estimated simultaneously via the differential absorption lidar technique. For the on-line wavelengths, the side of the selected absorption lines are used, which due to pressure broadening, weights the measurements to the lower troposphere, where CO2 variations caused by surface sources and sinks are largest. Simultaneous measurements of O2 column abundance are made using an identical approach using an O2 line. The laser backscatter profiles from clouds and aerosols are measured with other lidar channels, which permits identifying measurements influenced by clouds and/or aerosol scattering in the path. For space use, our lidar would continuously measure at nadir in near polar circular orbit. Using dawn and dusk measurements made over the same region will make it possible to sample the diurnal variations in CO2 mixing ratios. A 1-m diameter telescope is used for the receiver for all wavelengths. When averaging over 50 seconds, our calculations show a SNR of approximately 1500 is achievable for each gas at each on- and off-line measurement. Measurements from such a mission can be used to generate monthly global maps of the lower tropospheric CO2 column abundance. Our calculations show global coverage with an

accuracy of a few ppm with a spatial resolution of approximately 50,000 sq. km are achievable each month. We have demonstrated some key elements of the laser, detector and receiver approaches in the laboratory and with measurements over a 206 m horizontal path. These include stable measurements of CO2 line shapes in an absorption cell using a fiber laser amplifier seeded by a tunable diode laser, measurement of small amplitude changes at low optical signal levels with the PMT receiver, and comparison of the horizontal path measurements of CO2 against those from an in-situ instrument.
Author
Carbon Dioxide Concentration; Laser Beams; Troposphere; Optical Radar; Circular Orbits; Spaceborne Lasers

20040171271 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Compact, Passively Q-Switched Nd:YAG Laser for the MESSENGER Mission to the Planet Mercury
Krebs, Danny J.; Novo-Gradac, Anne-Marie; Li, Steven X.; Lindauer, Steven J.; Afzal, Robert S.; Yu, Antony; [2004]; 10 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

A compact, passively Q-switched Nd:YAG laser has been developed for the Mercury Laser Altimeter (MLA) instrument which is an instrument on the MESSENGER mission to the planet Mercury. The laser achieves 5.4 percent efficiency with a near diffraction limited beam. It has passed all space flight environmental tests at system, instrument, and satellite integration. The laser design draws on a heritage of previous laser altimetry missions, specifically ISESAT and Mars Global Surveyor; but incorporates thermal management features unique to the requirements of an orbit of the planet Mercury.
Author
Mercury (Planet); Neodymium Lasers; Q Switched Lasers; Space Missions; Yag Lasers; Messenger (Spacecraft)

20040171426 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Noise Limit in Frequency Stabilization of Lasers with Rigid Cavities
Numata, Kenji; Kemery, Amy; Camp, Jordan; [2004]; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

We evaluated thermal noise (Brownian motion) in a rigid reference cavity used for frequency stabilization of lasers, based on the mechanical loss of cavity materials and the numerical analysis of the mirror-spacer mechanics with t.he direct application of the fluctuation dissipation theorem. This noise sets a fundamental limit for the frequency stability achieved with a rigid frequency- reference cavity of order 1 Hz/square root Hz(0.01 Hz/square root Hz) at 10 mHz (100 Hz) at room temperature. This level coincides with the world-highest level stabilization results.
Author
Thermal Noise; Frequency Stability; Lasers

20040171596 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical and Thermal Analyses of High-Power Laser Diode Arrays
Vasilyev, Aleksey; Allan, Graham R.; Schafer, John; Stephen, Mark A.; Young, Stefano; [2004]; 4 pp.; In English; Solid State and Diode Laser Technology Review, Jun. 2004, Albuquerque, NM, USA
Report No.(s): SSDLTR-2004; Copyright; Avail: CASI; A01, Hardcopy

An important need, especially for space-borne applications, is the early identification and rejection of laser diode arrays which may fail prematurely. The search for reliable failure predictors is ongoing and has led to the development of two techniques, infrared imagery and monitoring the Temporally-resolved and Spectrally-Resolved (TSR) optical output from which temperature of the device can be measured. This is in addition to power monitoring on long term burn stations. A direct measurement of the temperature of the active region is an important parameter as the lifetime of Laser Diode Arrays (LDA) decreases exponentially with increasing temperature. We measure the temperature from time-resolving the spectral emission in an analogous method to Voss et al. In this paper we briefly discuss the measurement setup and present temperature data derived from thermal images and TSR data for two differently designed high-power 808 nanometer LDA packages of similar specification operated in an electrical and thermal environment that mimic the expected operational conditions.
Derived from text
Thermal Environments; Semiconductor Lasers; Temperature Measurement; High Power Lasers; Laser Arrays; Optical Measurement

37
MECHANICAL ENGINEERING

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

20040170651 Nevada Univ., Reno, NV

A New Generation of Magneto-Rheological Fluid Dampers

Gordaninejad, F.; Fuchs, A.; Dogrour, U.; Karakas, S.; Liu, Y.; Aug. 25, 2004; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-1-0614

Report No.(s): AD-A426496; ARO-41481-EG.2; No Copyright; Avail: Defense Technical Information Center (DTIC)

The overall goal of this 3-year project was to study the performance of novel, fail-safe, magneto-rheological fluid (MRF) dampers by using innovative magneto-rheological (MR) materials for off-highway, high-payload vehicles such as the U.S. Army's High Mobility Multi-Purpose Wheeled Vehicle (HMMWV). In the past 3 years, significant advances were achieved in the following areas: (1) MR materials development; (2) theoretical modeling and experimental study of a new compact fail-safe MR damper, including the design and development of a full-scale prototype; (3) a full-scale experimental set up for quarter-HMMWV-models; and (4) control system development for the nonlinear MR damper system. A systematic approach was followed to unify all efforts for this integrated research. Several new MR materials were developed and characterized that could be utilized in two new MR dampers with the same overall geometric dimensions as a regular HMMWV damper. A unique full-scale experimental set up was developed and tested. Extensive investigation was conducted on an accurate control system taking into account variation of the MR fluid's base viscosity and temperature. A list of 31 publications and conference papers is included. (4 tables, 37 figures, 31 refs.)

DTIC

Damping; Rheology; Valves; Vibration; Viscosity

20040170733 Army Research Lab., Adelphi, MD

An Analytic Model for the Determination of Excited State Parameters from Pump-probe Measurements

Pritchett, Timothy M.; Mott, Andrew G.; Ferry, Michael J.; Hoffman, Robert C.; Sep. 2004; 13 pp.; In English

Report No.(s): AD-A426788; ARL-TR-3327; No Copyright; Avail: CASI; A03, Hardcopy

In order to completely and accurately characterize the materials whose nonlinear optical response makes them good candidates for use in eye and sensor protection applications, one must measure not only the absorption and refraction cross-sections of the various quantum energy levels involved in the optical absorption process, but also the decay rates of these states. This can be accomplished in a single experiment using time resolved pump-probe techniques. In a pump-probe experiment, a strong pump pulse excites a sample of the material under investigation, and one measures the transmittance of a weak probe as a function of time. In a double pump-probe experiment, two pump pulses excite the sample sequentially. The first pulse populates various molecular excited states, while the second induces transitions whose rates depend on the various populations and cross- sections. As in a single pump-probe experiment, one measures the sample transmittance of a weak probe beam or pulse as a function of time, from which one can infer the relevant excitation and decay rates. Parameter values are obtained by fitting a theoretical model to the experimental data, a procedure that may be carried out with particular ease if the model has an analytic solution. We describe the most complete model for the normalized probe transmittance that may still be solved analytically.

DTIC

Excitation; Mathematical Models; Optical Pumping; Pumps

20040171185 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Analytical and Experimental Characterization of Gravity Induced Deformations In Subscale Gossamer Structures

Johnston, John D.; Blandino, Joseph R.; McEvoy, Kiley C.; [2004]; 16 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The development of gossamer space structures such as solar sails and sunshields presents many challenges due to their large size and extreme flexibility. The post-deployment structural geometry exhibited during ground testing may significantly depart from the in-space configuration due to the presence of gravity-induced deformations (gravity sag) of lightly preloaded membranes. This paper describes a study carried out to characterize gravity sag in two subscale gossamer structures: a single quadrant from a 2 m, 4 quadrant square solar sail and a 1.7 m membrane layer from a multi-layer sunshield The behavior of

the test articles was studied over a range of preloads and in several orientations with respect to gravity. An experimental study was carried out to measure the global surface profiles using photogrammetry, and nonlinear finite element analysis was used to predict the behavior of the test articles. Comparison of measured and predicted surface profiles shows that the finite dement analysis qualitatively predicts deformed shapes comparable to those observed in the laboratory. Quantitatively, finite element analysis predictions for peak gravity-induced deformations in both test articles were within 10% of measured values. Results from this study provide increased insight into gravity sag behavior in gossamer structures, and demonstrates the potential to analytically predict gravity-induced deformations to within reasonable accuracy.
Author
Numerical Analysis; Experimentation; Gravitation; Deformation; Spacecraft Structures

20040171333 West Virginia Univ., Morgantown, WV
Testing for Exhaust Emissions of Diesel Powered Off-Road Engines
Guatam, M.; Carder, D. K.; Clark, N. N.; Lyons, D. W.; May 2002; 282 pp.; In English
Report No.(s): PB2005-100304; No Copyright; Avail: CASI; A13, Hardcopy

Emissions databases from off-road diesel-powered equipment suffer immensely from insufficient real-world activity data. Moreover, there is little information available regarding the validity of standardized dynamometer engine test cycles that are currently used for emissions certification. The present study was initiated in order to fill the current void in the off-road equipment testing cycles and the consequent lack of real-world emissions data that is needed for accurately modeling emissions inventories. For this study, onboard engine data was logged from four off-road vehicles in order to generate transient test cycles that could be used to simulate real-world operating conditions for exhaust emissions research. The off-road diesel-powered equipment targeted for this study was selected to be representative of the major off-road diesel emissions contributor in California.
NTIS
Diesel Engines; Exhaust Emission; Exhaust Gases

20040171623 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Nanotechnology: A Vast Field For The Creative Mind
Benavides, Jeannette; [2004]; 31 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives examples of possible future uses of nanotechnology, with some emphasis on carbon nanotubes and medical applications. The presentation provides an overview of organizations conducting nanotechnology research in the USA, and suggests a timeline for nanotechnology development.
CASI
Nanotechnology; Research and Development

20040171628 Toledo Univ., OH, USA
Conical Magnetic Bearing Development and Magnetic Bearing Testing for Extreme Temperature Environments
Keith, Theo G., Jr.; Jansen, Mark; August 2004; 10 pp.; In English
Contract(s)/Grant(s): NCC3-1046; No Copyright; Avail: CASI; A02, Hardcopy

The main proposed research of this grant were: to design a high-temperature, conical magnetic bearing facility, to test the high-temperature, radial magnetic bearing facility to higher speeds, to investigate different backup bearing designs and materials, to retrofit the high-temperature test facility with a magnetic thrust bearing, to evaluate test bearings at various conditions, and test several lubricants using a spiral orbit tribometer. A high-temperature, conical magnetic bearing facility has been fully developed using Solidworks. The facility can reuse many of the parts of the current high-temperature, radial magnetic bearing, helping to reduce overall build costs. The facility has the ability to measure bearing force capacity in the X, Y, and Z directions through a novel bearing mounting design. The high temperature coils and laminations, a main component of the facility, are based upon the current radial design and can be fabricated at Texas A&M University. The coil design was highly successful in the radial magnetic bearing. Vendors were contacted about fabrication of the high temperature lamination stack. Stress analysis was done on the laminations. Some of the components were procured, but due to budget cuts, the facility build up was stopped.
Derived from text
Conical Bodies; Magnetic Bearings; High Temperature Tests

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*.

20040163126 Missouri Univ., Columbia, MO, USA
Three-Dimensional Postbuckling Analysis of Curved Beams
Pai, P. Frank; Lee, Seung-Yoon; International Journal of Computational Engineering Science; 2002; Volume 3, No. 3, pp. 305-338; In English
Contract(s)/Grant(s): NAG1-01037; NSF CMS-99-12482; Copyright; Avail: Other Sources

Presented here is a method of solving highly flexible curved beam undergoing huge static or quasi-static deformations. A geometrically exact beam theory based on the use of Jaumann stresses and strains and exact coordinate transformation is presented in terms of 17 first-order ordinary differential equations, and a multiple shooting method is used to solve the corresponding nonlinear two-point boundary value problems. The geometrically exact beam theory accounts far large rotations, large displacements, initial curvatures, extensionality, and transverse shear strains. Four examples are used to demonstrate this method, including a rotating clamped-free beam under the influence of gravity and centrifugal forces, an L-frame subjected to an in-plane tip load, a circular arch subjected to a concentrated load, and a clamped-hinged helical spring subjected to an axial displacement. Results show that the combination of the multiple shooting method and the geometrically exact beam theory works very well. Moreover, the obtained numerically exact solutions can be used to verify the accuracy of nonlinear finite element codes for nonlinear analysis of complex structures.
Author
Static Deformation; Curved Beams; Differential Equations; Structural Analysis; Clamped Structures; Finite Element Method; Gravitational Effects; Buckling

20040164062 Missouri Univ., Columbia, MO, USA
Design and Experimental Verification of Deployable/Inflatable Ultra-Lightweight Structures
Pai, P. Frank; 1 November 2004; 7 pp.; In English
Contract(s)/Grant(s): NAG1-01037; No Copyright; Avail: CASI; A02, Hardcopy

Because launch cost of a space structural system is often proportional to the launch volume and mass and there is no significant gravity in space, NASA's space exploration programs and various science missions have stimulated extensive use of ultra-lightweight deployable/inflatable structures. These structures are named here as Highly Flexible Structures (HFSs) because they are designed to undergo large displacements, rotations, and/or buckling without plastic deformation under normal operation conditions. Except recent applications to space structural systems, HFSs have been used in many mechanical systems, civil structures, aerospace vehicles, home appliances, and medical devices to satisfy space limitations, provide special mechanisms, and/or reduce structural weight. The extensive use of HFSs in today's structural engineering reveals the need of a design and analysis software and a database system with design guidelines for practicing engineers to perform computer-aided design and rapid prototyping of HFSs. Also to prepare engineering students for future structural engineering requires a new and easy-to- understand method of presenting the complex mathematics of the modeling and analysis of HFSs. However, because of the high flexibility of HFSs, many unique challenging problems in the modeling, design and analysis of HFSs need to be studied. The current state of research on HFSs needs advances in the following areas: (1) modeling of large rotations using appropriate strain measures, (2) modeling of cross-section warpings of structures, (3) how to account for both large rotations and cross- section warpings in 2D (two-dimensional) and 1D structural theories, (4) modeling of thickness thinning of membranes due to inflation pressure, pretension, and temperature change, (5) prediction of inflated shapes and wrinkles of inflatable structures, (6) development of efficient numerical methods for nonlinear static and dynamic analyses, and (7) filling the gap between geometrically exact elastic analysis and elastoplastic analysis. The objectives of this research project were: (1) to study the modeling, design, and analysis of deployable/inflatable ultra-lightweight structures, (2) to perform numerical and experimental studies on the static and dynamic characteristics and deployability of HFSs, (3) to derive guidelines for designing HFSs, (4) to develop a MATLAB toolbox for the design, analysis, and dynamic animation of HFSs, and (5) to perform experiments and establish an adequate database of post-buckling characteristics of HFSs.
Derived from text
Inflatable Structures; Flexibility; Aerospace Engineering; Numerical Analysis

20040170682 Air Force Center for Environmental Excellence, Brooks AFB, TX

Final Environmental Assessment for Proposed Construction II, Buckley Air Force Base, Colorado

Jun. 2004; 241 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426648; No Copyright; Avail: Defense Technical Information Center (DTIC)

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, Council on Environmental Quality NEPA implementing regulations (40 Code of Federal Regulations CFR parts 1500-1508), and Air Force NEPA implementing regulations (32 CFR 989), the USAF conducted an assessment of the potential consequences of implementing Proposed Construction II construction and demolition projects that are described below in the proposed action. The USAF proposes the Proposed Construction II projects at Buckley AFB. Within the Proposed Construction II projects, seven new construction and eight demolition projects encompassing approximately 32.41 and 0.96 acres of land, respectively, at various locations within the AFB boundaries. The Proposed Construction II projects would include construction of various buildings and facilities, including a new leadership development center, child development center, athletic fields, new munitions and haaardous materials gate, new visitors center, chapel and clinic. Demolition projects would include destruction of Buildings 19, 40, 41, 902, 1620, 1632, 1631 and area concrete foundations in the old Marine compound.

DTIC

Construction

20040170694 National Defense Univ., Washington, DC

Closing the Barn Door: Installation Force Protection (Joint Force Quarterly, Spring 2002)

Cirafici, John L.; Jan. 2002; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426667; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA is at war with an insidious and determined enemy, but not everyone is prepared for the fight. This enemy will avoid conventional battle at all costs, wears no uniform, and is unlikely to negotiate terms at a table. The personal commitment is total, and the only outcome can be victory or death. The enemy is terrorism, although its perpetrators would rather be seen as selfless warriors fighting a just war with their motivations firmly anchored in ideology and faith. Terrorist groups have tasted a series of victories. Since 1983 they have included bombings in Beirut, Naples, Ramstein, Rhein Main, Berlin, Riyadh, and Dhahran as well as a simultaneous attack on two American embassies in East Africa, the USS Cole incident, and the events of September 11, 2001. These successes reveal the challenge.

DTIC

Installing; Protection; Terrorism; Vulnerability

20040171122 Missouri Univ., Columbia, MO, USA

Fully Nonlinear Modeling and Analysis of Precision Membranes

Pai, P. Frank; Young, Leyland G.; International Journal of Computational Engineering Science; March 2003; Volume 4, No. 1, pp. 19-65; In English

Contract(s)/Grant(s): NAG1-01037; NSF CMS-99-12482; Copyright; Avail: CASI; A03, Hardcopy

High precision membranes are used in many current space applications. This paper presents a fully nonlinear membrane theory with forward and inverse analyses of high precision membrane structures. The fully nonlinear membrane theory is derived from Jaumann strains and stresses, exact coordinate transformations, the concept of local relative displacements, and orthogonal virtual rotations. In this theory, energy and Newtonian formulations are fully correlated, and every structural term can be interpreted in terms of vectors. Fully nonlinear ordinary differential equations (ODES) governing the large static deformations of known axisymmetric membranes under known axisymmetric loading (i.e., forward problems) are presented as first-order ODES, and a method for obtaining numerically exact solutions using the multiple shooting procedure is shown. A method for obtaining the undeformed geometry of any axisymmetric membrane with a known inflated geometry and a known internal pressure (i.e., inverse problems) is also derived. Numerical results from forward analysis are verified using results in the literature, and results from inverse analysis are verified using known exact solutions and solutions from the forward analysis. Results show that the membrane theory and the proposed numerical methods for solving nonlinear forward and inverse membrane problems are accurate.

Author

Nonlinear Equations; Membranes; Numerical Analysis; Membrane Structures; Differential Equations

20040171124 NASA Marshall Space Flight Center, Huntsville, AL, USA
Truss Optimization for a Manned Nuclear Electric Space Vehicle using Genetic Algorithms
Benford, Andrew; Tinker, Michael L.; [2004]; 8 pp.; In English; 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, 30 Aug. - 1 Sep. 2004, Albany, NY, USA
Contract(s)/Grant(s): 090-26-02; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this paper is to utilize the genetic algorithm (GA) optimization method for structural design of a nuclear propulsion vehicle. Genetic algorithms provide a guided, random search technique that mirrors biological adaptation. To verify the GA capabilities, other traditional optimization methods were used to generate results for comparison to the GA results, first for simple two-dimensional structures, and then for full-scale three-dimensional truss designs.
Author
Structural Design; Spacecraft Structures; Genetic Algorithms; Design Optimization; Trusses

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20040171162 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Geoscience Laser Altimeter System (GLAS) on the ICESat Mission: Science Measurement Performance since Launch
Sun, Xiao-Li; Abshire, James B.; Riris, Haris; McGarry, Jan; Sirota, Marcos; [2004]; 1 pp.; In English; 2004 Fall American Geophysical Union Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Geoscience Laser Altimeter System is the primary space lidar on NASA's ICESat mission. Since launch in January 2003 GLAS has produced about 544 million measurements of the Earth's surface and atmosphere. It has made global measurements of the Earth's icesheets, land topography and atmosphere with unprecedented vertical resolution and accuracy. GLAS was first activated for science measurements in February 2003. Since then its operation and performance has confirmed many pre-launch expectations and exceed a few of the most optimistic expectations in vertical resolution. However GLAS also suffered an unexpected failure of its first laser, and the GLAS measurements have yielded some surprises in other areas. The talk will give a post launch assessment of the science measurement performance of the GLAS instrument, and compare the science measurements and engineering operation to pre-launch expectations. It also will address some of what has been learned from the GLAS operations and data, which may benefit future space lidar.
Author
Geophysics; Ice, Cloud and Land Elevation Satellite; Laser Altimeters; Earth Surface; Spacecraft Launching

20040171523 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Torque Balances on the Taylor Cylinders in the Geomagnetic Data Assimilation
Kuang, Weijia; Tangborn, Andrew; [2004]; 1 pp.; In English; American Geophysical Union Meeting, 17-21 May 2004, Montreal, Canada; No Copyright; Avail: Other Sources; Abstract Only

In this presentation we report on our continuing effort in geomagnetic data assimilation, aiming at understanding and predicting geomagnetic secular variation on decadal time scales. In particular, we focus on the effect of the torque balances on the cylindrical surfaces in the core co-axial with the Earth's rotation axis (the Taylor cylinders) on the time evolution of assimilated solutions. We use our MoSST core dynamics,model and observed geomagnetic field at the Earth's surface derived via Comprehensive Field Model (CFM) for the geomagnetic data assimilation. In our earlier studies, a model solution is selected randomly from our numerical database. It is then assimilated with the observations such that the poloidal field possesses the same field tomography on the core-mantel boundary (CMB) continued downward from surface observations. This tomography change is assumed to be effective through out the outer core. While this approach allows rapid convergence between model solutions and the observations, it also generates sevee numerical instabilities: the delicate balance between weak fluid inertia and the magnetic torques on the Taylor cylinders are completely altered. Consequently, the assimilated solution diverges quickly (in approximately 10% of the magnetic free-decay time in the core). To improve the assimilation, we propose a partial penetration of the assimilation from the CMB: The full-scale modification at the CMB decreases linearly and vanish at an interior radius r(sub a). We shall examine from our assimilation tests possible relationships between the

convergence rate of the model solutions to observations and the cut-off radius r(sub a). A better assimilation shall serve our nudging tests in near future.
Author
Cylindrical Bodies; Geomagnetism; Magnetic Variations; Secular Variations; Torque

20040171525 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Modeling of Field-Aligned Guided Echoes in the Plasmasphere
Fung, Shing F.; Green, James L.; June 29, 2004; 29 pp.; In English
Contract(s)/Grant(s): UPN 51-370-28-30; No Copyright; Avail: CASI; A03, Hardcopy

The conditions under which high frequency (f\g\gf(sub uh)) long-range extraordinary-mode discrete field-aligned echoes observed by the Radio Plasma Imager (RPI) on board the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) satellite in the plasmasphere are investigated by ray tracing modeling. Field-aligned discrete echoes are most commonly observed by RPI in the plasmasphere although they are also observed over the polar cap region. The plasmasphere field-aligned echoes appearing as multiple echo traces at different virtual ranges are attributed to signals reflected successively between conjugate hemispheres that propagate along or nearly along closed geomagnetic field lines. The ray tracing simulations show that field-aligned ducts with as little as 1% density perturbations (depletions) and less than 10 wavelengths wide can guide nearly field-aligned propagating high frequency X mode waves. Effective guidance of wave at a given frequency and wave normal angle (Psi) depends on the cross-field density scale of the duct, such that ducts with stronger density depletions need to be wider in order to maintain the same gradient of refractive index across the magnetic field. While signal guidance by field aligned density gradient without ducting is possible only over the polar region, conjugate field-aligned echoes that have traversed through the equatorial region are most likely guided by ducting.
Author
Plasmasphere; Ray Tracing; Simulation; Field Aligned Currents; Echoes

20040171602 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Targeted Research and Technology Within NASA's Living With a Star Program
Antiochos, Spiro; Baker, Kile; Bellaire, Paul; Blake, Bern; Crowley, Geoff; Eddy, Jack; Goodrich, Charles; Gopalswamy, Nat; Gosling, Jack; Hesse, Michael, et al.; [2004]; 39 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Targeted Research & Technology (TR&T) NASA's Living With a Star (LWS) initiative is a systematic, goal-oriented research program targeting those aspects of the Sun-Earth system that affect society. The Targeted Research and Technology (TR&T) component of LWS provides the theory, modeling, and data analysis necessary to enable an integrated, system-wide picture of Sun-Earth connection science with societal relevance. Recognizing the central and essential role that TR&T would have for the success of the LWS initiative, the LWS Science Architecture Team (SAT) recommended that a Science Definition Team (SDT), with the same status as a flight mission definition team, be formed to design and coordinate a TR&T program having prioritized goals and objectives that focused on practical societal benefits. This report details the SDT recommendations for the TR&T program.
Author
Earth Sciences; NASA Programs; Research and Development; Sun

20040171620 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Basaltic Magmatism: The Dominant Factor in the Petrologic and Tectonic Evolution of the Earth
Lowman, Paul D., Jr.; [2003]; 1 pp.; In English; Geological Association of Canada, 28-29 May 2003, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

Silicate bodies such as the Moon, Mars, probably Mercury, and possibly Venus, appear to have evolved in three main stages: a first (felsic) differentiation, a late heavy bombardment, and a second (basaltic) differentiation. It has been proposed that the Earth underwent a similar sequence. This paper argues that the second differentiation, basaltic magmatism, has dominated the petrologic and tectonic evolution of the Earth for four billion years. A global andesitic crust, formed during and after accretion of the planet, was disrupted by major impacts that triggered mantle upwelling and sea-floor spreading about 4 billion years ago. The oceanic crust collectively has since been formed by basaltic volcanism, from spreading centers and mantle plumes. However, the continental crust has also been greatly affected. Basaltic underplating has promoted anatexis and diapiric intrusion of granitoids in granite-greenstone terrains, as well as providing heat for regional metamorphism. Basaltic intrusions, such as the Nipissing diabase of the Sudbury area, have added to the thickness of continental crust. Satellite magnetic surveys suggest that there are more such basaltic intrusions than previously realized; examples include the Bangui

anomaly of central Africa and the Kentucky anomaly. Basaltic overplating from mafic dike swarms has repeatedly flooded continents; had it not been for erosion, they would be covered with basalt as Venus is today. The tectonic effects of basaltic volcanism on continents have only recently been realized. The World Stress Map project has discovered that continents are under horizontal compressive stress, caused by push from mid-ocean ridges, i.e., by basaltic volcanism. The stress fields are generally uniform over large intraplate areas, and could contribute to intraplate tectonism. Seafloor spreading has demonstrably been effective for at least 200 million years, and ridge push thus a contributor to tectonic activity for that long. Collectively, the petrologic and tectonic evolution of the Earth has been dominated for about 4 billion years by the 'second differentiation,' i.e., by basaltic magmatism.
Author
Basalt; Magma; Earth Crust; Planetary Evolution

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*.

20040161546 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
High Resolution Spectroscopic Database for the NASA Earth Observing System Program
Rothman, Laurence; October 2004; 31 pp.; In English
Contract(s)/Grant(s): NAG5-8420; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this project has been to develop and enhance the HITRAN molecular spectroscopic database and associated software to support the observational programs of the Earth Observing System (EOS). Emphasis has been on the EOS projects: the Atmospheric Infrared Sounder (AIRS), the High-Resolution Dynamics Limb Sounder (HIRDLS), Measurements of Pollution in the Troposphere (MOPITT), the Tropospheric Emission Spectrometer (TES), and the Stratospheric Aerosol and Gas Experiment (SAGE III). The HITRAN program is also involved in the Ozone Monitoring Experiment (OMI). The data requirements of these programs in terms of spectroscopy are varied with respect to constituents being observed, required remote-sensing parameters, and spectral coverage. A general requisite is for additional spectral parameters and improvements to existing molecular bands sufficient for the simulation of the observations leading to retrieval of the atmospheric state. In addition, cross-section data for heavier molecular species must be expanded and made amenable to modeling in remote sensing. The effort in the project also includes developing software and distribution to make access, manipulation, and use of HITRAN functional to the EOS program.
Author
Data Bases; Earth Observing System (EOS); High Resolution; NASA Programs; Remote Sensing; Molecular Spectroscopy

20040170711 Washington Univ., Seattle, WA
Proceedings, Seismo-Acoustic Applications in Marine Geology and Geophysics Workshop, Woods Hole Oceanographic Institution, 24-26 March 2004
Odom, Robert I.; Stephen, Ralph A.; Jul. 2004; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0894; OCE-0332816
Report No.(s): AD-A426742; APL-UW-TR-0406; No Copyright; Avail: CASI; A04, Hardcopy

The workshop. 'Seismo-Acoustic Applications in Marine Geology and Geophysics.' took place at Woods Hole Oceanographic Institution on March 24-26. 2004. The thirty- three attendees of the workshop represented a broad spectrum of researchers including experimentalists and modelers. and spanned the fields of marine geology and geophysics. long- range ocean acoustics. and continental crutal seismology. The following were the workshop's goals: 1.. Identify necessary. important. or promising research directions to further the application of seismo-acoustics (1.-phases) in marine geology and geophysics. What are the limitations of our present knowledge? What potential is there for improving seismo- acoustics as a technique to study earth science in the oceans? What are the aspects of 1.-phase research relevant to the U.S. Navy. 2. Provide an opportunity for the marine geology and geophysics and ocean acoustics communities to organize their thoughts on this topic. and provide funding agencies and community with clear guidelines for future research in this field. Workshop recommendations could be cited. for example. in proposals from individual (or groups of individual) investigators to ONR and NSF. This report consists of a 58 - page summary of the workshop and its recommendations and 13 poster presentations

included on a multimedia CD-R available through the APL-UW Library (libraryapl.washington.edu).
DTIC
Conferences; Geology; Geophysics; Ocean Bottom; Oceanography; Seismology; Underwater Acoustics

20040171066 Tidewater Atlantic Research, Washington, DC
Identification and Evaluation of Submerged Magnetic Anomalies Deadmans Island Santa Rosa County, Florida
Watts, Gordon P.; Tubby, Raymond; Apr. 23, 2004; 61 pp.; In English
Contract(s)/Grant(s): DACW01-03-T-0048
Report No.(s): AD-A426963; COESAM/PDEI-04-002; No Copyright; Avail: CASI; A04, Hardcopy

The U.S. Army Corps of Engineers, Mobile District (USACE-M) has proposed installing a shoreline protection system at Deadmans Island, Santa Rosa County, Florida. This work entails the placement of a wall of vinyl sheetpile offshore of the island and the planting of vegetation on the island itself. Because of the archaeological sensitivity of the island, the USACE-M requested that an underwater remote sensing and terrestrial survey be carried out in the areas to be affected by construction activities. That investigation was conducted by personnel from Panamerican Consultants, Inc. (PCI) in August 2002. The results of that research identified a total of 17 magnetic anomalies. Four of those anomalies were located in the sheetpile alignment and were recommended for further investigation. As a consequence of PCI's investigation, the USACE-M issued a request for additional investigation to identify and assess the four potentially significant anomalies to be affected by the construction. That additional research was conducted by archaeologists from Tidewater Atlantic Research Inc. (TAR), of Washington, North Carolina. Field research was carried out between 23 and 24 Aug 2003. Assessment of the targets consisted of a systematic search of the bottom surface either by wading or diving with a hydraulic jet probe and/or induction dredge. The results of the investigation revealed that all four were generated by modern debris or material possibly associated with the marine railway or fertilizer plant established on Town Point during the late 19th and early 20th centuries. Anomalies 1 and 3 were identified as debris consisting of railroad iron, pilings, wire rope, and chain. Anomalies 9 and 13 were identified as coils of wire and structural material: dock structures and a barge. Besides the barge, all of the materials appeared to be fragmentary and retained little of their original fabric. Probing in the vicinity of the targets revealed no additional cultural materials. (58 re7
DTIC
Cultural Resources; Detection; Florida; Magnetic Anomalies; Ocean Bottom; Surveys; Target Acquisition; Target Recognition

20040171129 NASA Marshall Space Flight Center, Huntsville, AL, USA
Spatially Varying Spectrally Thresholds for MODIS Cloud Detection
Haines, S. L.; Jedlovec, G. J.; Lafontaine, F.; [2004]; 1 pp.; In English; 13th Conference on Satellite Meteorology and Oceanography, 20-24 Sep. 2004, Norfolk, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

The EOS science team has developed an elaborate global MODIS cloud detection procedure, and the resulting MODIS product (MOD35) is used in the retrieval process of several geophysical parameters to mask out clouds. While the global application of the cloud detection approach appears quite robust, the product has some shortcomings on the regional scale, often over determining clouds in a variety of settings, particularly at night. This over-determination of clouds can cause a reduction in the spatial coverage of MODIS derived clear-sky products. To minimize this problem, a new regional cloud detection method for use with MODIS data has been developed at NASA's Global Hydrology and Climate Center (GHCC). The approach is similar to that used by the GHCC for GOES data over the continental USA. Several spatially varying thresholds are applied to MODIS spectral data to produce a set of tests for detecting clouds. The thresholds are valid for each MODIS orbital pass, and are derived from 20-day composites of GOES channels with similar wavelengths to MODIS. This paper and accompanying poster will introduce the GHCC MODIS cloud mask, provide some examples, and present some preliminary validation.
Author
MODIS (Radiometry); Clouds (Meteorology); Earth Observing System (EOS); Detection; Geophysics; Hydrology; Climatology; Emission Spectra

20040171131 NASA Marshall Space Flight Center, Huntsville, AL, USA
Near Real-time Derived Products from MODIS
Suggs, Ron; Jedlovec, Gary; Haines, Stephanie; [2004]; 1 pp.; In English; 13th Conference on Satellite Meteorology, 20-24 Sep. 2004, Norfolk, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

As part of the Short-term Prediction Research Transition (SPoRT) program at NASA/MSFC, near real-time total precipitable water and land/sea surface temperature products from MODIS, on NASA's Terra and Aqua satellites, are being derived from a subset of MODIS channels with spectral characteristics similar to those planned for the GOES-R ABI. Under the SPoRT program these products are made available to several NWS Forecast Offices to assist in the preparation of short-term forecasts. This transition activity, from research to operations, serves to prepare forecasters for the next generation of satellite observing capabilities through real-time, hands-on applications to their forecast problems. The derived products are produced from a physical retrieval algorithm which can be applied to polar or geostationary measurements. The algorithm is a perturbation solution of the radiation transfer equation for a nonscattering atmosphere requiring first-guess temperature and moisture profiles. For this application first-guess information is obtained from the latest model forecasts. The utility of this retrieval approach is that it provides a near real-time high resolution update of a model's forecasted parameter allowing forecasters to validate and monitor the performance of the model's forecast. The poster will provide a description of the retrieval methodology and examples of the derived products. Case studies will also be presented comparing these products with those obtained from the Earth Observing System (EOS) MODIS science team algorithms.
Author
MODIS (Radiometry); Real Time Operation; NASA Programs; Precipitation (Meteorology)

20040171135 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Network Performance Measurements for NASA's Earth Observation System
Loiacono, Joe; Gormain, Andy; Smith, Jeff; [2004]; 33 pp.; In English
Contract(s)/Grant(s): NAS5-01909; Copyright; Avail: CASI; A03, Hardcopy

NASA's Earth Observation System (EOS) Project studies all aspects of planet Earth from space, including climate change, and ocean, ice, land, and vegetation characteristics. It consists of about 20 satellite missions over a period of about a decade. Extensive collaboration is used, both with other US. agencies (e.g., National Oceanic and Atmospheric Administration (NOA), USA Geological Survey (USGS), Department of Defense (DoD), and international agencies (e.g., European Space Agency (ESA), Japan Aerospace Exploration Agency (JAXA)), to improve cost effectiveness and obtain otherwise unavailable data. Scientific researchers are located at research institutions worldwide, primarily government research facilities and research universities. The EOS project makes extensive use of networks to support data acquisition, data production, and data distribution. Many of these functions impose requirements on the networks, including throughput and availability. In order to verify that these requirements are being met, and be pro-active in recognizing problems, NASA conducts on-going performance measurements. The purpose of this paper is to examine techniques used by NASA to measure the performance of the networks used by EOSDIS (EOS Data and Information System) and to indicate how this performance information is used.
Author
Earth Observing System (EOS); NASA Space Programs; Communication Networks; Earth Sciences

20040171142 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Inter-Comparison of Terra and Aqua MODIS
Xiong, X.; Salomonson, V. V.; Sun, J.; Wu, A.; Barnes, W.; Guenther, B.; [2004]; 1 pp.; In English; CEOS-IVOS Workshop on the Intercomparison of Large Scale Optical Sensors, 12-14 Oct. 2004, Noordwijk, Netherlands; Copyright; Avail: Other Sources; Abstract Only

Nearly identical copies of the Moderate Resolution Imaging Spectroradiometer (MODIS) have been operating on-board the NASA's Earth Observing System (EOS) Terra and Aqua satellites since their launches in December 1999 and May 2002, respectively. Each MODIS has 20 reflective solar bands (RSB) with center wavelengths ranging from 0.41 to 2.1 micrometers and 16 thermal emissive bands (TEB) from 3.7 to 14.4 micrometers. The absolute radiometric accuracy requirements (1 sigma) at the typical spectral radiance levels are plus or minus 2% for the RSB for the RSB reflectance factors and plus or minus 5% for the RSB radiance products. With few exceptions, the TEB requirements are plus or minus 1%. The sensor's on-orbit radiometric calibration is performed by the on-board calibrators, including a solar diffuser (SD) and a solar diffuser stability monitor (SDSM) system for the RSB and a V-groove flat panel blackbody (BB) for the TEB. In addition, the Moon has been extensively used by both Terra and Aqua MODIS to support their on-orbit calibration and characterization. This paper presents MODIS lunar calibration methodology and inter-comparison of Terra and Aqua MODIS in the VIS/NIR spectral regions. Current results from lunar observations show that the calibration difference between the two sensors is less than plus or minus 1%. Also discussed in this paper are the approaches and results of inter-comparison of Terra and Aqua MODIS in the TEB

using closely matched thermal infrared (TIR) channels on the Advanced Very High Resolution Radiometer (AVHRR) at 11 and 12 micrometers.
Author
MODIS (Radiometry); Terra Spacecraft; Earth Observing System (EOS); NASA Programs

20040171150 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Validation of SCIAMACHY Radiances and Ozone Products Using Ground and Space Observations
Hilsenrath, E.; Bhartia, P. K.; Bojkov, B. R.; Kowalewski, M.; Labow, G.; Ahmad, Z.; [2004]; 1 pp.; In English; 2nd Workshop on Atmospheric Chemistry Validation, 3-7 May 2004, Frascati, Italy; Copyright; Avail: Other Sources; Abstract Only

Validation of SCIAMACHY data products are is key element for the detecting a stratospheric ozone recovery, which is a high priority for environmental research and environmental policy. Models predict an ozone recovery at a much lower rate than the measured depletion rate observed to date. Therefore improved precision of the satellite and ground ozone observing systems are required over the long term to verify its recovery. We show that validation of satellite radiances from space and from the ground can be an effective means for correcting long term drifts of backscatter type satellite measurements such as SCIAMACHY and can be used to cross calibrate all BUV instruments in orbit (TOMS, SBUV/2, GOME, OMI, GOME-2, OMPS). This method bypasses the retrieval algorithms used for both satellite and ground based measurements that are normally used to validate and correct the satellite data. This approach however requires well calibrated instruments and an accurate radiative transfer model that accounts for aerosols. In addition to comparing radiances, validation of SCIAMACHY ozone products will conducted by comparing total and profile ozone with TOMS and SBUV/2.
Author
Satellite-Borne Instruments; Ultraviolet Spectrometers; Ozonometry

20040171155 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Surface-Satellite Measurements for Atmospheric Radiative Transfer (SMART)and Chemical, Optical and Microphysical Measurements of In-Situ Troposphere (COMMIT) Research Activities
Tsay, Si-Chee; [2004]; 1 pp.; In English; Third International Ocean Atmosphere Conference, 27-30 Jun. 2004, Beijing, China; No Copyright; Avail: Other Sources; Abstract Only

The GSFC SMART consists of a suite of remote sensing instruments, including many commercially available radiometers, spectrometer, interferometer, and three in-house developed inskuments: micro-pulse lidar (MPL), scanning microwave radiometer (SMiR), and sun-sky-surface photometer (S(sup 3)). SMART cover the spectral range from UV to microwave, and passive to active remote sensing. This is to enrich the EOS-like research activities (i.e., EOS validation, innovative investigations, and long-term local environmental observations). During past years, SMART has been deployed in many NASA supported field campaigns to collocate with satellite nadir overpass for intercomparisons, and for initializing model simulations. Built on the successful experience of SMART, we are currently developing a new ground-based in-situ sampling package, COMMIT, including measurements of trace gases (CO, SO2, NOx, and O3,) concentrations, fine/coarse particle sizers and chemical composition, single- and three-wavelength nephelometers, and surface meteorological probes. COMMIT is built for seeking a relationship between surface in-situ measurements and boundary layer characteristics. This is to enrich EOS-like research on removing boundary layer signal from the entire column from space observation - to deduce the stable (less variability) free-troposphere observations. The COMMIT will try its best to link the chemical, microphysical, and optical properties of the boundary layer with radiation. The next major activities for SMART-COMMIT are scheduled for 2004-2006 in BASE-ASIA and EAST-AIRE. The expected close collaboration of BASE-ASIA with various research projects in Asia (i.e., ABC in South Asia, led by Ramanathan et al.; EAST-AIRE in East Asia, led by Li et al.; and APEX in Northeast Asia, led by Nakajima et al.) will definitely provide a better understanding of the impact of the biomass burning and air pollutants on regional-to-global climate, hydrological and carbon cycles, and tropospheric chemistry in Asia.
Author
In Situ Measurement; Microwave Radiometers; Radiative Transfer; Remote Sensing; Troposphere; Atmospheric Chemistry; Optical Measurement; Satellite Observation

20040171157 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Cloud Coverage and Height Distribution from the GLAS Polar Orbiting Lidar: Comparison to Passive Cloud Retrievals
Spinhime, J. D.; Palm, S. P.; Hlavka, D. L.; Hart, W. D.; Mahesh, A.; [2004]; 1 pp.; In English; International Radiation Symposium, 23-28 Aug. 2004, Pusan, Korea, Republic of; No Copyright; Avail: Other Sources; Abstract Only

The Geoscience Laser Altimeter System (GLAS) began full on orbit operations in September 2003. A main application of the two-wavelength GLAS lidar is highly accurate detection and profiling of global cloud cover. Initial analysis indicates that cloud and aerosol layers are consistently detected on a global basis to cross-sections down to 10(exp -6) per meter. Images of the lidar data dramatically and accurately show the vertical structure of cloud and aerosol to the limit of signal attenuation. The GLAS lidar has made the most accurate measurement of global cloud coverage and height to date. In addition to the calibrated lidar signal, GLAS data products include multi level boundaries and optical depth of all transmissive layers. Processing includes a multi-variable separation of cloud and aerosol layers. An initial application of the data results is to compare monthly cloud means from several months of GLAS observations in 2003 to existing cloud climatologies from other satellite measurement. In some cases direct comparison to passive cloud retrievals is possible. A limitation of the lidar measurements is nadir only sampling. However monthly means exhibit reasonably good global statistics and coverage results, at other than polar regions, compare well with other measurements but show significant differences in height distribution. For polar regions where passive cloud retrievals are problematic and where orbit track density is greatest, the GLAS results are particularly an advance in cloud cover information. Direct comparison to MODIS retrievals show a better than 90% agreement in cloud detection for daytime, but less than 60% at night. Height retrievals are in much less agreement. GLAS is a part of the NASA EOS project and data products are thus openly available to the science community (see http://glo.gsfc.nasa.gov). Author

Climatology; Cloud Cover; Cloud Height Indicators; Geophysics; Laser Altimeters; Optical Radar; Polar Orbits

20040171159 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Intelligent Systems Technologies and Utilization of Earth Observation Data

Ramapriyan, H. K.; McConaughy, G. R.; Morse, H. S.; [2004]; 4 pp.; In English; IGARSS, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: CASI; A01, Hardcopy

The addition of raw data and derived geophysical parameters from several Earth observing satellites over the last decade to the data held by NASA data centers has created a data rich environment for the Earth science research and applications communities. The data products are being distributed to a large and diverse community of users. Due to advances in computational hardware, networks and communications, information management and software technologies, significant progress has been made in the last decade in archiving and providing data to users. However, to realize the full potential of the growing data archives, further progress is necessary in the transformation of data into information, and information into knowledge that can be used in particular applications. Sponsored by NASA s Intelligent Systems Project within the Computing, Information and Communication Technology (CICT) Program, a conceptual architecture study has been conducted to examine ideas to improve data utilization through the addition of intelligence into the archives in the context of an overall knowledge building system (KBS). Potential Intelligent Archive concepts include: 1) Mining archived data holdings to improve metadata to facilitate data access and usability; 2) Building intelligence about transformations on data, information, knowledge, and accompanying services; 3) Recognizing the value of results, indexing and formatting them for easy access; 4) Interacting as a cooperative node in a web of distributed systems to perform knowledge building; and 5) Being aware of other nodes in the KBS, participating in open systems interfaces and protocols for virtualization, and achieving collaborative interoperability.

Author

Earth Observing System (EOS); Technology Utilization; Data Acquisition; Artificial Intelligence

20040171173 NASA Goddard Space Flight Center, Greenbelt, MD, USA

MODIS In-flight Calibration Methodologies

Xiong, X.; Barnes, W.; [2004]; 1 pp.; In English; CEOS-IVOS Workshop on the lntercornparison of Large Scale Optical Sensors, 12-14 Oct. 2004, Noordwijk, Netherlands; No Copyright; Avail: Other Sources; Abstract Only

MODIS is a key instrument for the NASA's Earth Observing System (EOS) currently operating on the Terra spacecraft launched in December 1999 and Aqua spacecraft launched in May 2002. It is a cross-track scanning radiometer, making measurements over a wide field of view in 36 spectral bands with wavelengths from 0.41 to 14.5 micrometers and providing calibrated data products for science and research communities in their studies of the Earth s system of land, oceans, and atmosphere. A complete suite of on-board calibrators (OBC) have been designed for the instruments in-flight calibration and characterization, including a solar diffuser (SD) and solar diffuser stability monitor (SDSM) system for the radiometric calibration of the 20 reflective solar bands (RSB), a blackbody (BB) for the radiometric calibration of the 16 thermal emissive bands (TEB), and a spectro-radiometric calibration assembly (SRCA) for the spatial (all bands) and spectral (RSB only) characterization. This paper discusses MODIS in-flight Cali bration methodologies of using its on-board calibrators. Challenging issues and examples of tracking and correcting instrument on-orbit response changes are presented, including SD

degradation (20% at 412nm, 12% at 466nm, and 7% at 530nm over four and a half years) and response versus scan angle changes (10%, 4%, and 1% differences between beginning of the scan and end of the scan at 412nm, 466nm, and 530nm) in the VIS spectral region. Current instrument performance and lessons learned are also provided.
Author
Calibrating; MODIS (Radiometry); Earth Observing System (EOS); Spacecraft Instruments; Onboard Equipment

20040171207 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Malaria Modeling using Remote Sensing and GIS Technologies
Kiang, Richard; [2004]; 1 pp.; In English; Remote Sensing, GIS and Infectious Diseases Workshop, 14-15 Jun. 2004, Bangkok, Thailand; No Copyright; Avail: Other Sources; Abstract Only

Malaria has been with the human race since the ancient time. In spite of the advances of biomedical research and the completion of genomic mapping of Plasmodium falciparum, the exact mechanisms of how the various strains of parasites evade the human immune system and how they have adapted and become resistant to multiple drugs remain elusive. Perhaps because of these reasons, effective vaccines against malaria are still not available. Worldwide, approximately one to three millions deaths are attributed to malaria annually. With the increased availability of remotely sensed data, researchers in medical entomology, epidemiology and ecology have started to associate environmental and ecological variables with malaria transmission. In several studies, it has been shown that transmission correlates well with certain environmental and ecological parameters, and that remote sensing can be used to measure these determinants. In a NASA project, we have taken a holistic approach to examine how remote sensing and GIs can contribute to vector and malaria controls. To gain a better understanding of the interactions among the possible promoting factors, we have been developing a habitat model, a transmission model, and a risk prediction model, all using remote sensing data as input. Our objectives are: 1) To identify the potential breeding sites of major vector species and the locations for larvicide and insecticide applications in order to reduce costs, lessen the chance of developing pesticide resistance, and minimize the damage to the environment; 2) To develop a malaria transmission model characterizing the interactions among hosts, vectors, parasites, landcover and environment in order to identify the key factors that sustain or intensify malaria transmission, and 3) To develop a risk model to predict the occurrence of malaria and its transmission intensity using epidemiological data and satellite-derived or ground-measured environmental and meteorological data.
Author
Epidemiology; Genome; Parasitic Diseases; Remote Sensing; Mathematical Models; Geographic Information Systems

20040171213 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Challenging Issues for On-orbit Calibration in the VIS and NIR
Xiong, X.; Waluschka, E.; Salomonson, V. V.; Wolfe, R.; Barnes, W.; Guenther, B.; [2004]; 1 pp.; In English; CALCON (Conference on Characterization and Radiometric Calibration for Remote Sensing), 23-26 Aug. 2004, Logan, UT, USA; Copyright; Avail: Other Sources; Abstract Only

On-orbit calibration of Earth-observing sensors in the VIS and NIR spectral regions is usually performed using the sensors on-board devices such as internal lamp(s) or solar diffuser plate(s) to provide calibration parameters. For sensors with no (or with less reliable) on-board calibrators, lunar calibration or ground validation approaches are often used. Each of these has its own set of problems that need to be fully addressed in order to support high quality on-orbit calibration and characterization. Some science products, such as Ocean color, may impose more stringent requirements that demand greater calibration precision. This paper uses MODIS as an example to illustrate challenging issues involved in VIS and NIR on-orbit calibration. It focuses on the solar diffuser (SD) calibration approach, including the effects due to SD BRF, SD attenuation screen(s), and earthshine. The impact of optics (solar diffuser and scan mirror) on-orbit degradation, including changes in the sensor s response versus scan angle (RVS), on the calibration and subsequent data quality is also discussed.
Author
Near Infrared Radiation; Earth Observing System (EOS); Visible Spectrum; Onboard Equipment

20040171223 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Application of Bayesian Classification to Content-Based Data Management
Lynnes, Christopher; Berrick, S.; Gopalan, A.; Hua, X.; Shen, S.; Smith, P.; Yang, K-Y.; Wheeler, K.; Curry, C.; [2004]; 1 pp.; In English; NASA's Earth Science Technology Conference, 22-24 Jun. 2004, Palo Alto, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The high volume of Earth Observing System data has proven to be challenging to manage for data centers and users alike.

At the Goddard Earth Sciences Distributed Active Archive Center (GES DAAC), about 1 TB of new data are archived each day. Distribution to users is also about 1 TB/day. A substantial portion of this distribution is MODIS calibrated radiance data, which has a wide variety of uses. However, much of the data is not useful for a particular user's needs: for example, ocean color users typically need oceanic pixels that are free of cloud and sun-glint. The GES DAAC is using a simple Bayesian classification scheme to rapidly classify each pixel in the scene in order to support several experimental content-based data services for near-real-time MODIS calibrated radiance products (from Direct Readout stations). Content-based subsetting would allow distribution of, say, only clear pixels to the user if desired. Content-based subscriptions would distribute data to users only when they fit the user's usability criteria in their area of interest within the scene. Content-based cache management would retain more useful data on disk for easy online access. The classification may even be exploited in an automated quality assessment of the geolocation product. Though initially to be demonstrated at the GES DAAC, these techniques have applicability in other resource-limited environments, such as spaceborne data systems.
Author
Bayes Theorem; Classifications; Data Management; Earth Sciences

20040171250 NASA Goddard Space Flight Center, Greenbelt, MD, USA
ICESat Observations of Arctic Sea Ice: A First Look
Kwok, Ron; Zwally, H. Jay; Yi, Dong-Hui; [2004]; 9 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

Analysis of near-coincident ICESat and RADARSAT imagery shows that the retrieved elevations from the laser altimeter are sensitive to new openings (containing thin ice or open water) in the sea ice cover as well as to surface relief of old and first-year ice. The precision of the elevation estimates, measured over relatively flat sea ice, is approx. 2 cm Using the thickness of thin-ice in recent openings to estimate sea level references, we obtain the sea-ice free-board along the altimeter tracks. This step is necessitated by the large uncertainties in the time-varying sea surface topography compared to that required for accurate determination of free-board. Unknown snow depth introduces the largest uncertainty in the conversion of free-board to ice thickness. Surface roughness is also derived, for the first time, from the variability of successive elevation estimates along the altimeter track Overall, these ICESat measurements provide an unprecedented view of the Arctic Ocean ice cover at length scales at and above the spatial dimension of the altimeter footprint.
Author
Arctic Ocean; Ice, Cloud and Land Elevation Satellite; Data Processing; Surface Roughness

20040171258 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Satellite Observed Changes in the Arctic
Comiso, Josefino C.; Parkinson, Claire L.; Physics Today; June 2004; 16 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The Arctic is currently considered an area in transformation. Glaciers have been retreating, permafrost has been diminishing, snow covered areas have been decreasing, and sea ice and ice sheets have been thinning. This paper provides an overview of the unique role that satellite sensors have contributed in the detection of changes in the Arctic and demonstrates that many of the changes are not just local but a pan-Arctic phenomenon. Changes from the upper atmosphere to the surface are discussed and it is apparent that the magnitude of the trends tends to vary from region to region and from season to season. Previous reports of a warming Arctic and a retreating perennial ice cover have also been updated, and results show that changes are ongoing. Feedback effects that can lead to amplification of the signals and the role of satellite data in enhancing global circulation models are also discussed.
Author
Arctic Regions; Atmospheric Circulation; Atmospheric Models; Glaciers; Ice

20040171262 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Merging the MODIS and RUCL Monthly Snow-Cover Records
Hall, Dorothy K.; Foster, James L.; Robinson, David A.; Riggs, George A.; [2004]; 6 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium 2004, 20-24 Sep. 2004, Anchorage, AK, USA
Contract(s)/Grant(s): NOAA-NA-06GP0566; NAG5-11403; No Copyright; Avail: CASI; A02, Hardcopy

Monthly time series from two satellite snow-cover records are merged to study the construction of a climate-data record for the Northern Hemisphere, and its limitations.
Author
MODIS (Radiometry); Climatology; Snow Cover; Records; Algorithms

20040171275 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Hour of Spectacular Visualization

Hasler, Arthur F.; [2004]; 1 pp.; In English; Electronic Theater Presentation, 27 Oct. - 14 Nov. 2004, Bangkok, Thailand; No Copyright; Avail: Other Sources; Abstract Only

The NASA/NOAA Electronic Theater presents Earth science observations and visualizations from space in a historical perspective. Fly in from outer space to the Far East and down to Beijing and Bangkok. Zooms through the Cosmos to the site of the 2004 Summer Olympic games in Athens using 1 m IKONOS 'Spy Satellite' data. Contrast the 1972 Apollo 17 'Blue Marble' image of the Earth with the latest US and International global satellite images that allow us to view our Planet from any vantage point. See the latest spectacular images from NASA/NOAA remote sensing missions like Terra, GOES, TRMM, SeaWiFS, & Landsat 7, of typhoons/hurricanes and fires in California and around the planet. See how High Definition Television (HDTV) is revolutionizing the way we do science communication. Take the pulse of the planet on a daily, annual and 30-year time scale. See daily thunderstorms, the annual greening of the northern hemisphere land masses and Oceans, fires in Africa, dust storms in Iraq, and carbon monoxide exhaust from global burning. See visualizations featured on Newsweek, TIME, National Geographic, Popular Science covers & National & International Network TV. Spectacular new global visualizations of the observed and simulated atmosphere & Oceans are shown. See the currents and vortexes in the Oceans that bring up the nutrients to feed tiny plankton and draw the fish, whales and fishermen. See the how the ocean blooms in response to El Nino/La Nina climate changes. The Etheater will be presented using the latest High Definition TV (HDTV) and video projection technology on a large screen. See the global city lights, showing population concentrations in the US, Africa, and Asia observed by the 'night-vision' DMSP satellite.

Author

Earth Sciences; High Definition Television; NASA Programs; Visual Observation

20040171397 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The GLAS Polar Orbiting Lidar Experiment: First Year Results and Available Data

Spinhirne, James D.; Welton, E. Judd; Palm, Stephen P.; Hart, William D.; Hlavka, Dennis; Mahesh, Ashwin; Lancaster, Redgie S.; January 2004; 4 pp.; In English; International Laser Radar Conference, Matera, Italy; Copyright; Avail: CASI; A01, Hardcopy

The first polar orbiting satellite lidar instrument, the Geoscience Laser Altimeter System (GLAS), was launched in 2003 and is approaching six months of data operations. As part of the NASA Earth Observing System (EOS) project, the GLAS instrument is intended as a laser sensor fulfilling complementary requirements for several earth science disciplines including atmospheric and surface applications on the Ice, Cloud and Land Elevation Satellite. In this paper we present examples of atmospheric measurement results and explain access to data for the international science community.

Author

Space Based Radar; Optical Radar; Satellite-Borne Instruments; Laser Altimeters

20040171424 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Global, Multi-Satellite Precipitation Analysis at Fine Time Scales using TRMM Plus other Satellites

Adler, Robert; [2004]; 1 pp.; In English; The New Rain Rate Retrieval Algorithms, 10-11 Mar. 2003, Osaka, Japan; No Copyright; Avail: Other Sources; Abstract Only

A TRMM-based 3-hr analyses that uses TRMM observations to calibrate polar-orbit microwave observations from SSM/I (and other satellites, including AMSR on AQUA and ADEOS II) and geosynchronous IR observations is described. The various calibrated observations are combined into a final, 3-hr resolution map. This TRMM standard product will be available for the entire TRMM period (January 1998-present) in 2003 as product 3B-42 of the TRMM Version 6. A real-time version of this merged product is being produced and is available on the U.S. TRMM web site (trmm.gsfc.nasa.gov) at 0.25 degrees latitude-longitude resolution over the latitude range from 50 degrees N-50 degrees S. Examples will be shown, including its use in monitoring flood conditions and in relating weather-scale patterns to climate-scale patterns. Incorporation of this approach into the Global Precipitation Climatology Project (GPCP) will also be discussed.

Author

Precipitation (Meteorology); Remote Sensing; Climatology; Trmm Satellite

20040171433 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Spatial and Temporal Distribution of Tropospheric Clouds and Aerosols Observed by MODIS Onboard the Terra and Aqua Satellites

King, Michael D.; Platnick, Steven; Remer, Lorraine A.; Kaufman, Yoram J.; [2004]; 1 pp.; In English; 8th International Global Atmospheric Chemistry Conference, 4-9 Sep. 2004, Christchurch, New Zealand; No Copyright; Avail: Other Sources; Abstract Only

Remote sensing of cloud and aerosol optical properties is routinely obtained using the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard the Terra and Aqua satellites. Techniques that are being used to enhance our ability to characterize the global distribution of cloud and aerosol properties include well-calibrated multispectral radiometers that rely on visible, near-infrared, and thermal infrared channels. The availability of thermal channels to aid in cloud screening for aerosol properties is an important additional piece of information that has not always been incorporated into sensor designs. In this paper, we describe the radiative properties of clouds as currently determined from satellites (cloud fraction, optical thickness, cloud top pressure, and cloud effective radius), and highlight the global and regional cloud microphysical properties currently available for assessing climate variability and forcing. These include the latitudinal distribution of cloud optical and radiative properties of both liquid water and ice clouds, as well as joint histograms of cloud optical thickness and effective radius for selected geographical locations around the world. In addition, we will illustrate the radiative and microphysical properties of aerosol particles that are currently available from space-based observations, and show selected cases in which aerosol particles are observed to modify the cloud optical properties.

Author

Aerosols; Cloud Physics; MODIS (Radiometry); Spatial Distribution; Temporal Distribution; Troposphere; Terra Spacecraft

20040171463 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Analysis of Summer 2002 Melt Extent on the Greenland Ice Sheet using MODIS and SSM/I Data

Hall, Dorothy K.; Williams, Richard S., Jr.; Steffen, Konrad; Chien, Y. L.; Foster, James L.; Robinson, David A.; Riggs, George A.; [2004]; 1 pp.; In English; Presenation at IGARSS '04, 19-25 Sep. 2004, Anchorage, AK, USA; Copyright; Avail: Other Sources; Abstract Only

Previous work has shown that the summer of 2002 had the greatest area of snow melt extent on the Greenland ice sheet ever recorded using passive-microwave data. In this paper, we compare the 0 degree isotherm derived from the Moderate-Resolution Imaging Spectroradiometer (MODIS) instrument, with Special Sensor Microwave/Imager (SSM/I)-derived melt, at the time of the maximum melt extent in 2002. To validate the MODIS-derived land-surface temperatures (LSTs), we compared the MODIS LSTs with air temperatures from nine stations (using 11 different data points) and found that they agreed to within 2.3 plus or minus 2.09 C, with station temperatures consistently lower than the MODIS LSTs. According to the MODIS LST, the maximum surface melt extended to approximately 2300 m in southern Greenland; while the SSM/I measurements showed that the maximum melt extended to nearly 2700 m in southeastern Greenland. The MODIS and SSM/I data are complementary in providing detailed information about the progression of surface and near-surface melt on the Greenland ice sheet.

Author

Microwave Imagery; MODIS (Radiometry); Remote Sensing; Summer; Melting; Snow; Greenland

20040171509 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Estimation of Fire Emissions from Satellite-Based Measurements

Ichoku, Charles; Kaufman, Yoram J.; [2004]; 1 pp.; In English; 2004 American Geophysical Union Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Biomass burning is a worldwide phenomenon affecting many vegetated parts of the globe regularly. Fires emit large quantities of aerosol and trace gases into the atmosphere, thus influencing the atmospheric chemistry and climate. Traditional methods of fire emissions estimation achieved only limited success, because they were based on peripheral information such as rainfall patterns, vegetation types and changes, agricultural practices, and surface ozone concentrations. During the last several years, rapid developments in satellite remote sensing has allowed more direct estimation of smoke emissions using remotely-sensed fire data. However, current methods use fire pixel counts or burned areas, thereby depending on the accuracy of independent estimations of the biomass fuel loadings, combustion efficiency, and emission factors. With the enhanced radiometric range of its 4-micron fire channel, the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor, which flies aboard both of the Earth Observing System EOS) Terra and Aqua Satellites, is able to measure the rate of release of fire radiative energy (FRE) in MJ/s (something that older sensors could not do). MODIS also measures aerosol distribution. Taking advantage of these new resources, we have developed a procedure combining MODIS fire and aerosol products to derive

FRE-based smoke emission coefficients (C(e), in kg/MJ) for different regions of the globe. These coefficients are simply used to multiply FRE from MODIS to derive the emitted smoke aerosol mass. Results from this novel methodology are very encouraging. For instance, it was found that the smoke total particulate mass emission coefficient for the Brazilian Cerrado ecosystem (approximately 0.022 kg/MJ) is about twice the value for North America, Western Europe, or Australia, but about 50% lower than the value for southern Africa.
Author
Remote Sensing; Satellite Observation; MODIS (Radiometry); Earth Observing System (EOS); Biomass Burning; Smoke; Aerosols

20040171511 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Remote Measurements of Snowfalls in Wakasa Bay, Japan with Airborne Millimeter- wave Imaging Radiometer and Cloud Radar
Wang, J. R.; Austin, R.; Liu, G. S.; Racette, P. E.; [2004]; 1 pp.; In English; IGARSS 2004, 20-24 Sep. 2004, Anchorage, AK, USA; Copyright; Avail: Other Sources; Abstract Only

In this paper we explore the application of combined millimeter-wave radar and radiometry to remotely measure snowfall. During January-February of 2003, a field campaign was conducted with the NASA P-3 aircraft in Wakasa Bay, Japan for the validation of the AMSRE microwave radiometer on board the Aqua satellite. Among the suite of instruments-on board the P-3 aircraft were the Millimeter-wave Imaging Radiometer (MIR) from the NASA Goddard Space Flight Center and the 94 GHz Airborne Cloud Radar (ACR) which is co-owned and operated by NASA Jet Propulsion Laboratory/University of Massachusetts. MIR is a total power, across-track scanning radiometer that measures radiation at the frequencies of 89, 150, 183.3 +/- 1, 183.3 +/- 3, 183.3 +/-7, 220, and 340 GHz. The MIR has flown many successful missions since its completion in May 1992. ACR is a newer instrument and flew only a few times prior to the Wakasa Bay deployment. These two instruments which are particularly well suited for the detection of snowfall functioned normally during flights over snowfall and excellent data sets were acquired. On January 14, 28, and 29 flights were conducted over snowfall events. The MIR and ACR detected strong signals during periods of snowfall over ocean and land. Results from the analysis of these concurrent data sets show that (1) the scattering of millimeter-wave radiation as detected by the MIR is strongly correlated with ACR radar reflectivity profiles, and (2) the scattering is highly frequency-dependent, the higher the frequency the stronger the scattering. Additionally, the more transparent channels of the MIR (e.g., 89, 150, and 220 GHz) are found to display ambiguous signatures of snowfall because of their exposure to surface features. Thus, the snowfall detection and retrievals of snowfall parameters, such as the ice water path (IWP) and median mass diameter (D(me)) are best conducted at the more opaque channels near 183.3 GHz and 340 GHz. Retrievals of IWP and D(me) using the MIR measurements at 183.3 and 340 GHZ are currently in progress, and the results will be compared with those derived from the ACR reflectivity profiles. Implication from this comparison will be discussed.
Author
Airborne Radar; Snow; Ice; Microwave Radiometers; P-3 Aircraft; Remote Sensing

20040171512 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MODIS On-orbit Calibration: Key Issues and Approaches
Xiong, Xian-Xiong; Sun, J.; Chiang, K.; Che, N.; Barnes, W.; [2004]; 1 pp.; In English; SPIE Meeting, 2-6 Aug. 2004, Denver, CO, USA; Copyright; Avail: Other Sources; Abstract Only

MODIS, one of the key instruments for the NASA's Earth Observing System (EOS), is currently operating on both the Terra and Aqua spacecraft making continuous observations in 36 spectral bands from 0.4 to 14.4 micrometers. A complete suite of on-board calibrators (OBC) have been designed for the instruments' on-orbit calibration and characterization, including a solar diffuser (SD) and solar diffuser stability monitor (SDSM) system for the radiometric calibration of the 20 reflective solar bands (RSB), a blackbody (BB) for the radiometric calibration of the 16 thermal emissive bands (TEZB), and a spectro-radiometric calibration assembly (SRCA) for the sensors' spatial and spectral characterization. The task of continuously performing high quality on-orbit calibration and characterization of all 36 spectral bands with a total of 490 detectors located on four focal plane assemblies is extremely challenging. The use of a large two-sided paddle wheel scan mirror with a +/- 55 deg scan angle range and a retractable pinhole attenuation screen in front of the SD panel for calibrating the high gain bands have resulted in additional unanticipated complexity. In this paper, we describe some of the key issues in the Terra and Aqua MODIS on-orbit calibration and characterization, and discuss the methods developed to solve these problems or to reduce their impact on the Level 1B calibration algorithms. Instrument performance and current issues are also presented.
Author
MODIS (Radiometry); Calibrating; Earth Observing System (EOS); Spectral Bands; Satellite Observation

20040171526 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA's Earth Observing System (EOS): Observing the Atmosphere, Land, Oceans, and Ice from Space

King, Michael D.; [2004]; 1 pp.; In English; AMS Conference on Satellite Meteorology and Oceanography, 19-23 Sep. 2004, Norfolk, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Earth Observing System (EOS) is a space-based observing system comprised of a series of satellite sensors by which scientists can monitor the Earth, a Data and Information System (EOSDIS) enabling researchers worldwide to access the satellite data, and an interdisciplinary science research program to interpret the satellite data. During this year, the last of the first series of EOS missions, Aura, was launched. Aura is designed exclusively to conduct research on the composition, chemistry, and dynamics of the Earth's upper and lower atmosphere, employing multiple instruments on a single spacecraft. Aura is the third in a series of major Earth observing satellites to study the environment and climate change and is part of NASA's Earth Science Enterprise. The first and second missions, Terra and Aqua, are designed to study the land, oceans, atmospheric constituents (aerosols, clouds, temperature, and water vapor), and the Earth's radiation budget. The other seven EOS spacecraft include satellites to study (i) land cover & land use change, (ii) solar irradiance and solar spectral variation, (iii) ice volume, (iv) ocean processes (vector wind and sea surface topography), and (v) vertical variations of clouds, water vapor, and aerosols up to and including the stratosphere. Aura's chemistry measurements will also follow up on measurements that began with NASA's Upper Atmosphere Research Satellite and continue the record of satellite ozone data collected from the TOMS missions. In this presentation I will describe how scientists are using EOS data to examine the health of the earth's atmosphere, including atmospheric chemistry, aerosol properties, and cloud properties, with a special but not exclusive look at the latest earth observing mission, Aura.

Author

Earth Observing System (EOS); EOS Data and Information System; Satellite Instruments; Satellite Observation

20040171529 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Aerosol Extinction-to-Backscatter Ratio Database Derived from the NASA Micro-Pulse Lidar Network: Applications for Space-based Lidar Observations

Welton, Ellsworth J.; Campbell, James R.; Spinhime, James D.; Berkoff, Timothy A.; Holben, Brent; Tsay, Si-Chee; Bucholtz, Anthony; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

Backscatter lidar signals are a function of both backscatter and extinction. Hence, these lidar observations alone cannot separate the two quantities. The aerosol extinction-to-backscatter ratio, S, is the key parameter required to accurately retrieve extinction and optical depth from backscatter lidar observations of aerosol layers. S is commonly defined as 4*pi divided by the product of the single scatter albedo and the phase function at 180-degree scattering angle. Values of S for different aerosol types are not well known, and are even more difficult to determine when aerosols become mixed. Here we present a new lidar-sunphotometer S database derived from Observations of the NASA Micro-Pulse Lidar Network (MPLNET). MPLNET is a growing worldwide network of eye-safe backscatter lidars co-located with sunphotometers in the NASA Aerosol Robotic Network (AERONET). Values of S for different aerosol species and geographic regions will be presented. A framework for constructing an S look-up table will be shown. Look-up tables of S are needed to calculate aerosol extinction and optical depth from space-based lidar observations in the absence of co-located AOD data. Applications for using the new S look-up table to reprocess aerosol products from NASA's Geoscience Laser Altimeter System (GLAS) will be discussed.

Author (revised)

Optical Radar; Aerosols; Data Bases

20040171530 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Polarization Ray Trace Model of the MODIS Instrument

Waluschka, Eugene; Xiong, Jack; Esaias, Wayne E.; Voss, Kenneth; Souaidia, Nordine; Pellicori, Samuel; Moyer, David; Guenther, Bruce; Barnes, William, et al.; [2004]; 1 pp.; In English; 2004 Conference on Characterization and Radiometry Calibration for Remote Sensing, August 2004, UT, USA; No Copyright; Avail: Other Sources; Abstract Only

Sunlight reflected from the earth is, to a certain extent, polarized. Radiometers, such as the MODIS instrument on board the TERRA and AQUA spacecraft, are to a certain extent polarizers. Accurate radiometric measurements must take into account both the polarization state of the scene and the polarization sensitivity of the measuring instrument. The measured polarization characteristics of the MODIS instruments are contained in various radiometric models. Continued use of these radiometric math models, over a number of years, have shown where these models can be improved. Currently a MODIS polarization ray trace model has been created which models the thin film structure on the optical elements. This approach is

described and modeled and measured instrument polarization sensitivity results presented.
Author
Polarization Characteristics; Mathematical Models; Thin Films; Sunlight; Radiometers; MODIS (Radiometry)

20040171532 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Aura Mission, Science and Validation
Hilsenrath, Ernest; Schoeberl, Mark; Douglass, Anne; [2004]; 1 pp.; In English; 35th COSPAR Scientific Assembly, 18-25 Jul. 2004, Paris, France; No Copyright; Avail: Other Sources; Abstract Only

The EOS-Aura Mission is designed to answer three basic questions concerning the Earth's atmosphere: 1) Is stratospheric ozone recovering as predicted, 2) what are the processes that control air quality, and 3) how is changes in atmospheric chemistry effecting climate? Aura's four instruments work synergistically and are dedicated to answering these questions. Aura's instruments observe from the ultraviolet to the microwave region and view in the nadir and limb. This capability allows measurements of all the critical source, radical, and reservoir gases in the stratosphere to be observed globally on a daily basis. Aura will also continue the TOMS global ozone trend record. Observations in the troposphere will be conducted with the best spatial resolution and coverage ever achieved from space. Key pollutants, including aerosols, gases, and their precursors are the primary targets for Aura. High vertical resolution measurements will be made in the vicinity of the tropopause to better define the interactions of the UT/LS and particularly determine the amount downward transport of ozone and upward transport.of water vapor where both contribute to climate forcing. Aura will also measure aerosols in the stratosphere and troposphere where they play a role in ozone chemistry, air quality and climate. Aura data will be used by several environmental agencies for their decision support systems. Aura post launch validation program includes an augmented ground based measurement program which include the operational networks which measure atmospheric composition. Validation will be conducted under a range of geophysical conditions and throughout most of Aura s observing range. Balloon campaigns will conducted from a variety of latitudes and numerous aircraft missions are planned to cover an altitude range from the middle troposphere to the lower stratosphere and include in-situ and remote sensors. Long duration Un-inhabited aircraft are also being considered as part of the validation program. Substantial collaboration is planned with other chemistry satellite missions such as Envisat, SciSat, and Odin in order to make efficient use of resources and to provide continuity among these missions.
Author
Atmospheric Chemistry; Atmospheric Composition; Remote Sensors; Stratosphere; Environmental Research Satellites; Satellite Observation; Meteorological Satellites

20040171533 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Status of the Landsat Data Continuity Mission
Irons, James R.; Ochs, William R.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Efforts to begin implementing a successor mission to Landsat 7, called the Landsat Data Continuity Mission (LDCM), suffered a set back in 2003. NASA and the Department of Interior (DOI)/U.S. Geological Survey (USGS) currently manage the Landsat Program as an interagency partnership. The two agencies had planned to purchase data meeting LDCM specifications from a privately owned and commercially operated satellite system beginning in March, 2007. This approach represented a departure from the traditional procurement of a government owned and operated satellite system. NASA, however, cancelled a Request-for-Proposals (RFP) for providing the required data after an evaluation of proposals received from private industry. NASA concluded that the proposals failed to meet a key objective and expectation of the RFP, namely, to form a fair and equitable partnership between the Government and private industry. Alternative strategies for implementing an LDCM are now under consideration. The Executive Office of the President formed an interagency working group on the LDCM following the RFP cancellation. The working group is considering other options for implementing a successor system to Landsat 7 consistent with the Land Remote Sensing Policy Act of 1992 (Public Law 102-555). This Act lists four management options for consideration: 1) private sector funding and management; 2) an international consortium; 3) funding and management by the U.S. Government; and 4) a cooperative effort between the US. Government and the private sector. The working group is currently attempting to minimize the risk of a Landsat data gap through development of a strategy that leads to a Landsat 7 successor mission. The selected strategy and the status of the mission will be presented at the Symposium.
Author
Landsat 7; Landsat Satellites; Geological Surveys; Remote Sensing

20040171564 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Status of the Geostationary Spectrograph (GeoSpec) for Earth and Atmospheric Science Applications
Janz, Scott; Hilsenrath, Ernest; Mount, G.; Brune, W.; Heath, D.; [2004]; 1 pp.; In English; 35th COSPAR Scientific Assembly, 18-25 Jul. 2004, Paris, France; Copyright; Avail: Other Sources; Abstract Only

GeoSpec will support future satellite mission concepts in the Atmospheric Sciences and in Land and Ocean Sciences by providing time-resolved measurements of both chemically linked atmospheric trace gas concentrations of important molecules such as O3, NO2, CH2O and SO2 and at the same time coastal and ocean pollution events, tidal effects, and the origin and evolution of aerosol plumes. The instrument design concept in development is a dual spectrograph covering the WMS wavelength region of 310-500 nm and the VIS/NIR wavelength region of 480-900 nm coupled to all reflective telescope and high sensitivity PIN/CMOS area detector. The goal of the project is to demonstrate a system capable of making moderate spatial resolution (750 meters at nadir) hyperspectral measurements (0.6 to 1.2 nm resolution) from a geostationary orbit. This would enable studies of time-varying pollution and coastal change processes with a temporal resolution of 5 minutes on a regional scale to 1 hour on a continental scale. Other spatial resolutions can be supported by varying the focal length of the input telescope. Scientific rationale and instrument design and status will be presented.
Author
Atmospheric Chemistry; Aerosols; Atmospheric Composition; Atmospheric Physics; Spectrographs

20040171582 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New Earth Science Data and Access Methods
Moses, John F.; Weinstein, Beth E.; Farnham, Jennifer; [2004]; 4 pp.; In English; IGARSS 2004, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: CASI; A01, Hardcopy

NASA's Earth Science Enterprise, working with its domestic and international partners, provides scientific data and analysis to improve life here on Earth. NASA provides science data products that cover a wide range of physical, geophysical, biochemical and other parameters, as well as services for interdisciplinary Earth science studies. Management and distribution of these products is administered through the Earth Observing System Data and Information System (EOSDIS) Distributed Active Archive Centers (DAACs), which all hold data within a different Earth science discipline. This paper will highlight selected EOS datasets and will focus on how these observations contribute to the improvement of essential services such as weather forecasting, climate prediction, air quality, and agricultural efficiency. Emphasis will be placed on new data products derived from instruments on board Terra, Aqua and ICESat as well as new regional data products and field campaigns. A variety of data tools and services are available to the user community. This paper will introduce primary and specialized DAAC-specific methods for finding, ordering and using these data products. Special sections will focus on orienting users unfamiliar with DAAC resources, HDF-EOS formatted data and the use of desktop research and application tools.
Author
Earth Sciences; Biochemistry; Geophysics; EOS Data and Information System; Earth Observing System (EOS)

20040171601 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NASA's L-band Imaging Scatterometer
Rincon, Rafael F.; Hildebrand, Peter; Hilliard, Larry; Mead, James; [2004]; 1 pp.; In English; 2004 IEEE Geoscience and Remote Sensing Symposium, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA's L-band Imaging Scatterometer (LIS) is a new state-of-the-art radar that combines electronic beam scanning and digital beam forming technologies. The instrument will be used in conjunction with ESTAR instruments to demonstrate the capability of making concurrent measurements of radar cross-section and radiometric brightness temperature from common targets. The main application of the instrument is the measurement of ocean salinity and soil moisture. This paper will discuss the instrument design, calibration, and digital beamforming techniques.
Author
Scatterometers; Beamforming; Imaging Techniques; Soil Moisture

20040171625 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Development of the Synthetic Aperture Radiometer ESTAR and the Next Generation
LeVine, David M.; Haken, Michael; Swift, Calvin T.; [2004]; 4 pp.; In English; IGARSS 2004, 20-24 Sep. 2004, Anchorage, AK, USA; Copyright; Avail: CASI; A01, Hardcopy

ESTAR is a research instrument built to develop the technology of aperture synthesis for passive remote sensing of Earth from space. Aperture synthesis is an interferometric technology that addresses the problem of putting large antenna apertures in space to achieve the spatial resolution needed for remote sensing at long wavelengths ESTAR was a first step (synthesis only across track and only at horizontal polarization). The development has progressed to a new generation instrument that

is dual polarized and does aperture synthesis in two dimensions. Among the plans for the future is technology to combine active and passive remote sensing.
Author
Remote Sensing; Synthetic Apertures; Microwave Radiometers; Technology Utilization

20040171633 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Space Geodesy Monitoring Mass Transport in Global Geophysical Fluids
Chao, Benjamin F.; [2004]; 1 pp.; In English; Gravity, Geoid and Space Missions, 30 Aug. - 3 Sep. 2004, Poroto, Portugal; No Copyright; Avail: Other Sources; Abstract Only

Mass transports occurring in the atmosphere-hydrosphere-cryosphere-solid Earth-core system (the 'global geophysical fluids') are important geophysical phenomena. They occur on all temporal and spatial scales. Examples include air mass and ocean circulations, oceanic and solid tides, hydrological water and idsnow redistribution, mantle processes such as post-glacial rebound, earthquakes and tectonic motions, and core geodynamo activities. The temporal history and spatial pattern of such mass transport are often not amenable to direct observations. Space geodesy techniques, however, have proven to be an effective tool in monitorihg certain direct consequences of the mass transport, including Earth's rotation variations, gravitational field variations, and the geocenter motion. Considerable advances have been made in recent years in observing and understanding of these geodynamic effects. This paper will use several prominent examples to illustrate the triumphs in research over the past years under a 'Moore's law' in space geodesy. New space missions and projects promise to further advance our knowledge about the global mass transports. The latter contributes to our understanding of the geophysical processes that produce and regulate the mass transports, as well as of the solid Earth's response to such changes in terms of Earth's mechanical properties.
Author
Geodesy; Satellite Observation; Geodetic Surveys; Geophysical Fluids

20040171659 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Overview of NASA's Earth Science Data Systems
McDonald, Kenneth; [2004]; 1 pp.; In English; CEOS WGISS 18th Meeting, 29 Aug. - 11 Sep. 2004, Hong Kong, Wuhan and Beijing, China; No Copyright; Avail: Other Sources; Abstract Only

For over the last 15 years, NASA's Earth Science Enterprise (ESE) has devoted a tremendous effort to design and build the Earth Observing System (EOS) Data and Information System (EOSDIS) to acquire, process, archive and distribute the data of the EOS series of satellites and other ESE missions and field programs. The development of EOSDIS began with an early prototype to support NASA data from heritage missions and progressed through a formal development process to today's system that supports the data from multiple missions including Landsat 7, Terra, Aqua, SORCE and ICESat. The system is deployed at multiple Distributed Active Archive Centers (DAACs) and its current holdings are approximately 4.5 petabytes. The current set of unique users requesting EOS data and information products exceeds 2 million. While EOSDIS has been the centerpiece of NASA's Earth Science Data Systems, other initiatives have augmented the services of EOSDIS and have impacted its evolution and the future directions of data systems within the ESE. ESDIS had an active prototyping effort and has continued to be involved in the activities of the Earth Science Technology Office (ESTO). In response to concerns from the science community that EOSDIS was too large and monolithic, the ESE initiated the Earth Science Information Partners (ESP) Federation Experiment that funded a series of projects to develop specialized products and services to support Earth science research and applications. Last year, the enterprise made 41 awards to successful proposals to the Research, Education and Applications Solutions Network (REASON) Cooperative Agreement Notice to continue and extend the ESP activity. The ESE has also sponsored a formulation activity called the Strategy for the Evolution of ESE Data Systems (SEEDS) to develop approaches and decision support processes for the management of the collection of data system and service providers of the enterprise. Throughout the development of its earth science data systems, NASA has had an active collaboration with a number of interagency and international partners. One of the mechanisms that has been extremely helpful in initiating and promoting this collaboration has been NASA's participation in the Committee on Earth Observation Satellites (CEOS) and its Working Group on Information Systems and Services (WGISS). The CEOS members, working together, have implemented an International Directory Network that enables users to locate collections of earth science data held by the international community and an International Catalog System to search and order specific data products. CEOS WGISS has also promoted the international interest in the Open GIS Consortium s specifications that further advance the access and use of geospatial

data and the interoperation of GTS components. These are just a few highlights of the benefits that member agencies gain from CEOS participation.
Author
Earth Observing System (EOS); Earth Observations (From Space); Data Acquisition; EOS Data and Information System; NASA Programs; Information Systems

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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*.

20040170653 Georgia Inst. of Tech., Atlanta, GA
Model and Subcomponent Development for a Pulse- Combustor-Driven Microgenerator
Zinn, Ben T.; Glezer, Ari; Allen, Mark G.; Menon, Suresh; Taylor, David; Aug. 31, 2004; 76 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAG55-98-1-0284
Report No.(s): AD-A426539; E-25-Y77; ARO-38564.1-EG-MUR; No Copyright; Avail: Defense Technical Information Center (DTIC)

This project focused on an investigation of the feasibility of pulse-combustion-based micro heat engines for electrical power generation. The micro heat engines to be studied are based on a reciprocating free piston that is driven by a periodic pulse combustion process, resulting in high levels of integration of the mechanical and electrical functionality of the engine (i.e., the same piston performs both the fuel-to-mechanical energy conversion as well as the mechanical-to-electrical energy conversion). Other than the reciprocating piston, the only other moving parts in the engine are optional fuel control and passive flapper mixing valves. For the first three years of the program the major emphasis was on performing modeling and numerical simulations of the pulse combustors and free piston generator and the development of magnetic generator topology. The issues that are addressed in this report include small-scale pulse combustion phenomena and modeling of combustion in high surface-to-volume ratio environments; design of ultracompact permanent-magnet-based and non-permanent-magnet-based variable reluctance generators; and selection of appropriate materials and fabrication sequences for the realization of the various subcomponents of the generator using micromachining technology as appropriate. In the final two years of the program the emphasis switched to fabrication and testing of critical subcomponents to assess the advantages and limitations of the application of micromachining technology to the fabrication of microgenerator subcomponents. (2 tables, 71 figures, numerous refs.)
DTIC
Combustion Chambers; Electric Generators; Electric Power Plants; Fabrication; Internal Combustion Engines; Microminiaturization; Piston Engines

20040170723 Northrop Grumman Corp., El Segundo, CA
Power Aware Smart Submunitions (PASS)
Barnett, Jeffrey A.; Jun. 2004; 155 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-02-C-4001; Proj-M761
Report No.(s): AD-A426771; TR-04-040; AFRL-IF-WP-TR-2004-1545; No Copyright; Avail: CASI; A08, Hardcopy

The Power-Aware Smart Submunitions (PASS) project is funded through the DARPA IPTO Power Aware Computing and Communications (PACC) program. PASS has investigated the application of power-aware technology to military systems in general and smart submunitions in particular. This final report presents a summary of that investigation as well as several research notes included in the appendix. The research notes include a technology roadmap, description of how applications must interact with the power-management infrastructure, and methods to manage energy versus delay tradeoffs. Our conclusion is that application developers must determine the connections between energy management and optimization of mission goals; technology that performs energy conservation is valuable but, by itself, is not competent to optimally achieve mission objectives.
DTIC
Energy Conservation; Energy Policy; Ordnance

20040171089 Nevada Univ., Reno, NV, USA, Oak Ridge National Lab., TN
Adaptive Full-Spectrum Solar Energy Systems. Cross-Cutting R&D on Adaptive Full-Spectrum Solar Energy Systems for More Efficient and Affordable Use of Solar Energy in Buildings and Hybrid Photobioreactors
Wood, B. D.; Muhs, J. D.; Oct. 2003; In English
Report No.(s): DE2004-822376; No Copyright; Avail: National Technical Information Service (NTIS)

This R&D project is a three year team effort to develop a hybrid solar lighting (HSL) system that transports day light from a paraboloidal dish concentrator to a luminaire via a large core polymer fiber optic. The luminaire can be a device to distribute sunlight into a space for the production of algae or it can be a device that is a combination of day lighting and fluorescent lighting for office lighting. In this project, the sunlight is collected using a one-meter paraboloidal concentrator dish with two-axis tracking. The secondary mirror consists of eight planar-segmented mirrors that direct the visible part of the spectrum to eight fibers (receiver) and subsequently to eight luminaires. This results in about 8,200 lumens incident at each fiber tip. Each fiber can illuminate about 16.7 m(sup 2) (180 ft(sup 2)) of office space. The IR spectrum is directed to a thermophotovoltaic array to produce electricity. This report emphasizes the design of the thermophotovoltaic receiver and the whole system simulation model.
NTIS
Solar Energy; Research and Development; Buildings; Visible Spectrum

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ENVIRONMENT POLLUTION

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

20040170422 California Energy Commission, Sacramento, CA, USA
West Coast Regional Carbon Sequestration Partnership
Myer, L.; Surles, T.; Birkinshaw, K.; Jan. 2004; 20 pp.; In English
Report No.(s): DE2004-823377; No Copyright; Avail: Department of Energy Information Bridge

The West Coast Regional Carbon Sequestration Partnership is one of seven partnerships which have been established by the US Department of Energy (DOE) to evaluate carbon dioxide capture, transport and sequestration (CT&S) technologies best suited for different regions of the country. The West Coast Region comprises Arizona, California, Nevada, Oregon, Washington, and the North Slope of Alaska. Led by the California Energy Commission, the West Coast Partnership is a consortium of over thirty five organizations, including state natural resource and environmental protection agencies; national labs and universities; private companies working on CO(sub 2) capture, transportation, and storage technologies; utilities; oil and gas companies; nonprofit organizations; and policy/governance coordinating organizations. In an eighteen month Phase I project, the Partnership will evaluate both terrestrial and geologic sequestration options.
NTIS
Carbon Dioxide; Environment Protection

20040170430 Environmental Protection Agency, Kansas City, KS, USA
Second Five-Year Review Report for Fairfield Coal Gasification Plant Site, City of Fairfield, Jefferson County, Iowa
Sep. 2002; 52 pp.; In English
Report No.(s): PB2005-100915; No Copyright; Avail: CASI; A04, Hardcopy

The major components of the selected remedy for the Fairfield Coal Gasification Plant site in Fairfield, Iowa, included: excavation and incineration of source material and contaminated soil; bioremediation pilot study and potential full-scale in-situ bioremediation of subsurface contaminated soil and ground water; placement of deed restrictions on site property; and extraction and treatment of contaminated ground water. The site achieved construction completion with the signing of the Preliminary Close Out Report on August 24, 1995. The trigger for this five-year review was the previous five-year review report submitted on October 3, 1997.
NTIS
Hazardous Materials; Toxicity; Water Pollution

20040170432 National Oceanic and Atmospheric Administration, Research Triangle Park, NC, USA, Delaware State Dept. of Natural Resources, Dover, DE, USA
CMAQ Modeling for Air Toxics at Fine Scales: A Prototype Study
Majeed, M. A.; Ching, J.; Otte, T.; Reynolds, L.; Tang, R.; 2004; In English
Report No.(s): PB2005-100836; EPA/600/A-04/101; NERL RTP-AMD-04-073; No Copyright; Avail: National Technical Information Service (NTIS)

Toxic Air Pollutants (TAPs) exhibit considerable spatial and temporal variability across urban areas. Therefore, the ability of chemical transport models (CTMs), e.g., Community Multi-scale Air Quality (CMAQ), to reproduce the spatial and temporal variability is needed to perform accurate exposure assessments and to be able to identify and characterize toxic hot spots, which are the areas that experience high levels of air toxics (AT). These areas are not only impacted by local sources but also by the secondary production of many air toxics compounds due to photochemistry and long range transport. For example, formaldehyde and acetaldehyde have secondary components of oxidant photochemistry. The source distribution, photochemistry, dry and wet deposition of these compounds are scale dependent. Therefore, in order to capture the spatial and temporal variability of these compounds and identify air toxic hot spots, it is necessary to perform air quality simulations at fine scales.
NTIS
Air Pollution; Toxicity; Air Quality

20040170433 Environmental Protection Agency, Research Triangle Park, NC
Year-Long MM5 Evaluation Using a Model Evaluation Toolkit
Gilliam, R. C.; Bhave, P. V.; Pleim, J. E.; Otte, T. L.; 2004; 6 pp.; In English
Report No.(s): PB2005-100835; EPA/600/A-04/098; NERL-RTP-AMD-04-069; No Copyright; Avail: CASI; A02, Hardcopy
Results from air quality simulations have far reaching implications and are closely linked to the meteorological model that drives chemical transport, diffusion, and reactions. Therefore, modeling systems should be evaluated by considering all components involved (Hogrefe et al. 2001). This connection can be achieved by linking the statistical analysis of the air quality model with that of the meteorological model in space and time, in order to distinguish how errors in the air chemistry model are attributed to errors in the meteorological modeling. An evaluation tool is being developed that will (1) provide a better sense of meteorological model uncertainty; (2) standardize the evaluation process; (3) manage a large volume of evaluation results; (4) make the overall evaluation process more efficient and less labor intensive; and (5) directly link the meteorological model evaluation with the air quality model evaluation. This study applies the model evaluation tool to a year-long simulation using the Pennsylvania State University (PSU) / National Center for Atmospheric Research (NCAR) fifth-generation mesoscale model (MM5). The results are reported not only to examine the MM5 model performance, but also to demonstrate the effectiveness of the evaluation system. Among the evaluations presented are surface-based 2 m temperature, 10 m wind, 2 m mixing ratio, precipitation and solar radiation. Wind profiler data are also used to examine the ability of MM5 to simulate the vertical distribution of wind over the diurnal cycle. Additionally, a direct linkage between the meteorological and the air quality model performance, specifically ozone and nitrate, is attempted. Only a brief summary of the results are presented here because of manuscript length requirements.
NTIS
Air Quality; Meteorology

20040170434 Environmental Protection Agency, Research Triangle Park, NC, National Oceanic and Atmospheric Administration, Research Triangle Park, NC, USA
PREMAQ: A New Pre-Processor to CMAQ for Air-Quality Forecasting
Otte, T. L.; Pouliot, G.; Pleim, J. E.; 2004; 6 pp.; In English
Report No.(s): PB2005-100834; EPA/600/A-04/097; NERL-RTP-AMD-04-067; No Copyright; Avail: CASI; A02, Hardcopy
On 6 May 2003, NOAA and the U.S. EPA signed a Memorandum of Understanding and a Memorandum of Agreement to expand their collaboration toward the development of a national air-quality forecasting (AQF) system. NOAA and the U.S. EPA are jointly developing various components of the AQF system, which will be run operationally at the NOAA's National Weather Service. Currently, the AQF system is based on the National Centers for Environmental Prediction's (NCEP's) Eta Model and the U.S. EPA's Community Multiscale Air Quality (CMAQ) Modeling System. The Eta/CMAQ AQF system is designed to provide twice daily numerical guidance for air-quality forecasts for the U.S. Initially, the capability includes surface-level O3 forecasts of hourly average concentrations as well as 8-h averages. Future expansion of the system will include PM2.5. The current forecast domain is the Northeast U.S. using a 12-km horizontal grid spacing on a Lambert Conformal map projection.
NTIS
Air Quality; Forecasting

20040170435 Environmental Protection Agency, Research Triangle Park, NC
What's New in MCIP2 (Meteorology-Chemistry Interface Processor)
Otte, T. L.; 2004; 6 pp.; In English
Report No.(s): PB2005-100833; EPA/600/A-04/0909; NERL/RTP-AMD-04-068; No Copyright; Avail: CASI; A02, Hardcopy

The Community Multiscale Air Quality Model's (CMAQ's) Meteorology-Chemistry Interface Processor (MCIP2) has been updated for release from the Community Modeling and Analysis System (CMAS) Center. Several changes have been included in the new release, MCIP Version 2.3, ranging from new capabilities to minor bug fixes. The full suite of changes is described below. Users should refer to the CHANGES file in the MCIP2 release to find out which routines are impacted by each change to MCIP2.
NTIS
Air Quality; Environment Models

20040170441 National Energy Technology Lab., Pittsburgh, PA
Database and Analytical Tool Development for the Management of Data Derived from US DOE (NETL) Funded Fine Particulate (PM(2.5)) Research
2004; 40 pp.; In English
Report No.(s): DE2004-822379; No Copyright; Avail: Department of Energy Information Bridge
Advanced Technology Systems, Inc. (ATS) was contracted by the U. S. Department of Energy's National Energy Technology Laboratory (DOE-NETL) to develop a state-of-the-art, scalable and robust web-accessible database application to manage the extensive data sets resulting from the DOE-NETL-sponsored ambient air monitoring programs in the upper Ohio River valley region. The data management system was designed to include a web-based user interface that will allow easy access to the data by the scientific community, policy- and decision-makers, and other interested stakeholders, while providing detailed information on sampling, analytical and quality control parameters. In addition, the system will provide graphical analytical tools for displaying, analyzing and interpreting the air quality data.
NTIS
Particulates; Data Management; Energy Technology; Data Bases

20040170475 Aerodyne Research, Inc., Billerica, MA, USA
Atmospheric Pressure Flow Reactor/Aerosol Mass Spectrometer Studies of Tropospheric Aerosol Nucleation and Growth Kinetics
Worsnop, D. R.; 2001; 14 pp.; In English
Report No.(s): DE2004-809421; No Copyright; Avail: Department of Energy Information Bridge
The objective of this program was to determine the mechanisms and rates of growth and transformation and growth processes that control secondary aerosol particles in both the clear and polluted troposphere. The experimental plan coupled an aerosol mass spectrometer (AMS) with a chemical ionization mass spectrometer to provide simultaneous measurement of condensed and particle phases. The first task investigated the kinetics of tropospheric particle growth and transformation by measuring vapor accretion to particles.
NTIS
Aerosols; Troposphere

20040171085 Department of Energy, Los Alamos, CA, USA
Department of Energy Finding of No Significant Impact for the Proposed Nonproliferation and International Security Center at Los Alamos National Laboratory, Los Alamos, New Mexico
2004; 54 pp.; In English
Report No.(s): DE2004-768515; No Copyright; Avail: Department of Energy Information Bridge
The Environmental Assessment (EA) for the Nonproliferation and International Security Center (the Center) at Los Alamos National Laboratory (DOE/EA-l 238) (attached) provides sufficient evidence and analysis to determine that a Finding Of No Significant Impact is appropriate for this action. The EA documents the evidence and analysis in the following chapters: 1. Purpose and Need for Agency Action; 2. Description of Alternatives; and 3. Affected Environment and Environmental Consequences.
NTIS
Alternatives; Spent Fuels; Environmental Surveys

20040171088 ALSTOM Power, Inc.,, Windsor, CT, USA
Ultra Low NO(x) Integrated System for NO(x) Emission Control From Coal-Fired Boilers
Richards, G. H.; Maney, C. Q.; Borio, R. W.; Dec. 30, 2002; In English
Report No.(s): DE2004-821200; PPL-02-CT-19; No Copyright; Avail: National Technical Information Service (NTIS)

ALSTOM Power Inc.'s Power Plant Laboratories, working in concert with ALSTOM Power's Performance Projects Group, has teamed with the U.S. Department of Energy's National Energy Technology Laboratory (DOE NETL) to conduct a comprehensive study to develop/evaluate low-cost, efficient NOx control technologies for retrofit to pulverized coal fired utility boilers. The objective of this project was to develop retrofit NOx control technology to achieve less than 0.15 lb/MMBtu NOx (for bituminous coals) and 0.10 lb/MMBtu NOx (for subbituminous coals) from existing pulverized coal fired utility boilers at a cost which is at least 25% less than SCR technology. Efficient control of NOx is seen as an important, enabling step in keeping coal as a viable part of the national energy mix in this century, and beyond.
NTIS
Nitrogen Oxides; Coal; Boilers

20040171090 Texas Univ., Austin, TX, USA
CO2 Capture by Absorption with Potassium Carbonate
Rochelle, G. T.; Chen, E.; Cullinane, J. T.; Hilliard, M.; Oyenekan, B.; Oct. 31, 2003; In English
Report No.(s): DE2004-822371; No Copyright; Avail: National Technical Information Service (NTIS)
The objective of this work is to improve the process for CO2 capture by alkanolamine absorption/stripping by developing an alternative solvent, aqueous K2CO3 promoted by piperazine. A rigorous thermodynamic model has been further developed with a stand-alone FORTRAN code to represent the CO2 vapor pressure and speciation of the new solvent. The welding work has initiated and will be completed for a revised startup of the pilot plant in Feburary 2004.
NTIS
Carbon Dioxide; Absorption; Potassium Compounds

20040171100 Carnegie-Mellon Univ., Pittsburgh, PA, USA
Advanced Oxidation Process. Final Report
Horwitz, C. P.; Collins, T. J.; Nov. 04, 2003; 20 pp.; In English
Report No.(s): DE2004-821583; No Copyright; Avail: Department of Energy Information Bridge
The removal of recalcitrant sulfur species, dibenzothiophene and its derivatives, from automotive fuels is an integral component in the development of cleaner burning and more efficient automobile engines. Oxidative desulfurization (ODS) wherein the dibenzothiophene derivative is converted to its corresponding sulfoxide and sulfone is an attractive approach to sulfur removal because the oxidized species are easily extracted or precipitated and filtered from the hydrocarbon phase. Fe-TAML activators of hydrogen peroxide (TAML is Tetra-Amido- Macrocyclic-Ligand) catalytically convert dibenzothiophene and its derivatives rapidly and effectively at moderate temperatures (50-60 degrees C) and ambient pressure to the corresponding sulfoxides and sulfones. The oxidation process can be performed in both aqueous systems containing alcohols such as methanol, ethanol, or t-butanol, and in a two-phase hydrocarbon/aqueous system containing tert-butanol or acetonitrile. In the biphasic system, essentially complete conversion of the DBT to its oxidized products can be achieved using slightly longer reaction times than in homogeneous solution. Among the key features of the technology are the mild reaction conditions, the very high selectivity where no over oxidation of the sulfur compounds occurs, the near stoichiometric use of hydrogen peroxide, the apparent lack of degradation of sensitive fuel components, and the ease of separation of oxidized products.
NTIS
Sulfur Compounds; Automobile Engines; Automobile Fuels

20040171102 EnviRes, LLC, Lexington, KY, USA
Reducing Ultra-Clean Transportation Fuel Costs with HyMELT (TRADE MARK) Hydrogen
Jul. 31, 2003; In English
Report No.(s): DE2004-821975; No Copyright; Avail: National Technical Information Service (NTIS)
This report describes activities for the third quarter of work performed under this agreement. Atmospheric testing was conducted as scheduled on June 5 through June 13, 2003. The test results were encouraging, however, the rate of carbon dissolution was below expectations. Additional atmospheric testing is scheduled for the first week of September 2003. Phase I of the work to be done under this agreement consists of conducting atmospheric gasification of coal using the HyMelt technology to produce separate hydrogen rich and carbon monoxide rich product stream. In addition smaller quantities of petroleum coke and a low value refinery stream will be gasified. DOE and EnviRes will evaluate the results of this work to determine the feasibility and desirability of proceeding to Phase II of the work to be done under this agreement, which is gasification of the above-mentioned feeds at a gasifier pressure of approximately 5 bar. The results of this work will be used

to evaluate the technical and economic aspects of producing ultra-clean transportation fuels using the HyMelt technology in existing and proposed refinery configurations.
NTIS
Clean Fuels; Transportation; Gasification

20040171103, Babcock and Wilcox Co., Alliance, OH, USA, Illinois State Geological Survey, Champaign, IL, USA
Advanced, Low/Zero Emission Boiler Design and Operation
Marin, O.; Chatel-Pelage, F.; Apr. 2003; 32 pp.; In English
Report No.(s): DE2004-821462; No Copyright; Avail: Department of Energy Information Bridge

This document reviews the work performed during the quarter January-March 2003. The main objectives of the project are: To demonstrate the feasibility of the full-oxy combustion with flue gas recirculation on Babcock & Wilcox's 1.5MW pilot boiler, To measure its performances in terms of emissions and boiler efficiency while selecting the right oxygen injection strategies, To perform an economical feasibility study, comparing this solution with alternate technologies, and To design a new generation, full oxy-fired boiler. The main objective of this quarter was to initiate the project, primarily the experimental tasks. The contractor and its subcontractors have defined a working plan, and the first tasks have been started. Task 1 (Site Preparation) is now in progress, defining the modifications to be implemented to the boiler and oxygen delivery system. The changes are required in order to overcome some current limitations of the existing system. As part of a previous project carried out in 2002, several changes have already been made on the pilot boiler, including the enrichment of the secondary and tertiary air with oxygen or the replacement of these streams with oxygen-enriched recycled flue gas. A notable modification for the current project involves the replacement of the primary air with oxygen-enriched flue gas. Consequently, the current oxygen supply and flue gas recycle system is being modified to meet this new requirement. Task 2 (Combustion and Emissions Performance Optimization) has been initiated with a preliminary selection of four series of tests to be performed. So far, the project schedule is on-track: site preparation (Task 1) should be completed by August 1st, 2003 and the tests (Task 2) are planned for September-October 2003. The Techno-Economic Study (Task 3) will be initiated in the following quarter.
NTIS
Boilers; Combustion Products

20040171141 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New Perspectives from Satellite and Profile Observations on Tropospheric Ozone over Africa and the Adjacent Oceans: An Indian-Atlantic Ocean Link to tbe 'Ozone Paradox'
Thompson, Anne M.; Witte, Jacquelyn C.; Diab, Roseanne D.; Thouret, Valerie; Sauvage, Bastien; Chatfield, B.; Guan, Hong; [2004]; 1 pp.; In English; IGAC Conference 2004, 4-9 Sep. 2004, Christchurch, New Zealand; Copyright; Avail: Other Sources; Abstract Only

In the past few years, tropospheric ozone observations of Africa and its adjacent ocenas have been greatly enhanced by high resolution (spatial and temporal) satellite measurements and profile data from aircraft (MOZAIC) and balloon-borne (SHADOZ) soundings. These views have demonstrated for the first time the complexity of chemical-dynamical interactions over the African continent and the Indian and Atlantic Oceans. The tropical Atlantic 'ozone paradax' refers to the observation that during the season of maximum biomass burning in west Africa north of the Intertropical Convergence Zone (ITCZ), the highest tropospheric ozone total column occurs south of the ITCZ over the tropical Atlantic. The longitudinal view of tropospheric ozone in the southern tropics from SHADOZ (Southern Hemisphere Additional Ozonesondes) soundings shown the persistence of a 'zonal-wave one' pattern that reinforces the 'ozone paradox'. These ozone features interact with dynamics over southern and northern Africa where anthropogenic sources include the industrial regions of the South African Highveld and Mideastern-Mediterranean influences, respectively. Our newest studies with satellites and soundings show that up to half the ozone pollution over the Atlantic in the January-March 'paradox' period may originate from south Asian pollution. Individual patches of pollurion over the Indian Ocean are transported upward by convective mixing and are enriched by pyrogenic, biogenic sources and lightning as they cross Africa and descend over the Atlantic. In summary, local sources, intercontinental import and export and unique regional transport patterns put Africa at a crossroads of troposheric ozone influences.
Author
Africa; Atlantic Ocean; Indian Ocean; Ozone; Satellite Observation; Troposphere

20040171148 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Biomass-Burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA)
Tsay, S.-C.; Hsu, N. C.; King, M. D.; Sun, W.-Y.; [2004]; 1 pp.; In English; 8th International Global Atmospheric Chemistry Conference, 4-9 Sep. 2004, Christchurch, New Zealand; No Copyright; Avail: Other Sources; Abstract Only

Biomass burning has been a regular practice for land clearing and land conversion in many countries, especially those in Africa, South America, and Southeast Asia. However, the unique climatology of Southeast Asia is very different than that of Africa and South America, such that large-scale biomass burning causes smoke to interact extensively with clouds during the peak-burning season of March to April. Significant global sources of greenhouse gases (e.g., CO2, CH4), chemically active gases (e.g., NO, CO, HC, CH3Br), and atmospheric aerosols are produced by biomass burning processes. These gases influence the Earth- atmosphere system, impacting both global climate and tropospheric chemistry. Some aerosols can serve as cloud condensation nuclei, which play an important role in determining cloud lifetime and precipitation, hence, altering the earth s radiation and water budget. Analyses from satellite measurements reveal the reflected solar (emitted thermal) radiation from clouds due to smoke aerosols can be reduced (enhanced) by 100 (20) Watts per square meter over the month of March 2000. In addition, the reduction in cloud spectral reflectance is large enough to lead to significant errors in satellite retrievals of cloud properties (e.g., optical thickness and effective radius). The fresh water distribution in this region is highly dependent on monsoon rainfall; in fact, the predictability of the tropical climate system is much reduced during the boreal spring. Therefore, to accurately assess the impact of smoke aerosols in this region requires continuous observations from satellites, aircraft, ground-based networks and dedicated field experiments. BASE-ASIA initiative has been proposed and will be discussed.
Author
Aerosols; Biomass Burning; Climatology; Smoke; Southeast Asia; Atmospheric Chemistry

20040171153 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Estimation of Dynamical Parameters in Atmospheric Data Sets
Wenig, Mark O.; [2004]; 1 pp.; In English; AGU Fall Meeting 2004, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

In this study a new technique is used to derive dynamical parameters out of atmospheric data sets. This technique, called the structure tensor technique, can be used to estimate dynamical parameters such as motion, source strengths, diffusion constants or exponential decay rates. A general mathematical framework was developed for the direct estimation of the physical parameters that govern the underlying processes from image sequences. This estimation technique can be adapted to the specific physical problem under investigation, so it can be used in a variety of applications in trace gas, aerosol, and cloud remote sensing. The fundamental algorithm will be extended to the analysis of multi- channel (e.g. multi trace gas) image sequences and to provide solutions to the extended aperture problem. In this study sensitivity studies have been performed to determine the usability of this technique for data sets with different resolution in time and space and different dimensions.
Author
Trace Elements; Trace Contaminants; Atmospheric Composition; Aerosols

20040171165 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Cloud and Aerosol Measurements from the GLAS Polar Orbiting Lidar: First Year Results
Spinhirne, J. D.; Palm, S. P.; Hlavka, D. L.; Hart, W. D.; Mahesh, A.; Welton, E. J.; [2004]; 1 pp.; In English; International Radiation Symposium, 23-28 Aug. 2004, Pusan, Korea, Republic of; No Copyright; Avail: Other Sources; Abstract Only

The Geoscience Laser Altimeter System (GLAS) launched in 2003 is the first polar orbiting satellite lidar. The instrument was designed for high performance observations of the distribution and optical scattering cross sections of clouds and aerosol. GLAS is approaching six months of on orbit data operation. These data from thousands of orbits illustrate the ability of space lidar to accurately and dramatically measure the height distribution of global cloud and aerosol to an unprecedented degree. There were many intended science applications of the GLAS data and significant results have already been realized. One application is the accurate height distribution and coverage of global cloud cover with one goal of defining the limitation and inaccuracies of passive retrievals. Comparison to MODIS cloud retrievals shows notable discrepancies. Initial comparisons to NOAA 14&15 satellite cloud retrievals show basic similarity in overall cloud coverage, but important differences in height distribution. Because of the especially poor performance of passive cloud retrievals in polar regions, and partly because of high orbit track densities, the GLAS measurements are by far the most accurate measurement of Arctic and Antarctica cloud cover from space to date. Global aerosol height profiling is a fundamentally new measurement from space with multiple applications. A most important aerosol application is providing input to global aerosol generation and transport models. Another is improved measurement of aerosol optical depth. Oceanic surface energy flux derivation from PBL and LCL height measurements is another application of GLAS data that is being pursued. A special area of work for GLAS data is the correction and application of multiple scattering effects. Stretching of surface return pulses in excess of 40 m from cloud propagation effects and other interesting multiple scattering phenomena have been observed. As an EOS project instrument,

GLAS data products are openly available to the science community. First year results from GLAS are summarized.
Author
Aerosols; Cloud Cover; Geophysics; Laser Altimeters; Optical Radar; Polar Orbits

20040171190 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Aerosol Sources, Absorption, and Intercontinental Transport: Synergies Among Models, Remote Sensing, and Atmospheric Measurements
Chin, Mian; Chu, Allen; Levy, Robert; Remer, Lorraine; Kaufman, Yoram; Dubovik, Oleg; Holben, Brent; Eck, Tom; Anderson, Tad; Quinn, Patricia, et al.; [2004]; 1 pp.; In English; IGAC Conference 2004, 4-9 Sep. 2004, Christchurch, New Zealand; No Copyright; Avail: Other Sources; Abstract Only

Aerosol climate forcing is one of the largest uncertainties in assessing the anthropogenic impact on the global climate system. This uncertainty arises from the poorly quantified aerosol sources, especially black carbon emissions, our limited knowledge of aerosol mixing state and optical properties, and the consequences of intercontinental transport of aerosols and their precursors. Here we use a global model GOCART to simulate atmospheric aerosols, including sulfate, black carbon, organic carbon, dust, and sea salt, from anthropogenic, .biomass burning, and natural sources. We compare the model calculated aerosol extinction and absorption with those quantities from the ground-based sun photometer measurements from AERON' at several different wavelengths and the field observations from ACE-Asia, and model calculated total aerosol optical depth and fine mode fractions with the MODIS satellite retrieval. We will also estimate the intercontinental transport of pollution and dust aerosols from their source regions to other areas in different seasons.
Author
Aerosols; Climatology; Environment Effects; MODIS (Radiometry); Air Pollution; Dust

20040171201 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dust, Pollution, and Biomass Burning Aerosols in Asian Pacific: A Column Satellite-Surface Perspective
Tsay, Si-Chee; [2004]; 1 pp.; In English; 1st Najing Institute of Meteorology and SeaSpace International Remote Sensing Symposium, 6-12 Jun. 2004, Najing, China; No Copyright; Avail: CASI; A01, Hardcopy

Airborne dusts from northern China contribute a significant part of the air quality problem and, to some extent, regional climatic impact in Asia during spring-time. However, with the economical growth in China, increases in the emission of air pollutants generated from industrial and vehicular sources will not only impact the radiation balance, but adverse health effects to humans all year round. In addition, both of these dust and air pollution clouds can transport swiftly across the Pacific reaching North America within a few days, possessing an even larger scale effect. The Asian dust and air pollution aerosols can be detected by its colored appearance on current Earth observing satellites (e.g., MODIS, SeaWiFS, TOMS, etc.) and its evolution monitored by satellites and surface network. Biomass burning has been a regular practice for land clearing and land conversion in many countries, especially those in Africa, South America, and Southeast Asia. However, the unique climatology of Southeast Asia is very different than that of Africa and South America, such that large-scale biomass burning causes smoke to interact extensively with clouds during the peak-burning season of March to April. Significant global sources of greenhouse gases (e.g., CO2, CH4), chemically active gases (e.g., NO, CO, HC, CH3Br), and atmospheric aerosols are produced by biomass burning processes. These gases influence the Earth-atmosphere system, impacting both global climate and tropospheric chemistry. Some aerosols can serve as cloud condensation nuclei, which play an important role in determining cloud lifetime and precipitation, hence, altering the earth's radiation and water budget. Biomass burning also affects the biogeochemical cycling of nitrogen and carbon compounds from the soil to the atmosphere; the hydrological cycle (i.e., run off and evaporation); land surface reflectivity and emissivity; as well as ecosystem biodiversity and stability. Two new initiatives, EAST-AIRE (East Asian Study of Tropospheric Aerosols: an International Regional Experiment) and BASE-ASIA (Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment) will be presented and discussed their contribution to better understand the impacts of aerosols on regional-to-global climate, hydrological and carbon cycles, and tropospheric chemistry.
Author
Aerosols; Air Pollution; Asia; Biomass Burning; Dust; Pacific Ocean; Satellite Surfaces; Ecosystems

20040171204 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Global Aerosol Profiling by Orbital Lidar, GLAS Results and Validation
Spinhirne, J. D.; Palm, S. P.; Hlavka, D. L.; Hart, W. D.; Mahesh, A.; Welton, E. J.; [2004]; 1 pp.; In English; Aeronet/Photon Workshop, 10-14 May 2004, Huelva, Spain; No Copyright; Avail: Other Sources; Abstract Only

The Geoscience Laser Altimeter System (GLAS) launched in 2003 is the first polar orbiting satellite lidar. The instrument was designed for high performance observations of the distribution and optical scattering cross sections of clouds and aerosol. GLAS is approaching six months of on orbit data operation. These data from thousands of orbits illustrate the ability of space lidar to accurately and dramatically measure the height distribution of global aerosol to an unprecedented degree. There were many intended science applications of the GLAS data and significant results have already been realized. profiling is a fundamentally new measurement from space with multiple applications. A most important aerosol application is providing input to global aerosol generation and transport models. Another is improved measurement of aerosol optical depth. A main approach to verify the aerosol optical depth retrieval is comparison to surface measurements by Aeronet. A special feature of the GLAS satellite bus is to rapidly point the lidar instrument at off nadir targets with less than 100 m accuracy. About a dozen selected Aeronet sites were pointed at whenever the G U S lidar came within 5 degrees of zenith. These plus a more general comparison to nearby sites support the G U S data product values. In addition the GUS data can be used to add vertical distribution information to Aeronet aerosol measurements.. As an EOS project instrument, GLAS data products are openly available to the science community. First year results from G U S are summarized.
Author
Aerosols; Clouds (Meteorology); Vertical Distribution; Scattering Cross Sections; Optical Radar

20040171322 North Dakota Univ., Grand Forks, ND, USA, North Dakota Univ., Grand Forks, ND, USA
Electrostatically Enhanced Barrier Filter Collection
Erjavec, J.; Mann, M. D.; Knutson, R. Z.; Swanson, M. L.; Collings, M. E.; Jun. 2003; In English
Report No.(s): DE2004-824751; No Copyright; Avail: National Technical Information Service (NTIS)
Integrated gasification combined cycle (IGCC) offers the potential for very high efficiency and clean electric generation. In IGCC, the product gas from the gasifier needs to be cleaned of particulate matter to avoid erosion and high-temperature corrosion difficulties arising with the turbine blades. Current methods involve cooling the gases to 100 degrees Celsius to condense alkalis and remove sulfur and particulates using conventional scrubber technology. This cool gas is then directed to a turbine for electric generation. While IGCC has the potential to reach efficiencies of over 50%, the current need to cool the product gas for cleaning prior to firing it in a turbine is keeping IGCC from reaching its full potential. The objective of the current project was to develop a highly reliable particulate collector system that can meet the most stringent turbine requirements and emission standards, can operate at temperatures above 1500 degrees Fahrenheit, is applicable for use with all U.S. coals, is compatible with various sorbent injection schemes for sulfur and alkali control, can be integrated into a variety of configurations for both pressurized gasification and combustion, increases allowable face velocity to reduce filter system capital cost, and is cost-competitive with existing technologies.
NTIS
Coal; Gasification

20040171331 California Univ., Berkeley, CA, USA, Sonoma Technology, Inc., Petaluma, CA
Interim Report for the Fresno Asthmatic Children's Environment Study (FACES)
Tager, I.; Hammond, S. K.; Mortimer, K.; Neugebauer, R.; Balmes, J. R.; Aug. 2002; 250 pp.; In English
Report No.(s): PB2005-100302; No Copyright; Avail: CASI; A11, Hardcopy
FACES is designed to examine the acute and chronic health effects of particulate matter (PM) air pollution, in combination with other ambient air pollutants and bioaerosols on children with asthma who reside in the Fresno/Clovis area. Exposure assessment will include centrally located ambient monitors as well as neighborhood, home and some personal monitors. The detailed exposure monitoring will allow FACES to evaluate which components of air pollution, in combination with biological agents, influence the natural history of asthma. The detailed descriptive data collected as part of the health assessments will allow FACES to identify biological and environmental characteristics that make some children more susceptible to the health effects of air pollution.
NTIS
Air Pollution; Asthma; Exposure

20040171332 California Univ., Irvine, CA, USA
Heterogeneous NO(sub x) Chemistry in Polluted Urban Atmospheres: Implication for the Formation of Particles and Ozone and Control Strategy Development
Finlayson-Pitts, B. J.; Wingen, L. M.; Jan. 2004; 260 pp.; In English
Report No.(s): PB2005-100303; No Copyright; Avail: CASI; A12, Hardcopy

Experimental laboratory studies of heterogeneous reactions of oxides of nitrogen were carried out using a variety of spectroscopic techniques. This included the development and application of a new chamber that combines long path infrared analysis for gases with attenuated total reflectance infrared analysis for simultaneous measurement of the chemistry occurring in the thin surface film. The reactions studied include the heterogeneous hydrolysis of NO2 to form gas phase HONO and surface-absorbed HNO3, 'renoxification' reactions of absorbed nitric acid with NO to regenerated NO2 and the effects of light on the production of gas phase HONO. The nature of the thin water film on the surface that provides the milieu for this chemistry was also explored and the changes in the film characterized as a function of relative humidity. Finally, the interaction of gas phase HONO itself with surfaces were explored and it was shown that a competition between HONO and water for surface sites is a major determinant of how much HONO is released to the gas phase. Preliminary air shed modeling of the renoxification process suggests that such chemistry may be significant in determining ozone and particle concentrations in polluted urban atmospheres and highlights the importance of including heterogeneous reactions in the boundary layer in current air shed models.
NTIS
Ozone; Air Pollution; Atmospheric Composition

20040171334 Sveriges Lantbruksuniv., Uppsala, Sweden
Effects of Speed and Road Conditions on Fuel Comsumption of Agricultural Tractor
Lundborg, M.; Aug. 2003; 62 pp.; In Swedish
Report No.(s): PB2005-100272; Copyright; Avail: National Technical Information Service (NTIS)
During transport using vehicles with combustion engine emissions are created and these are harmful for the environment. In Sweden more than one fourth of the air emissions come from the transport sector. The emissions are strongly correlated to consumed fuel. Few studies using tractors have been performed in this area and therefore it is of great interest to study this. In this work, the relation between fuel consumption and speed, mass and road conditions during transport with an agricultural tractor was studied to perform field measurement continuously. A system for continuously logging fuel consumption, speed and position was developed. The main components of the instrumentation system were a fuel flow meter, a GPS receiver, a so called 5:th wheel and a computer with the software LabView. The computer logged all measured data, processed and presented it on a screen. All data were saved in a log file.
NTIS
Fuel Consumption; Exhaust Emission

20040171337 Maryland Dept. of Natural Resources, Annapolis, MD, USA
Mercury Measurement and Characterization at Constellation Power Source Generation's Coal-Fired Units
Aug. 2004; In English
Report No.(s): PB2005-100995; PPRP-130; No Copyright; Avail: National Technical Information Service (NTIS)
There are current efforts in Maryland to model the atmospheric deposition of mercury releases from certain types of plants in Maryland, study bioaccumulation, and study the economic impacts of fish consumption advisories, to better understand the implications of mercury emissions. The program described in this report complements these existing programs by providing direct measurement of mercury emissions from coal-fired power plants in Maryland. MDE required that all coal-fired generating units in Maryland perform specific stack tests in 2003 to determine the amount and nature of their mercury emissions using a test method called the Ontario Hydro Method (ASTM Method 6784-02). Constellation Power Source Generation (CPSG) and the Maryland Department of Natural Resources Power Plant Research Program (PPRP) developed a cooperative project to expand the scope of the MDE-required testing. The focus of the cooperative project was to provide process-level data to help generators better understand how mercury changes as it passes through the combustion and flue gas stages of the plant, and so aid the facility to better design control strategies.
NTIS
Flue Gases; Mercury (Metal)

20040171340 Sensor Research and Development Corp., Orono, ME, USA
Cavity Ring-Down Spectroscopy Mercury Continuous Emission Monitor
Carter, C. C.; 2004; In English
Report No.(s): DE2004-820567; No Copyright; Avail: National Technical Information Service (NTIS)
Previous work on the detection of mercury using the cavity ring-down (CRD) technique has concentrated on the detection and characterization of the desired mercury transition. Interferent species present in flue gas emissions have been tested as well

as a simulated flue gas stream. Additionally, work has been done on different mercury species such as the elemental and oxidized forms. The next phase of the effort deals with the actual sampling system. This sampling system will be responsible for acquiring a sample stream from the flue gas stack, taking it to the CRD cavity where it will be analyzed and returning the gas stream to the stack. In the process of transporting the sample gas stream every effort must be taken to minimize any losses of mercury to the walls of the sampling system as well as maintaining the mercury in its specific state (i.e. elemental, oxidized, or other mercury compounds).
NTIS
Spectroscopy; Cavities; Exhaust Emission; Mercury Compounds

20040171344 Texas Univ., Austin, TX, USA
Design Guide for Highway Noise Barriers
Klingner, R. E.; McNerney, M. T.; Busch-Vishniac, I.; Nov. 2003; 102 pp.; In English
Report No.(s): PB2005-100965; No Copyright; Avail: CASI; A06, Hardcopy

The current TxDOT design process for highway noise barriers is reviewed. Design requirements for highway noise barriers are then presented. These include acoustical requirements, structural requirements, safety requirements, aesthetic requirements, and cost considerations. Examples are given of different highway noise barriers used in Texas. Sample plans and specifications are presented. Design requirements are broadly grouped into acoustical requirements, environmental requirements, traffic safety requirements, and structural requirements; those requirements are again presented, drawing on the material presented in the preceding chapters.
NTIS
Traffic; Noise Reduction

20040171352 Environmental Protection Agency, Washington, DC, USA
Greenhouse Effect, Sea Level Rise, and Barrier Islands: Case Study of Long Beach Island, New Jersey
Titus, J. G.; 2004; 26 pp.; In English
Report No.(s): PB2005-100940; No Copyright; Avail: CASI; A03, Hardcopy

Increasing atmospheric concentrations of carbon dioxide and other gases are expected to cause a global warming that could raise sea level a few feet in the next century. This paper examines four options by which barrier-island communities could respond, focusing on Long Beach Island, New Jersey. For the next few decades, the most common response will probably be to raise the islands in place by pumping sand onto beaches and building lots. Eventually, as costs increase, many communities may accept a gradual landward retreat. Nevertheless, federal agencies that encourage risky development, state agencies that discourage it, residents who feel entitled to subsidized coastal protection, and environmentalists insensitive to constitutional property rights will all have to compromise for a rational solution to be possible. Local officials on barrier islands should begin to hold public meetings to develop a public consensus on the appropriate response to sea level rise.
NTIS
Sea Level; Greenhouse Effect; Beaches

20040171353 Arizona State Univ., Tempe, AZ, USA
Enhancing the Atomic-Level Understanding of CO(sub2) Mineral Sequestration Mechanisms via Advanced Computational Modeling
Dec. 19, 2003; In English
Report No.(s): DE2004-822760; No Copyright; Avail: National Technical Information Service (NTIS)

The objective of this project is to use advanced first-principles simulation techniques in concert with experimental observations to develop a detailed, quantitative, atomic-level understanding of aqueous-solution serpentine carbonation mechanisms. The goal is to develop the necessary atomic-level understanding to facilitate the engineering of improved carbonation feedstock materials and reaction processes for CO2 sequestration.
NTIS
Carbon Dioxide; Minerals; Exhaust Emission; Models; Energy Technology

20040171357 Carnegie-Mellon Univ., Pittsburgh, PA
Atmospheric Aerosol Source-Receptor Relationships: The Role Of Coal-Fired Power Plants
Nov. 2003; In English
Report No.(s): DE2004-822707; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the technical progress made on the Pittsburgh Air Quality Study (PAQS) during the period of March 2003 through August 2003. Significant progress was made this project period on the source characterization, source apportionment, and deterministic modeling activities. Major accomplishments included: Development of an emission profile for an integrated coke production facility and simulations using PMCAMx for a two week period during July 2001. The emissions from the coke facility are dominated by carbonaceous compounds. Forty seven percent of the organic carbon mass was identified on a compound level basis. Polycyclic aromatic hydrocarbons were the dominant organic compound class in the coke emissions. Initial comparisons with the data collected in Pittsburgh suggest good agreement between the model predictions and observations. Single particle composition data appear useful for identifying primary sources. An example of this unique approach is illustrated using the Fe and Ce particle class with appear associated with steel production.
NTIS
Aerosols; Coal; Power Plants; Organic Compounds; Environmental Monitoring

20040171358 Reaction Engineering International, Salt Lake City, UT
Oxidation of Mercury Across SCR Catalysts in Coal-Fired Power Plants Burning Low Rank Fuels
Jul. 25, 2003; In English
Report No.(s): DE2004-822762; No Copyright; Avail: National Technical Information Service (NTIS)
This is the first Quarterly Technical Report for DOE Cooperative Agreement No: DE-FC26- 03NT41728. The objective of this program is to measure the oxidation of mercury in flue gas across SCR catalyst in a coal-fired power plant burning low rank fuels using a slipstream reactor containing multiple commercial catalysts in parallel. The Electric Power Research Institute (EPRI) and Ceramics GmbH are providing co-funding for this program. This program contains multiple tasks and good progress is being made on all fronts. During this quarter, analysis of the coal, ash and mercury speciation data from the first test series was completed. Good agreement was shown between different methods of measuring mercury in the flue gas: Ontario Hydro, semi-continuous emission monitor (SCEM) and coal composition. There was a loss of total mercury across the commercial catalysts, but not across the blank monolith. The blank monolith showed no oxidation. The data from the first test series show the same trend in mercury oxidation as a function of space velocity that has been seen elsewhere. At space velocities in the range of 6,000-7,000 hr-1 the blank monolith did not show any mercury oxidation, with or without ammonia present. Two of the commercial catalysts clearly showed an effect of ammonia. Two other commercial catalysts showed an effect of ammonia, although the error bars for the no-ammonia case are large. A test plan was written for the second test series and is being reviewed.
NTIS
Mercury (Metal); Oxidation; Catalysts; Fuels

20040171360 Cincinnati Univ., OH, USA
Dual Phase Membrane for High Temperature CO(sub 2) Separation
Lin, J. Y. S.; Dec. 2003; 18 pp.; In English
Report No.(s): DE2004-822769; No Copyright; Avail: Department of Energy Information Bridge
This project is aimed at synthesis of a new inorganic dual-phase carbonate membrane for high temperature CO2 separation. Metal-carbonate dual-phase membranes were prepared by the direct infiltration method and the synthesis conditions were optimized. The dual-phase membranes are gas-tight with helium permeance about six orders of magnitude lower than that for the metal support. Efforts were made to test seals for permeation and separation experiments for dual-phase membrane at the intermediate temperature range (about 500 degrees C) under oxidizing atmosphere. An effective new permeation cell with a metal seal was designed, fabricated and tested. The permeation setup provided leak-free sealing for the dual-phase membranes under the desired operation conditions. Though the reliable data showing high permeance for carbon dioxide with oxygen for the prepared metal-carbonate dual phase membrane has not been measured, the research efforts in improving membrane synthesis and setting up a new permeation cell with suitable seal have made it closer for one to demonstrate good dual-phase membranes for high temperature carbon dioxide separation. Research efforts were also directed towards preparation of a new ceramic-carbonate dual- phase membrane. Porous lanthanum cobaltite (LC) perovskite type oxide ceramic support with oxidation resistance better than the metal support and high electronic conductivity (1300-1500 S/cm in 400-600 degrees C), was prepared and studied as an alternative support for the dual-phase carbonate membranes. The LC powder was found not reactive with the carbonate at 600 degrees C. The porous LC disks have helium permeance and pore diameter smaller than the metal support but larger than the common a-alumina support. These results show promise to use the LC support for preparation of oxidation resistant dual-phase carbonate membranes.
NTIS
Carbon Dioxide; High Temperature; Membranes; Synthesis (Chemistry); Separation

20040171361 Reaction Engineering International, Salt Lake City, UT

Oxidation of Mercury Across SCR Catalysts in Coal-Fired Power Plants Burning Low Rank Fuels

Nov. 26, 2003; In English

Report No.(s): DE2004-822771; No Copyright; Avail: National Technical Information Service (NTIS)

This is the third Quarterly Technical Report for DOE Cooperative Agreement No: DE-FC26- 03NT41728. The objective of this program is to measure the oxidation of mercury in flue gas across SCR catalyst in a coal-fired power plant burning low rank fuels using a slipstream reactor containing multiple commercial catalysts in parallel. The Electric Power Research Institute (EPRI) and Argillon GmbH are providing co-funding for this program. This program contains multiple tasks and good progress is being made on all fronts. During this quarter, the second set of mercury measurements was made after the catalysts had been exposed to flue gas for about 2,000 hours. There was good agreement between the Ontario Hydro measurements and the SCEM measurements. Carbon trap measurements of total mercury agreed fairly well with the SCEM. There did appear to be some loss of mercury in the sampling system toward the end of the sampling campaign. NOx reductions across the catalysts ranged from 60% to 88%. Loss of total mercury across the commercial catalysts was not observed, as it had been in the March/April test series. It is not clear whether this was due to aging of the catalyst or to changes in the sampling system made between March/April and August. In the presence of ammonia, the blank monolith showed no oxidation. Two of the commercial catalysts showed mercury oxidation that was comparable to that in the March/April series. The other three commercial catalysts showed a decrease in mercury oxidation relative to the March/April series. Oxidation of mercury increased without ammonia present. Transient experiments showed that when ammonia was turned on, mercury appeared to desorb from the catalyst, suggesting displacement of adsorbed mercury by the ammonia.

NTIS

Oxidation; Catalysts; Flue Gases; Mercury (Metal)

20040171366 Florida Univ., Gainesville, FL, USA

Multifunctional (NO(x)/CO/O(2)) Solid-State Sensors for Coal Combustion Control

Wachsman, E. D.; Dec. 31, 2003; In English

Report No.(s): DE2004-824014; No Copyright; Avail: National Technical Information Service (NTIS)

The composition and microstructure of the sensing electrode are the key parameters that influence the sensing mechanism, and hence key sensor performance parameters: sensitivity, selectivity and response time. During this reporting period we investigated the effect of microstructure and the fundamental heterogeneous gas solid interactions of our NO sensor electrode material. In order to optimize the sensor electrode microstructure, powders were prepared using four different powder synthesis routes, resulting in different particle sizes distributions and BET surface areas. Different electrode processing conditions, e.g. screen-printing slurry composition, sintering schedule, etc. were also applied. In this report we demonstrate that the microstructure of electrodes, synthesized with the same composition, has a dramatic effect on both sensitivity and response time of potentiometric NO sensors. A quartz reactor and a tube furnace were built for the catalysis experiments. The installation of a quadrupole mass spectrometer (QMS) and a multi gas controller were completed. Moreover, the system for the temperature-programmed reaction (TPR) and desorption (TPD) were completed by combining the equipment. We used this heterogeneous catalysis system to determine the adsorption characteristics of O(sub 2), NO, CO, CO(sub 2), and their mixtures, on the electrode material using TPD, and related the results to sensor performance.

NTIS

Coal; Combustion Control; Solid State; Sensors; Carbon Dioxide; Carbon Monoxide; Nitrogen Dioxide

20040171374 Ohio Univ., Athens, OH, USA

Evaluation of the Emission, Transport, and Deposition of Mercury, Fine Particulate Matter, and Arsenic from Coal-Based Power Plants in the Ohio River Valley Region. Semi-Annual Technical Progress Report for the Period April 3, 2003-October 2, 2003

2004; In English

Report No.(s): DE2004-824127; No Copyright; Avail: National Technical Information Service (NTIS)

Ohio University, in collaboration with CONSOL Energy, Advanced Technology Systems, Inc (ATS) and Atmospheric and Environmental Research, Inc. (AER) as subcontractors, is evaluating the impact of emissions from coal-fired power plants in the Ohio River Valley region as they relate to the transport and deposition of mercury, arsenic, and associated fine particulate matter. This evaluation will involve two interrelated areas of effort: ambient air monitoring and regional-scale modeling analysis. The scope of work for the ambient air monitoring will include the deployment of a surface air monitoring (SAM) station in southeastern Ohio. The SAM station will contain sampling equipment to collect and measure mercury (including speciated forms of mercury and wet and dry deposited mercury), arsenic, particulate matter (PM) mass, PM composition, and

gaseous criteria pollutants (CO, NO(x), SO2, O3 etc.). Laboratory analysis of time-integrated samples will be used to obtain chemical speciation of ambient PM composition and mercury in precipitation. Near-real-time measurements will be used to measure the ambient concentrations of PM mass and all gaseous species including Hg(sup 0) and RGM. Approximately of 18 months of field data will be collected at the SAM site to validate the proposed regional model simulations for episodic and seasonal model runs. The ambient air quality data will also provide mercury, arsenic, and fine particulate matter data that can be used by Ohio Valley industries to assess performance on multi-pollutant control systems.
NTIS
Environmental Monitoring; Emission; Deposition; Mercury (Metal)

20040171514 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Relationship between Column AOT and Surface PM2.5 over the U.S.
Chin, Mian; [2004]; 1 pp.; In English; EPA/NASA/NOAA Workshop, 14-16 Sep. 2004, Research Triangle Park, NC, USA; No Copyright; Avail: Other Sources; Abstract Only

The quantitative use of the satellite observations of aerosol for local air quality forecast/study will be explored by examining the relationship between the column Aerosol Optical Thickness (AOT) and the surface PM2.5 at different locations and seasons over the U.S. We use the global model GOCART, the MODIS satellite data, and the EPA surface measurements to demonstrate the feasibility of satellite data application for air quality study.
Author
Aerosols; Air Quality; Optical Thickness; Satellite Observation

20040171567 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Regional and Global CO and Aerosol Correlations: An Integrated Approach of Surface, Satellite, and Aircraft Measurements and Model Simulations
Bian-Hui-Sheng; Duncan, Bryan; Chin, Mian; Kasibhatla, Prasad; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We investigate regional and global CO and fine mode aerosol correlations by combining GOCART model simulations with various measurements from surface (CMDL /CO and AERONET / aerosol), satellite (MOPl3T / CO and MODIS / aerosol), and aircraft. CO mixing ratios and aerosol concentrations are examined using surface and aircraft measurements on several representative regions. Satellite observations provide the comparisons of CO column and aerosol fine model AOD at global scale. Numerical model simulation allows us to compare CO and aerosol properties without temporal and spatial limitation and with the capability to trace emissions by isolating different somces. Our zonal mean comparisons confirm the previous researches that the variations of CO and aerosol properties are out of phase by several month. over northern hemisphere middle latitudes where anthropogenic emissions dominate. Over the biomass burning dominating regions, such as southern hemisphere (SH) extra-tropical zone, the concentration and column properties of CO and aerosol show more agreement. Long- term transport and local chemistry drive the biggest phase shift of CO and aerosol properties over remote SH ocean regions. There are much more complicated relationships CO and aerosol properties over stations and small regions due to emission, transport, and local chemistry.
Author
Aerosols; Atmospheric Models; Satellite Observation; Tropical Regions; Biomass Burning; Carbon Monoxide

20040171574 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Integrating Role of Ozone Sounding: Illustrations from SHADOZ (Southern Hemisphere Additional Ozonesondes and IONS (INTEX (Intercontinental Transport Experiment) Ozonesonde Network Study)
Thompson, Anne M.; [2004]; 2 pp.; In English; ISSAOS 2004, 19-24 Sep. 2004, L'Aquila, Italy; No Copyright; Avail: Other Sources; Abstract Only

The Integrating Role of ozone soundings: Illustrations from SHADOZ (southern Hemisphere Additional ozonesondes and IONS (INTEX [Intercontinental Transport Experiment] ozonesonde Network study).
Author
Ozone; Ions; Sounding

20040171588 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Application of MODIS-Derived Active Fire Radiative Energy to Fire Disaster and Smoke Pollution Monitoring
Ichoku, Charles; Kaufman, Yoram J.; Hao, Wei Min; Habib, Shahid; [2004]; 3 pp.; In English; International Geoscience and Remote Sensing Symposium, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: CASI; A01, Hardcopy

The radiative energy emitted by large fires and the corresponding smoke aerosol loading are simultaneously measured from the MODIS sensor from both the Terra and Aqua satellites. Quantitative relationships between the rates of emission of fire radiative energy and smoke are being developed for different fire-prone regions of the globe. Preliminary results are presented. When fully developed, the system will enable the use of MODIS direct broadcast fire data for near real-time monitoring of fire strength and smoke emission as well as forecasting of fire progression and smoke dispersion, several hours to a few days in advance.
Author
MODIS (Radiometry); Pollution Monitoring; Fires

20040171600 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Discoveries about Tropospheric Ozone Pollution from Satellite and Soundings
Thompson, Anne M.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We have been producing near-red time tropospheric ozone satellite maps from the TOMS (Total Ozone Mapping Spectrometer) sensor since 1997. Maps for 1996-2000 for the operational Earth-Probe instrument are at:\hhttp://www.atmos.umd.edu/~tropo\g. Pollution in the tropics is influenced by biomass burning and by transport patterns that favor recirculation and in other cases reflect climate variability like the El-Nino-Southern Oscillation [Thompson et al., 2001]. The satellite view of chemical-dynamical interactions in tropospheric ozone is not adequate to capture vertical gradients in pollution. Thus, in 1998, NASA's Goddard Space Flight Center and a team of international sponsors established the SHADOZ (Southern Hemisphere ADditional OZonesondes) project to address the gap in tropical ozone soundings. SHADOZ augments launches and provides a public archive of ozonesonde data from twelve tropical stations at http://croc.gsfc.nasa.gov/shadoz. Further insights into the role of chemical and dynamical influences have emerged from the first 4-5 years of SHADOZ data (more than 2000 ozone profiles). Highly variable tropospheric ozone and a zonal wave-one pattern in tropospheric ozone suggest that dynamics is as important as pollution in determining tropical ozone distributions.
Author
Air Pollution; Ozone; Troposphere; Satellite Sounding

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GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20040170478 NASA Marshall Space Flight Center, Huntsville, AL, USA
First Terrestrial Soft X-ray Aurora Observations by Chandra
Bhardwaj, Anil; Elsner, Ronald F.; Gladstone, G. Randall; Waite, J. Hunter, Jr.; Cravens, Thomas E.; Ostgaard, Nikolai; Chang, Shen-Wu; Metzger, Albert E.; Majeed, Tariq; [2004]; 1 pp.; In English; Huntsville Modeling Workshop, 18-22 Oct. 2004, Huntsville, AL, USA; Copyright; Avail: Other Sources; Abstract Only

Northern polar 'auroral' regions of Earth was observed by High-Resolution Camera in imaging mode (T32C-I) aboard Chandra X-Ray Observatory (CXO) during mid December 2003 - mid April 2004. Ten CXO observations, each approximately 20 min duration, were made in a non-conventional method (due to CXO technical issues), such that Chandra was aimed at a fixed point in sky and the Earth's polar cusp was allowed to drift through the HRC-I field-of-view. The observations were performed when CXO was near apogee and timed during northern winter mostly near midnight (6 hr), except two observations which occurred around 1200 UT, so that northern polar region is entirely in dark and solar fluoresced x-ray contamination can be avoided. These observations were aimed at searching the Earth's soft x-ray aurora and to do a comparative study with Jupiter's x-ray aurora, where a pulsating x-ray hot-spot near the northern magnetic pole has been observed by Chandra that implies a particle source region near Jupiter's magnetopause, and entry of heavy solar wind ions due to high-latitude reconnection as a viable explanation for the soft x-ray emissions. The first Chandra soft (0.1-2 keV) x-ray observations of Earth's aurora show that it is highly variable (intense arc, multiple arcs, diffuse, at times almost absent). In at least one of the observations an isolated blob of emission is observed where we expect cusp to be: giving indication of solar wind charge-exchange signature in x-rays. We are comparing the Chandra x-ray observations with observations at other wavelengths and particle data from Earth-orbiting satellites and solar wind measurements from near-Earth ACE and SOH0 spacecraft. Preliminary results from these unique CXO-Earth observations will be presented and discussed.
Author
Jupiter (Planet); Earth (Planet); Auroras; X Ray Astrophysics Facility; Polar Regions; X Rays

20040170698 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Derivation of a Self-Consistent Auroral Oval Model Using the Auroral Boundary Index

Anderson, Keith A.; Jun. 2004; 110 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426701; AFIT/GAP/ENP/04-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

The position and intensity of the auroral oval has many implications for the Air Force from determining the effects of incoming electron flux on DoD systems to modeling the ionosphere to exploit current HF communications capabilities. The auroral morphology is a good indicator of the level at which space weather and its near-Earth consequences are occurring, and thus it is important to develop an auroral prediction model. However, since no purely physics-based models exist to describe the temporal and spatial evolution of the auroral zone, space weather practitioners and researchers are forced to produce statistical representations, 'organized' by some relevant geophysical parameter. Currently, the most widely used model is the Hardy et al. (1985) auroral oval model, which is binned according to the Kp index. The Kp index is a mid-Iatitude measure of planetary geomagnetic activity, and was presumed to be well-correlated to the size and shape of the auroral region. However, subsequent research has shown that Kp is probably not the best binning parameter. This study used the Auroral Boundary Index (ABI) to parameterize the statistics of the auroral oval location since it is a measurement of the electron fluxes computed directly from sensors aboard the DMSP satellites. Thus, the current work represents a move toward a more self-consistent-and presumably more accurate- climatological representation of the auroral oval boundaries. This was accomplished by recreating the process performed by Hardy et al., substituting the ABI for the Kp index and deriving an entirely new set of auroral ovals based on almost 11 years ofDMSP data from the F8 and F9 satellites. To quantitatively assess the differences between the two models, electron flux values were compared to actual DMSP data of individual satellite passes. Preliminary findings suggest that the new ABI auroral ov

DTIC

Auroras; Boundaries; Geomagnetism; Precipitation (Meteorology)

20040170741 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Comparative Study on the Use of Coherent Radar- Derived Electric Fields vs. Statistical Electric Fields for the Initialization of a High-Latitude Ionospheric Model

Hogue, Christopher M.; Jun. 2003; 109 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426801; AFIT/GAP/ENP/04-03; No Copyright; Avail: CASI; A06, Hardcopy

The structure and time development of the magnetosphere-ionosphere system have significant impacts on the Air Force and its mission. Specifically, an accurate knowledge of ionospheric plasma densities is important for the operation of many Air Force systems. This research analyzes plasma density structure development through comparing two distinct electric field models. The two models compared here are a commonly used statistical model created by Heppner and Maynard 1987, and a more recently developed model using real- time coherent radar measurements from the SuperDARN radar network. Ionospheric simulations were run using Utah State University s Time-Dependent Ionospheric Model (TDIM) with the two electric field models as drivers, and density results from the simulations were compared with both a conceptual model and in-situ DMSP satellite measurements. While there are limitations to the comparison technique, results indicate that, in general, using the SuperDARN-derived electric fields to drive the TDIM has advantages over using the statistical fields. The higher spatial and temporal resolution of the input electric fields generally seem to produce more realistic morphological density structures, with smoothing due to statistical averaging and geomagnetic index-binning reduced. This research provides an essential first step in using high resolution, real-time SuperDARN-derived electric fields to drive a physical model of the ionosphere in order to create realistic ionospheric density results.

DTIC

Atmospheric Models; Coherent Radar; Earth Ionosphere; Electric Fields; Polar Regions

20040170745 Naval Surface Warfare Center, Dahlgren, VA

Mathematical Description of the OMNIS Satellite Orbit Generation Program (OrbGen)

O'Toole, James W.; Oct. 2004; 173 pp.; In English

Report No.(s): AD-A426808; NSWCDD/TR-02/118; No Copyright; Avail: CASI; A08, Hardcopy

This document discusses the mathematical procedures used in the OMNIS orbit generation program. It provides a detailed description of the top-level procedures used for the numerical integration, references all of the force models employed and discusses those force models that have a substantial impact on the integration technique chosen. The document attempts to discuss the mathematics of the orbit integration but does not discuss the details of the implementation into code. A primary use of the program has been for Global Positioning System (GPS) satellites; however, it is used for low altitude satellites as well. Force models follow the World Geodetic System 1984 (WGS 84) constants and models, the International Earth Rotation

Service (lERS) conventions when models are not covered by WGS 84, and specialized models when required, e.g., specialized radiation pressure forces for various GPS satellite vehicle types, as well as atmospheric density models for use in the atmospheric drag modeling of low altitude satellites. The program can segment drag forces, during the integration span, in order to accommodate inaccurate drag modeling. The program can accommodate several thrusts of arbitrary duration and magnitude. The inertial system used is J2OOO and the conversion to the Earth-fixed International Terrestrial Reference Frame (ITRF) is based on the 1980 revision of the 1976 International Astronomical Union (IAU) precession and 1980 mutation theory, using the Earth Orientation Parameters published by the lERS. The program is completely coded in FORTRAN 77. It is coded in double precision and executes on a UNIX operating system.
DTIC
Mathematical Models; Numerical Integration; Satellite Orbits

20040170754 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Estimating Equatorial F-Region Daytime Vertical E x B Drift Velocities from Ground-Based Magnetometer Measurements in the Philippine Longitude Sector
Kinkela, Shauna M.; Jun. 2004; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426826; AFIT/GAP/ENP/04-04; No Copyright; Avail: CASI; A05, Hardcopy

Ionospheric disturbances can severely impact Department of Defense (DoD) systems. such as radar. satellite. and navigation technologies. Forecasting disturbances and describing the Earth's ionosphere, in turn. relies upon innovative computer-based models that gather input parameters from ground and space-borne observations and empirical models for ionospheric drivers. Equatorial E x B drift velocities are significant input parameters that go into many ionospheric models, because they help describe vertical plasma motions near the magnetic equator. Previous work by Anderson, et al 2002 has demonstrated the ability to derive Peruvian longitude sector, daytime vertical E x B drifts from ground-based magnetometer data. The present research extends these results to the Philippines using 56 days of magnetometer data from two stations in 2002. For each day of magnetometer data, corresponding Global Ultraviolet Imager (GUVI) 1356A airglow emission data from the evening equatorial anomaly were used to estimate the average E x B drift velocities Anderson. private communication. 2003. These drift values were then compared statistically to the horizontal component of the Philippine magnetometer data for all 56 days. In this process. data were grouped according to F1O.7 values. Overall, the best regression relation resulted from the ascending, April 2002 sample of 13 days of data (correlation coefficient of 0.63). Previous research does not conclusively predict how our Apri1 2002 Philippine slope should compare against the corresponding Peruvian result. Specifically. Richmond 1973 predicts the two slopes should be approximately equal. However, Forbes 1981 suggests the Philippine regression slope should be 30 percent smaller than the corresponding Peruvian slope.
DTIC
Daytime; Equatorial Regions; Estimating; F Region; Ionospheric Disturbances; Longitude; Magnetometers

20040170784 Remcom, Inc., State College, PA
Real Time RF Propagation Simulation Support for AFSOR
Fast, Stephen A.; Marston, C. C.; Jun. 24, 2004; 73 pp.; In English
Contract(s)/Grant(s): F49620-03-C-0037
Report No.(s): AD-A426873; REM-PT-01; AFRL-SR-AR-TR-04-0514; No Copyright; Avail: CASI; A04, Hardcopy

Recent research activities have been conducted to define the propagation and attenuation of communications signals through the atmosphere. These have, to a certain extent, allowed for the consideration of numerous factors, including multipath, ducting, diffraction, terrain, and weather phenomena. The Air Force Flight Test Center and the Navy Air Combat Environment, Test and Engineering Facility both require the capability to accurately represent the 'real world' atmospheric propagation of communications signals for real-time Installed Systems Test Facility (ISFT) applications. This project developed methods for rapid efficient methods, algorithms and software to signal attenuation for the Joint Communications Simulator (JCS). The JCS is a real time simulator and thus the delivered software must provide propagation predictions for all relevant simulation players. Only those propagation predictions in which the loss displays a large change over a typical time step are evaluated. Thus, the terrain resolution and other first order environmental factors the determination of re-computation time for the simulation assets.
DTIC
Atmospheric Attenuation; Computerized Simulation; Radio Frequencies; Simulators; Telecommunication

20040171120 NASA Marshall Space Flight Center, Huntsville, AL, USA

Cross-Scale Coupling in the Inner Magnetosphere

Khazanov, G. V.; Galagher, D.; Spann, J.; Singh, N.; [2004]; 1 pp.; In English; Huntsville 2004 Workshop, 18-22 Oct. 2004, Huntsville, AL, USA; No Copyright; Avail: Other Sources; Abstract Only

Magnetosphere-ionosphere (MI) coupling has interested scientists for decades and, in spite of experimental and theoretical research efforts, is still one of the least well-known dynamic processes in space plasma. The reason for this is that the numerous physical processes associated with MI coupling occur over multiple spatial lengths and temporal scales. One typical example of MI coupling is small- and large-scale ring current (RC) electrodynamic coupling. In this talk, we will address the two primary issues of RC electrodynamic coupling: (1) RC self-consistent coupling with electromagnetic ion cyclotron (EMIC) waves (small-scale electrodynamic coupling) and (2) RC self-consistent MI coupling that includes calculation of the magnetospheric electric field (large-scale electrodynamic coupling). We also will emphasize the role of the heavy ions in the number of wave-particle interaction magnetospheric processes. In particular, we will discuss some of the experimental and theoretical studies that have investigated the role of the heavy ions (mainly He(+) and O(+)) in generation and propagation of electromagnetic ion cyclotron waves and their contribution to the heating of magnetospheric electrons and ions. The more recent studies have also shown that the heavy ions can greatly contribute to a generation of lower hybrid waves, ring current precipitation phenomena, and the overall energy redistribution in the inner magnetosphere. Using newly developed 2.5-dimensional particle-in-cell simulations, we study the energization and nonlinear coupling of different plasma waves in the presence of the heavy ions. We have shown that the high frequency wave modes critically depend on the heavy ion density and irrespective of the driven wave modes, both the light and heavy ions undergo significant transverse acceleration. But for the large heavy-ion densities, even the electrons are significantly accelerated in the parallel direction by the waves below the LH frequency.

Author

Magnetosphere-Ionosphere Coupling; Space Plasmas; Ion Cyclotron Radiation; Electrodynamics

20040171125 NASA Marshall Space Flight Center, Huntsville, AL, USA

How Well are Recent Climate Variability Signals Resolved by Satellite Radiative Flux Estimates?

Robertson, Franklin R.; Lu, H.-L.; [2004]; 1 pp.; In English; 13th AMS Conference on Satellite Meteorology and Oceanography, 20-23 Sep. 2004, Norfolk, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

One notable aspect of Earth s climate is that although the planet appears to be very close to radiative balance at top-of-atmosphere (TOA), the atmosphere itself and underlying surface are not. Profound exchanges of energy between the atmosphere and oceans, land and cryosphere occur over a range of time scales. Recent evidence from broadband satellite measurements suggests that even these TOA fluxes contain some detectable variations. Our ability to measure and reconstruct radiative fluxes at the surface and at the top of atmosphere is improving rapidly. Understanding the character of radiative flux estimates and relating them to variations in other energy fluxes and climate state variables is key to improving our understanding of climate. In this work we will evaluate several recently released estimates of radiative fluxes, focusing primarily on surface estimates. The International Satellite Cloud Climatology Project FD radiative flux profiles are available from rnid-1983 to near present and have been constructed by driving the radiative transfer physics from the Goddard Institute for Space Studies (GISS) global model with ISCCP clouds and HIRS operational soundings profiles. Full and clear sky SW and LW fluxes are produced. A similar product from the NASA/GEWEX Surface Radiation Budget Project using different radiative flux codes and thermodynamics from the NASA/Goddard Earth Observing System assimilation model makes a similar calculation of surface fluxes. However this data set currently extends only through 1995. Several estimates of downward LW flux at the surface inferred from microwave data are also examined. Since these products have been evaluated with Baseline Surface Radiation Network data over land we focus over ocean regions and use the DOE/NOAA/NASA Shipboard Ocean Atmospheric Radiation (SOAR) surface flux measurements to characterize performance of these data sets under both clear and cloudy conditions. Some aspects of performance are stratified according to SST and vertical motion regimes. Comparisons to the TRMM/CERES SRB data in 1998 are also interpreted. These radiative fluxes are then analyzed to determine how surface (and TOA) radiative exchanges respond to interannual signals of ENS0 warm and cold events. Our analysis includes regional changes as well as integrated signals over land, ocean and various latitude bands. Changes in water vapor and cloud forcing signatures are prominent on interannual time scales. Prominent signals are also found in the SW fluxes for the Pinatubo volcanic event. These systematic changes in fluxes are related to changes in large-scale circulations and energy transport in the atmosphere and ocean. Some estimates of signal-to-noise and reliability are discussed to place our results in context.

Author

Radiative Transfer; Earth Radiation Budget

20040171147 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Co-Seismic Mass Displacement and its Effect on Earth's Rotation and Gravity

Chao, B. F.; Gross, R. S.; [2004]; 1 pp.; In English; 3rd International Conference on Continental Earthquakes, 12-14 Jul. 2004, Beijing, China; No Copyright; Avail: Other Sources; Abstract Only

Mantle processes often involve large-scale mass transport, ranging from mantle convection, tectonic motions, glacial isostatic adjustment, to tides, atmospheric and oceanic loadings, volcanism and seismicity. On very short time scale of less than an hour, co-seismic event, apart from the 'shaking' that is the earthquake, leaves behind permanent (step-function-like) displacements in the crust and mantle. This redistribution of mass changes the Earth's inertia tensor (and hence Earth's rotation in both length-of-day and polar motion), and the gravity field. The question is whether these effects are large enough to be of any significance. In this paper we report updated calculation results based on Chao & Gross. The calculation uses the normal mode summation scheme, applied to over twenty thousand major earthquakes that occurred during 1976-2002, according to source mechanism solutions given by the Harvard Centroid Moment Tensor catalog. Compared to the truly large ones earlier in the century, the earthquakes we study are individually all too small to have left any discernible signature in geodetic records of Earth rotation or global gravity field. However, their collective effects continue to exhibit an extremely strong statistical tendencies, conspiring to decrease J2 and J22 while shortening LOD, resulting in a rounder and more compact Earth. Strong tendency is also seen in the earthquakes trying to 'nudge' the Earth rotation pole towards approx. 140 deg.E, roughly opposite to the observed polar drift direction. Currently, the Gravity Recovery And Climate Experiment (GRACE) is measuring the time-variable gravity to high degree and order with unprecedented accuracy. Our results show that great earthquakes such as the 1960 Chilean or 1964 Alaskan events cause gravitational field changes that are large enough to be detected by GRACE. Author

Displacement; Seismology; Gravitation; Mass Transfer; Earth Rotation

20040171158 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Deep Structure of the Earth and Concentration of Metals in the Lithosphere: A Geodynamic Approach

Taylor, Patrick T.; Kutina, J.; Pei, R.; [2004]; 1 pp.; In English; 32nd International Geological Congress, 20-28 Aug. 2004, Florence, Italy; No Copyright; Avail: Other Sources; Abstract Only

A discussion of and introduction to satellite-altitude geopotential fields studies and their interpretation with emphasis on results from metalliferous regions will be given. The magnetic and gravimetric measurements from satellite altitudes show heterogeneity in deeper parts of the lithosphere. These patterns of magnetic anomalies do not only reveal the largest iron ore deposits such as Kiruna, Sweden and Kursk, Russia, but also linear features indicating structural discontinuities. Changes of magnetic amplitude of these patterns are caused by intersecting transverse fractures localizing magmatism and concentration of metals. The role of trans-regional mantle-rooted structural discontinuities in the concentration of metals will be discussed and a new type of mineral prognosis map will be presented. Deep-rooted structural discontinuities, defined by combination of geological and geophysical criteria, with spacing of several hundred kilometers, reveal a quite uniform pattern in the deeper parts of the lithosphere. As these structures provide favorable pathways for the ascent of heat, magmas and ore-forming fluids, their recognition is of crucial importance and can be used in the compilation of a new type of mineral prognosis map. Examples are shown from the USA, Canada, China, Burma, South America, Europe and Australia. The European example includes a pattern of east west trending structural discontinuities or belts and their junction with the NW-trending Tornqvist-Teisseyre Line. The Upper Silesian-Cracovian Zn-Pb district occurs along one of the latitudinal belts. Leslaw Teper of the University of Silesia has been invited to show the fractures in crystalline basement beneath the sediments hosting the Zn-Pb ores.

Author

Geodynamics; Lithosphere; Metals; Earth Surface; Structural Properties (Geology); Mineralogy

20040171170 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Geomagnetic Estimate of Mean Paleointensity

Voorhies, Coerte; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

To test a statistical hypothesis about Earth's magnetic field against paleomagnetism, the present field is used to estimate time averaged paleointensity. The estimate uses the modem magnetic multipole spectrum R(n), which gives the mean square induction represented by spherical harmonics of degree n averaged over the sphere of radius a = 6371.2 km. The hypothesis asserts that the low degree multipole powers of the core-source field are distributed as chi-squared with 2n+l degrees of freedom and expectation values {R(n)} = K[(n+l/2)/n(n+l](c/a)(sup 2n+4), where c is the 3480 km radius of Earth's core. (This is compatible with a usually mainly geocentric axial dipolar field). Amplitude K is estimated by fitting theoretical to observational spectra through degree 12. The resulting calibrated expectation spectrum is summed through degree 12 to

estimate expected square intensity {F(sup 2)}. The sum also estimates {F(sup 2)} averaged over geologic time, in so far as the present magnetic spectrum is a fair sample of that generated in the past by core geodynamic processes.
Author
Geomagnetism; Numerical Analysis; Paleomagnetism; Magnetic Fields; Earth Magnetosphere

20040171174 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity of a Cloud-Resolving Model to the Bulk and Explicit Bin Microphysical Schemes
Tao, Wei-Kuo; Li, X.; Khain, A. P.; Simpson, J.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

A cloud-resolving model is used to study sensitivities of two different microphysical schemes, one is the bulk type, and the other is an explicit bin scheme, in simulating a mid-latitude squall line case. Simulations using different microphysical schemes are compared with each other and also with the observations. Both the bulk and bin models reproduce the general features during the developing and mature stage of the system. The leading convective zone, the trailing stratiform region, the horizontal wind flow patterns, pressure perturbation associated with the storm dynamics, and the cool pool in front of the system all agree well with the observations. Both the observations and the bulk scheme simulation serve as validations for the newly incorporated bin scheme. However, it is also shown that the bulk and bin simulations have distinct differences, most notably in the stratiform region. Weak convective cells exist in the stratiform region in the bulk simulation, but not in the bin simulation. These weak convective cells in the stratiform region are remnants of the previous stronger convections at the leading edge of the system. The bin simulation, on the other hand, has a horizontally homogeneous stratiform rain structure, which agrees better with the observations. Further analysis of the downdraft core strength, the potential temperature perturbation, and the evaporative cooling rate shows that the differences between the bulk and bin models are due mainly to the stronger low-level evaporative cooling simulated in the bulk model. Further quantitative analysis and sensitivity tests for this case using both the bulk and bin models will be presented in the talk.
Author
Atmospheric Models; Clouds (Meteorology); Sensitivity; Geophysics

20040171180 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time-Variable Gravity from Space: Quarter Century of Observations, Mysteries, and Prospects
Chao, Benjamin F.; [2003]; 1 pp.; In English; International Association of Geodesy Conference, 18-22 Feb. 2003, Lanzarote, Canary Islands, Spain; No Copyright; Avail: Other Sources; Abstract Only

Any large mass transport in the Earth system produces changes in the gravity field. Via the space geodetic technique of satellite-laser ranging in the last quarter century, the Earth s dynamic oblateness J2 (the lowest-degree harmonic component of the gravity field) has been observed to undergo a slight decrease - until around 1998, when it switched quite suddenly to an increase trend which has continued to date. The secular decrease in J2 has long been attributed primarily to the post-glacial rebound in the mantle; the present increase signifies an even larger change in global mass distribution whose J2 effect overshadows that of the post-glacial rebound, at least over interannual timescales. Intriguing evidences have been found in the ocean water distribution, especially in the extratropical Pacific basins, that may be responsible for this 52 change. New techniques based on satellite-to-satellite tracking will yield greatly improved observations for time-variable gravity, with much higher precision and spatial resolution @e., much higher harmonic degrees). The most important example is the GRACE mission launched in March 2002, following the success of the CHAMP mission. Such observations are becoming a new and powerful tool for remote sensing of geophysical fluid processes that involve larger-scale mass transports.
Author
Gravitational Fields; Oblate Spheroids; Mass Transfer; Geophysics; Mass Distribution; Glaciers

20040171224 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Future Missions
Barth, Janet; [2004]; 5 pp.; In English; Workshop on Radiation Belt Models, 5-8 Oct. 2004, Greenbelt, MD, USA; No Copyright; Avail: CASI; A01, Hardcopy

The panels of this viewgraph presentation cover: 1) Living with a Star Geospace Mission; 2) The NASA TWINS and THEMIS missions; 3) The USAF DSX mission; 4) The CSA ORBITALS mission; 5) The ESA Galileo mission.
CASI
Geophysics; Scientific Satellites

20040171227 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Crustal Magnetization Model of Maud Rise in the Southwest Indian Ocean

Kim, Hyung Rae; vanFrese, Ralph R. B.; Golynsky, Alexander V.; Taylor, Patrick T.; Kim, Jeong Woo; [2004]; 1 pp.; In English; Fall 2004 AGU

Report No.(s): AGU-80002829; Copyright; Avail: Other Sources; Abstract Only

We modeled the crustal magnetization for the Maud Rise in the south-west Indian Ocean off the coast of East Antarctica using magnetic observations from the Oersted satellite and near-surface surveys complied by the Antarctic Digital Magnetic Anomaly Project (ADMAP). A new inversion modeling scheme of the multi-altitude anomaly fields suggests that the magnetic effects due to crustal thickness variations and remanence involving the normal polarity Cretaceous Quiet Zone (KQZ) become increasingly dominant with altitude. The magnetic crustal thickness effects were modeled in the Oersted data using crustal thickness variations derived from satellite altitude gravity data. Remanent magnetization modeling of the residual Oersted and near-surface magnetic anomalies supports extending the KQZ eastwards to the Astrid Ridge. The remaining near-surface anomalies involve crustal features with relatively high frequency effects that are strongly attenuated at satellite altitudes. The crustal modeling can be extended by the satellite magnetic anomalies across the Indian Ocean Ridge for insight on the crustal properties of the conjugate Agulhas Plateau. The modeling supports the Jurassic reconstruction of Gondwana when the African Limpopo-Zambezi and East Antarctic Princess Astrid coasts were connected as part of a relatively demagnetized crustal block. Author

Indian Ocean; Magnetization; Earth Crust; Magnetic Anomalies; Ocean Models

20040171236 Colorado Univ., Boulder, CO, USA

Geomorphology and Geodynamics at Crustal Boundaries within Asia and Africa

April 30, 2004; 9 pp.; In English

Contract(s)/Grant(s): NAG5-10418

Report No.(s): CU-1533842; No Copyright; Avail: CASI; A02, Hardcopy

The release of SRTM images by NASA over the past two years year has been greeted by foreign Earth scientist's as 'NASA's gift to the World'. The goodwill that this has engendered in parts of Africa. India, Pakistan and Bangladesh, as scientists in those countries contemplated what many of them considered an unprovoked and unjustifiable US invasion of Iraq, cannot be underestimated. We have used SRTM images from Africa and India and elsewhere to examine aspects of tectonism, geodynamics and tsunami and earthquake hazards. Highlights of this research are itemized in this final report. One difficulty that has arisen is , of course, that the funding for the science lead the availability of the data by more than a year. and as a result many of the findings are as yet unpublished.

Author

Geomorphology; Geodynamics; Crusts; Boundary Conditions

20040171245 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Standard Atmosphere of the Antarctic Plateau

Mahesh, Ashwin; Lubin, Dan; [August 2004]; 24 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Climate models often rely on standard atmospheres to represent various regions; these broadly capture the important physical and radiative characteristics of regional atmospheres, and become benchmarks for simulations by researchers. The high Antarctic plateau is a significant region of the earth for which such standard atmospheres are as yet unavailable. Moreover, representative profiles from atmospheres over other regions of the planet, including &om the northern high latitudes, are not comparable to the atmosphere over the Antarctic plateau, and are therefore only of limited value as substitutes in climate models. Using data from radiosondes, ozonesondes and satellites along with other observations from South Pole station, typical seasonal atmospheric profiles for the high plateau are compiled. Proper representations of rapidly changing ozone concentrations (during the ozone hole) and the effect of surface elevation on tropospheric temperatures are discussed. The differences between standard profiles developed here and the most similar standard atmosphere that already exists - namely, the Arctic Winter profile - suggest that these new profiles will be extremely useful to make accurate representations of the atmosphere over the high plateau.

Author

Antarctic Regions; Climate Models; Plateaus; Earth Sciences; Reference Atmospheres

20040171248 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Estimating Antarctic Near-Surface Magnetic Anomalies from Oersted and CHAMP Satellite Magnetometer Observations

vonFrese, Ralph R. B.; Kim, Hyung Rae; Gaya-Pique, Luis R.; Taylor, Patrick T.; Golynsky, Alexander V.; Kim, Jeong Woo; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 2004; Copyright; Avail: Other Sources; Abstract Only

Significant improvement in predicting near-surface magnetic anomalies can result from the highly accurate magnetic observations of the CHAMP satellite that is orbiting at about 400 km altitude. In general, regional magnetic signals of the crust are strongly masked by the core field and its secular variations due to wavelength coupling in the spherical harmonic representation and thus are difficult to isolate in the satellite measurements. However, efforts to isolate the regional lithospheric from core field components can exploit the correlations between the CHAMP magnetic anomalies and the pseudo magnetic effects inferred from gravity-derived crustal thickness variations. In addition, we can use spectral correlation theory to filter the static lithospheric field components from the dynamic external field effects. Employing these procedures, we processed the CHAMP magnetic conservations for an improved magnetic anomaly map of the Antarctic crust. Relative to the much higher altitude Oersted and noisier Magsat observations, CHAMP magnetic anomalies at 400 km altitude reveal new details on the effects of intra-crustal magnetic features and crustal thickness variations of the Antarctic. Moreover, these results greatly facilitate predicting magnetic anomalies in the regional coverage gaps of the ADMAP compilation of Antarctic magnetic anomalies from shipborne, airborne and ground surveys. Our analysis suggests that considerable new insights on the magnetic properties of the lithosphere may be revealed by a further order-of-magnitude improvement in the accuracy of the magnetometer.

Author

Antarctic Regions; Magnetic Anomalies; Magnetic Fields; Satellite Observation; Earth Crust

20040171294 Michigan Univ., Ann Arbor, MI, USA

Global Geospace Science (GGS)/POLAR Thermal Ion Dynamics Experiments (TIDE) Co-Investigator Program: Mission Operations and Data Analysis (MO/DA)

Nagy, Andrew; Liemohn, M.; March 17, 2004; 3 pp.; In English

Contract(s)/Grant(s): NAG5-10887; No Copyright; Avail: CASI; A01, Hardcopy

We have pursued several investigations using the Polar/TIDE data set. The first was a comparison of TIDE high-altitude observations with similar ion flux signatures in the Los Alamos National Laboratory (LANL) magnetospheric plasma analyzer (MPA) data. There are several geosynchronously orbiting satellites with LANL MPA instruments onboard. When the satellite is immersed in fresh plasma sheet electrons, the spacecraft voltage drops to several hundred volts negative, and cold ions are accelerated in to the detector. In the LANL MPA spectrograms, the accelerated cold ions appear as a bright, narrow line, following the voltage of the spacecraft. This 'ion line' is seen regularly on the nightside, but has not received much attention. The Polar TIDE observations indicated a ubiquitous 'lobal wind' in the near-- magnetotail, a field-aligned stream of approx. 100 eV ions flowing out of both polar ionospheres. The interesting result of this research is that the MPA ion line is also peaked in the field-aligned direction, even though the potential well should be uniform in all directions. It is believed that this is evidence that the lobal winds not only populate the high-latitude lobes, but fill the lobes all the way in to the near-Earth plasma sheet (the location of geosynchronous orbit). This activity developed into a full-scale survey of the lobal wind observations in the TIDE database. The universality of these observations with respect to local time and solar wind conditions implies that the ionospheric outflow is supplying the near-Earth plasma sheet at all times, regardless of magnetic activity. We have conducted a statistical study of the characteristics of the lobal wind in these two data sets FIDE and LANL MPA), finding much similarity between them. Using these characteristics as input conditions to our inner magnetosphere ion transport model, we have conducted simulations of the flow of these particles inside of geosynchronous orbit to show the impact these particles will have on the near-Earth space environment. As the study has progressed, these results have been presented several times to the TIDE team during teleconferences. It is planned to present this survey at the GEM 2004 Summer Workshop, and hopefully at additional conferences in the near future. We are presently writing a paper on the lobal wind occurrence statistics, which should be submitted in April or May to the Journal of Geophysical Research for publication. An undergraduate student at the University of Alabama in Huntsville, Will Maddox, working at NASA MSFC with Dr. Paul Craven, is presently creating a database of the values TIDE moments for the lobal wind (under Dr. Liemohn's guidance), and this will be the focus of a follow-on paper.

Derived from text

Geosynchronous Orbits; Geophysics; Ions; Thermodynamics; Data Processing

20040171400 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Influence of the Several Very Large Solar Proton Events in Years 2000-2003 on the Neutral Middle Atmosphere

Jackman, Charles H.; Deland, Matthew T.; Labow, Gordon J.; Fleming, Eric L.; Weisenstein, Debra K.; Ko, Malcolm K. W.; Sinnhuber, Miriam; Anderson, John; Russell, James M.; [2004]; 8 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

Solar proton events (SPEs) are known to have caused changes in constituents in the Earth's polar neutral middle atmosphere. The past four years, 2000-2003, have been replete with SPEs and huge fluxes of high energy protons occurred in July and November 2000, September and November 2001, and October 2003. The highly energetic protons produce ionizations, excitations, dissociations, and dissociative ionizations of the background constituents, which lead to the production of HOx (H, OH, HO2) and NOy (N, NO, NO2, NO3, N2O5, HNO3, HO2NO2, ClONO2, BrONO2). The HOx increases lead to short-lived ozone decreases in the polar mesosphere and upper stratosphere due to the short lifetimes of the HOx constituents. Large mesospheric ozone depletions (\g70%) due to the HOx enhancements were observed and modeled as a result of the very large July 2000 SPE. The NOy increases lead to long-lived stratospheric ozone changes because of the long lifetime of the NOy family in this region. Polar total ozone depletions \g1% were simulated in both hemispheres for extended periods of time (several months) as a result of the NOy enhancements due to the very large SPEs.

CASI

Solar Terrestrial Interactions; Solar Protons; Middle Atmosphere; Atmospheric Composition

20040171402 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Glacier Acceleration and Thinning after Ice Shelf Collapse in the Larsen B Embayment, Antarctica

Scambos, T. A.; Bohlander, J. A.; Shuman, C. A.; Skvarca, P.; [2004]; 14 pp.; In English

Contract(s)/Grant(s): NAG5-11308; NSF OPP-98-14550; NSF OPP-03-38134; Copyright; Avail: CASI; A03, Hardcopy

Ice velocities derived from five Landsat 7 images acquired between January 2000 and February 2003 show a two- to six-fold increase in centerline speed of four glaciers flowing into the now-collapsed section of the Larsen B Ice Shelf. Satellite laser altimetry from ICEsat indicates the surface of Hektoria Glacier lowered by up to 38 +/- 6 m a six-month period beginning one year after the break-up in March 2002. Smaller elevation losses are observed for Crane and Jorum glaciers over a later 5-month period. Two glaciers south of the collapse area, Flask and Leppard, show little change in speed or elevation. Seasonal variations in speed preceding the large post-collapse velocity increases suggest that both summer melt percolation and changes in the stress field due to shelf removal play a major role in glacier dynamics.

Author

Glaciers; Collapse; Annual Variations

20040171465 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Dynamics of the Atmospheric Radiation Environment at Aviation Altitudes

Stassinopoulos, Epaminondas G.; [2004]; 17 pp.; In English; Radiation Effects on Components and Systems (RADECS) 2004 Workshop, 22-24 Sep. 2004, Madrid, Spain; No Copyright; Avail: CASI; A03, Hardcopy

Single Event Effects vulnerability of on-board computers that regulate the: navigational, flight control, communication, and life support systems has become an issue in advanced modern aircraft, especially those that may be equipped with new technology devices in terabit memory banks (low voltage, nanometer feature size, gigabit integration). To address this concern, radiation spectrometers need to fly continually on a multitude of carriers over long periods of time so as to accumulate sufficient information that will broaden our understanding of the very dynamic and complex nature of the atmospheric radiation environment regarding: composition, spectral distribution, intensity, temporal variation, and spatial variation.

Derived from text

Atmospheric Radiation; Temporal Distribution; Altitude

20040171502 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Magnetohydrodynamic Convection in the Outer Core and its Geodynamic Consequences

Kuang, Weijia; Chao, Benjamin F.; Fang, Ming; [2004]; 1 pp.; In English; American Geophysical Union Meeting, 17-21 May 2004, Montreal, Canada; No Copyright; Avail: Other Sources; Abstract Only

The Earth's fluid outer core is in vigorous convection through much of the Earth's history. In addition to generating and maintaining Earth s time-varying magnetic field (geodynamo), the core convection also generates mass redistribution in the core and a dynamical pressure field on the core-mantle boundary (CMB). All these shall result in various core-mantle interactions, and contribute to surface geodynamic observables. For example, electromagnetic core-mantle coupling arises from finite electrically conducting lower mantle; gravitational interaction occurs between the cores and the heterogeneous

mantle; mechanical coupling may also occur when the CMB topography is aspherical. Besides changing the mantle rotation via the coupling torques, the mass-redistribution in the core shall produce a spatial-temporal gravity anomaly. Numerical modeling of the core dynamical processes contributes in several geophysical disciplines. It helps explain the physical causes of surface geodynamic observables via space geodetic techniques and other means, e.g. Earth's rotation variation on decadal time scales, and secular time-variable gravity. Conversely, identification of the sources of the observables can provide additional insights on the dynamics of the fluid core, leading to better constraints on the physics in the numerical modeling. In the past few years, our core dynamics modeling efforts, with respect to our MoSST model, have made significant progress in understanding individual geophysical consequences. However, integrated studies are desirable, not only because of more mature numerical core dynamics models, but also because of inter-correlation among the geophysical phenomena, e.g. mass redistribution in the outer core produces not only time-variable gravity, but also gravitational core-mantle coupling and thus the Earth's rotation variation. They are expected to further facilitate multidisciplinary studies of core dynamics and interactions of the core with other components of the Earth.
Author
Convection; Core-Mantle Boundary; Geodynamics; Magnetohydrodynamics; Earth Surface

20040171517 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Near Space Tracking of the EM Phenomena Associated with the Main Earthquakes
Ouzounov, Dimitar; Taylor, Patrick; Bryant, Nevin; Pulinets, Sergey; Liu, Jann-Yenq; Yang, Kwang-Su; [2004]; 1 pp.; In English; IAC 2004 55th Congress Meeting, 4-8 Oct. 2004, Van Couver, Canada
Report No.(s): IAC-04-IAF-C.1.06; No Copyright; Avail: Other Sources; Abstract Only

Searching for electromagnetic (EM) phenomena originating in the Earth's crust prior to major earthquakes (M\g5) are the object of this exploratory study. We present the idea of a possible relationship between: (1) electro-chemical and thermodynamic processes in the Earth's crust and (2) ionic enhancement of the atmosphere/ionosphere with tectonic stress and earthquake activity. The major source of these signals are proposed to originate from electromagnetic phenomenon which are responsible for these observed pre-seismic processes, such as, enhanced IR emission, also born as thermal anomalies, generation of long wave radiation, light emission caused by ground-to-air electric discharges, Total Electron Content (TEC) ionospheric anomalies and ionospheric plasma variations. The source of these data will include: (i) ionospheric plasma perturbations data from the recently launched DEMETER mission and currently available TEC/GPS network data; (ii) geomagnetic data from ORSTED and CHAMP; (iii) Thermal infra-red (TIR) transients mapped by the polar orbiting (NOAA/AVHRR, MODIS) and (iv) geosynchronous weather satellites measurements of GOES, METEOSAT. This approach requires continues observations and data collecting, in addition to both ground and space based monitoring over selected regions in order to investigate the various techniques for recording possible anomalies. During the space campaign emphasis will be on IR emission, obtained from TIR (thermal infrared) satellites, that records land/sea surface temperature anomalies and changes in the plasma and total electron content (TEC) of the ionosphere that occur over areas of potential earthquake activity.
Author
Electromagnetism; Earthquakes; Geomagnetism; Satellite Observation

20040171586 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time Changes of the European Gravity Field from GRACE: A Comparison with Ground Measurements from Superconducting Gravimeters and with Hydrology Model Predictions
Hinderer, J.; Lemoine, Frank G.; Crossley, D.; Boy, J.-P.; [2004]; 1 pp.; In English; Joint CHAMP/GRACE Science Meeting, 6-8 Jul. 2004, Potsdam, Germany; Copyright; Avail: Other Sources; Abstract Only

We investigate the time-variable gravity changes in Europe retrieved from the initial GRACE monthly solutions spanning a 18 month duration from April 2002 to October 2003. Gravity anomaly maps are retrieved in Central Europe from the monthly satellite solutions we compare the fields according to various truncation levels (typically between degree 10 and 20) of the initial fields (expressed in spherical harmonics to degree 120). For these different degrees, an empirical orthogonal function (EOF) decomposition of the time-variable gravity field leads us to its main spatial and temporal characteristics. We show that the dominant signal is found to be annual with an amplitude and a phase both in agreement with predictions in Europe modeled using snow and soil-moisture variations from recent hydrology models. We compare these GRACE gravity field changes to surface gravity observations from 6 superconducting gravimeters of the GGP (Global Geodynamics Project) European sub-network, with a special attention to loading corrections. Initial results suggest that all 3 data sets (GRACE, hydrology and GGP) are responding to annual changes in near-surface water in Europe of a few microGal (at length scales of approx.1000 km) that show a high value in winter and a summer minimum. We also point out that the GRACE gravity field

evolution seems to indicate that there is a trend in gravity between summer 2002 and summer 2003 which can be related to the 2003 heatwave in Europe and its hydrological consequences (drought). Despite the limited time span of our analysis and the uncertainties in retrieving a regional solution from the network of gravimeters, the calibration and validation aspects of the GRACE data processing based on the annual hydrology cycle in Europe are in progress.
Author
Gravimeters; Time Dependence; Gravitational Fields; Superconductivity; Geodynamics

20040171605 NASA Goddard Space Flight Center, Greenbelt, MD, USA
On the Origin of Whistler Mode Radiation in the Plasmasphere
Green, James L.; Boardsen, Scott; Garcia, Leonard; Taylor, W. W. L.; Fung, Shing F.; Reinisch, B. W.; [March 2004]; 36 pp.; In English
Contract(s)/Grant(s): NASW-97002; Copyright; Avail: CASI; A03, Hardcopy

The origin of whistler mode radiation in the plasmasphere is examined from three years of plasma wave observations from the Dynamics Explorer and three years from the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) spacecraft. These data are used to construct plasma wave intensity maps of whistler mode radiation in the plasmasphere. The highest average intensities of the radiation in the wave maps show source locations and/or sites of wave amplification. Each type of emission is classified based on its magnetic latitude and longitude rather than any spectral feature. Equatorial electromagnetic (EM) emissions (approx. 30-330 Hz), plasmaspheric hiss (approx. 330 Hz - 3.3 kHz), chorus (approx. 2 kHz - 6 kHz), and VLF transmitters (approx. 10-50 kHz) are the main types of waves that are clearly delineated in the plasma wave maps. Observations of the equatorial EM emissions show that the most intense region is on or near the magnetic equator in the afternoon sector and that during times of negative B(sub z) (interplanetary magnetic field),the maximum intensity moves from L values of 3 to less than 2. These observations are consistent with the origin of this emission being particle-wave interactions in or near the magnetic equator. Plasmaspheric hiss shows high intensity at high latitudes and low altitudes (L shells from 2 to 4) and in the magnetic equator over L values from 2 to 3 in the early afternoon sector. The longitudinal distribution of the hiss intensity (excluding the enhancement at the equator) is similar to the distribution of lightning: stronger over continents than over the ocean, stronger in the summer than winter, and stronger on the dayside than nightside. These observations strongly support lightning as the dominant source for plasmaspheric hiss, which through particle-wave interactions, maintains the slot region in the radiation belts. The enhancement of hiss at the magnetic equator is consistent with particle-wave interactions. The chorus emissions are most intense on the morning side as previously reported. At frequencies from approx. 10-50 kHz VLF transmitters dominate the spectrum. The maximum intensity of the VLF transmitters is in the late evening or early morning with enhancements all along L shells from 1.8 to 3.
Author
Whistlers; Plasmasphere; Plasma Waves

20040171622 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time-Variable Gravity: The Low-Degree Components and their Connections with Geophysical/Climatic Changes
Cox, Christopher M.; Chao, Benjamin F.; Au, Andrew Y.; [2004]; 1 pp.; In English; Asia Oceanica Geosciences Society 1st Annual Meeting, 5-9 Jul. 2004, Singapore, Singapore; No Copyright; Avail: Other Sources; Abstract Only

The oblateness of the Earth's gravity field, J2, has long been observed to undergo a slight decrease due to post-glacial rebound of the mantle. Sometime around 1998 this trend reversed quite suddenly. This reversal persisted until 2001, at which point the atmosphere-corrected time series appears to have reversed yet again. Presently, the time series appears to be returning to the value that would nominally have been reached had the anomaly not occurred. This anomaly signifies a large interannual change in global mass distribution whose J2 effect overshadows that of the post-glacial rebound over such timescales. A number of possible causes have been considered, with oceanic mass redistribution as the leading candidate although other effects, such as glacial melting and core effects may be contributing.
Author
Time Series Analysis; Gravitational Fields; Climate Change; Glaciers; Mass Distribution

20040171626 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Paleo-Pole Positions from Martian Magnetic Anomaly Data
Frawley, James J.; Taylor, Patrick T.; [2004]; 32 pp.; In English
Contract(s)/Grant(s): NAG5-9832; No Copyright; Avail: CASI; A03, Hardcopy

Magnetic component anomaly maps were made from five mapping cycles of the Mars Global Surveyor's magnetometer

data. Our goal was to find and isolate positive and negative anomaly pairs which would indicate magnetization of a single source body. From these anomalies we could compute the direction of the magnetizing vector and subsequently the location of the magnetic pole existing at the time of magnetization. We found nine suitable anomaly pairs and from these we computed paleo-poles that were nearly equally divided between north, south and mid-latitudes. These results suggest that during the existence of the martian main magnetic field it experienced several reversals and excursions.
Author
Magnetic Poles; Planetary Mapping; Planetary Magnetic Fields; Mars Surface; Magnetic Anomalies

20040171641 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Living with a Star: New Opportunities in Sun-Climate Research
Eddy, John Allen; December 2003; 52 pp.; In English; No Copyright; Avail: CASI; A04, Hardcopy

Enormous advances have been made in the last quarter century in all of these needed areas, covering the two essential halves of the Sun-Climate question: in what we know of solar variations and, equally important, in what we know of the climate system and of climatic changes. These research achievements allow us to examine all aspects of the question more directly and quantitatively than was ever possible before, and in the brighter light and more objective context of other known or suspected climate change mechanisms, including human-induced global greenhouse warming. Brief summaries of present status and current understanding are given below for nine facets of Sun-Climate science in which major progress has been made in recent years. At the same time it will be seen that in every instance, significant elements of uncertainty still remain, Some of the most important of these unanswered questions are considered later, in Section IV.
Derived from text
Solar Activity Effects; Solar Terrestrial Interactions; Climate

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20040161553 NASA Marshall Space Flight Center, Huntsville, AL, USA
Tropospheric Wind Monitoring During Day-of-Launch Operations for National Aeronautics and Space Administration's Space Shuttle Program
Decker, Ryan K.; Leach, Richard; [2004]; 5 pp.; In English; 11th AMS Conference on Aviation, Range and Aerospace Meteorology, 4-8 Oct. 2004, Hyannis, MA, USA; No Copyright; Avail: CASI; A01, Hardcopy

The Environments Group at the National Aeronautics and Space Administration's Marshall Space Flight Center (NASA/MSFC) monitors the winds aloft at Kennedy Space Center (KSC) during the countdown for all Space Shuttle launches. Assessment of tropospheric winds is used to support the ascent phase of launch. Three systems at KSC are used to generate independent tropospheric wind profiles prior to launch; 1) high resolution Jimsphere balloon system, 2) 50-MHz Doppler Radar Wind Profiler (DRWP) and 3) low resolution radiosonde system. Data generated by the systems are used to assess spatial and temporal wind variability during launch countdown to ensure wind change observed does not violate wind change criteria constraints.
Author
Jimsphere Balloons; Spacecraft Launching; Wind (Meteorology); Winds Aloft; Radiosondes; Wind Profiles; Meteorological Radar

20040161573 Alabama Univ., Huntsville, AL, USA, NASA Marshall Space Flight Center, Huntsville, AL, USA
Aerospace Meteorology Lessons Learned Relative to Aerospace Vehicle Design and Operations
Vaughan, William W.; Anderson, B. Jeffrey; [2004]; 11 pp.; In English; 11th AMS Conference on Aviation, Range and Aerospace Meteorology, 4-8 Oct. 2004, Hyannis, MA, USA
Contract(s)/Grant(s): P6.2; No Copyright; Avail: CASI; A03, Hardcopy

Aerospace Meteorology came into being in the 1950s as the development of rockets for military and civilian usage grew in the USA. The term was coined to identify those involved in the development of natural environment models, design/operational requirements, and environment measurement systems to support the needs of aerospace vehicles, both launch vehicles and spacecraft. It encompassed the atmospheric environment of the Earth, including Earth orbit environments. Several groups within the USA were active in this area, including the Department of Defense, National Aeronautics and Space Administration, and a few of the aerospace industry groups. Some aerospace meteorology efforts were similar to those being

undertaken relative to aviation interests. As part of the aerospace meteorology activities a number of lessons learned resulted that produced follow on efforts which benefited from these experiences, thus leading to the rather efficient and technologically current descriptions of terrestrial environment design requirements, prelaunch monitoring systems, and forecast capabilities available to support the development and operations of aerospace vehicles.
Author (revised)
Meteorology; Spacecraft Launching; Rocket Launching; Weather; Aerospace Vehicles

20040170424 Environmental Law Inst., Washington, DC, USA
Reporting on Climate Change: Understanding the Science. Third Edition
2004; In English
Report No.(s): DE2004-822717; No Copyright; Avail: National Technical Information Service (NTIS)
Reporting on Climate Change: Understanding the Science is a guide for reporters, educators, and other communicators on the current understanding about the science of global climate change. This guide is based on the consensus view of the world's scientists from the United Nation's sponsored Intergovernmental Panel of Climate Change (IPCC). The IPCC's report Climate Change 2001: The Scientific Basis, is the most comprehensive and up to date assessment of scientific understanding about past, present and future climate change.
NTIS
Climate Change; Climatology

20040170428 Environmental Protection Agency, Washington, DC, USA
Anticipatory Planning for Sea-Level Rise Along the Coast of Maine
Sep. 1995; In English
Report No.(s): PB2005-100949; EPA-230-R-95-900; No Copyright; Avail: National Technical Information Service (NTIS)
The present configuration of Maine's coast is attributable to a rise in sea level over the past 10, 000 years. Scientists have been able to verify that sea level has continued a gradual rise in all of Maine's major coastal municipalities during at least the last fifty years. Geologists and climate modelers project that this rise will continue, although there is not total agreement on the projected rate of rise. A continuation of the historic rate of sea-level rise of around 2 mm/year (20 cm/100 years) places many shoreline properties in jeopardy from coastal erosion and inundation. However, several consensus reports of the international scientific community over the last decade project an accelerated rate of sea-level rise as a result of global climate change associated with the greenhouse effect.
NTIS
Sea Level; Coasts; Maine

20040170452 Michigan Univ., Ann Arbor, MI, USA
Dynamical Studies of the Middle Atmosphere Using High Resolution Doppler Imager Observations
Skinner, Wilbert; [2002]; 16 pp.; In English
Contract(s)/Grant(s): NAG5-11068
Report No.(s): F004998; No Copyright; Avail: CASI; A03, Hardcopy
This report summarizes the activities of NASA grant NAG5-11068, 'Dynamicai Studies of the Middle Atmosphere Using High Resolution Doppler Imager Observations.' The High Resolution Doppler Imager (HRDI) on the Upper Atmosphere Research Satellite (UARS) has been providing direct measurements of the Earth's horizontal wind field in the stratosphere, mesosphere and lower thermosphere. Mesospheric temperatures, ozone, and O((sup 1) D) densities, and stratospheric aerosol extinctions coefficients, are also retrieved. The goal of HRDI is to measure the vector winds in the stratosphere (10-40 km), mesosphere, and lower thermosphere (approximately 50-120 km) during the day, and the lower thermosphere at night (approximately 95 km) to an accuracy of 5 m/s. The horizontal wind vector is measured by observing the Doppler shift of rotational lines of molecular oxygen along two lines of sight. In addition to winds, temperatures and volume emission rates are determined in the mesosphere and lower thermosphere, from which ozone and O((sup 1) D) concentrations can be derived, and aerosol scattering coefficients are determined in the stratosphere. UARS was launched on September 12, 1991, into a 585-km circular orbit inclined 57 degrees to the equator HRDI was activated September 28, 1991 and following a period of checkout and adjustment of the instrument parameters, scientific observations began November 2, 199 1. HRDI operated nearly continuously from launch until April 1995. At that time the UARS solar array drive failed, forcing the instruments to time-share the available power. From July 1995 to July 1996 HRDI operated approximately 50% of the time. At that point, one of the three spacecraft batteries failed and from then until September 1998 the duty cycle was less than 20% per month,

At that time it was determined that HRDI could operate during each daytime pass, which increased the daytime duty cycle to close to l00%, while nighttime operations were limited to about a week per month. In the fall of 1999, the second tape recorder failed requiring a real time contact with a TRDSS satellite to retrieve that data. This resulted in about 60% data collection efficiency. Finally, in the summer of 2000, the second star sensor failed requiring the spacecraft attitude to be controlled by a three axis magnetometer and sun sensor. This resulted in a loss of attitude knowledge but operations continue with the anticipation of correcting the attitude. A new method for determining the tide and mean structure from satellite data in conjunction with a new tidal model has been devised. For brevity, it shall be referred to as the TMAT or Tide-Mean Assimilation Technique. Most previous methods of tidal analysis are based on various ways of slicing the data set.
Derived from text
Atmospheric Temperature; Mesosphere; Middle Atmosphere; Oxygen; Stratosphere; Wind Direction; Wind Velocity

20040170457 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Review of TRMM/GPM Rainfall Algorithm Validation
Smith, Eric A.; [2004]; 1 pp.; In English; International Radiation Symposium 2004, 21-28 Aug. 2004, Busan, Korea, Republic of; No Copyright; Avail: Other Sources; Abstract Only

A review is presented concerning current progress on evaluation and validation of standard Tropical Rainfall Measuring Mission (TRMM) precipitation retrieval algorithms and the prospects for implementing an improved validation research program for the next generation Global Precipitation Measurement (GPM) Mission. All standard TRMM algorithms are physical in design, and are thus based on fundamental principles of microwave radiative transfer and its interaction with semi-detailed cloud microphysical constituents. They are evaluated for consistency and degree of equivalence with one another, as well as intercompared to radar-retrieved rainfall at TRMM's four main ground validation sites. Similarities and differences are interpreted in the context of the radiative and microphysical assumptions underpinning the algorithms. Results indicate that the current accuracies of the TRMM Version 6 algorithms are approximately 15% at zonal-averaged / monthly scales with precisions of approximately 25% for full resolution / instantaneous rain rate estimates (i.e., level 2 retrievals). Strengths and weaknesses of the TRMM validation approach are summarized. Because the dew of convergence of level 2 TRMM algorithms is being used as a guide for setting validation requirements for the GPM mission, it is important that the GPM algorithm validation program be improved to ensure concomitant improvement in the standard GPM retrieval algorithms. An overview of the GPM Mission's validation plan is provided including a description of a new type of physical validation model using an analytic 3-dimensional radiative transfer model.
Author
Trmm Satellite; Rain; Algorithms

20040170474 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Observations of Florida Convective Storms using Dual Wavelength Airborne Radar
Heymsfield, G. M.; Heymsfield, A. J.; Belcher, L.; [2004]; 4 pp.; In English; 14th International Conference on Clouds and Precipitation, 19-23 Jul. 2004, Bologna, Italy; Copyright; Avail: CASI; A01, Hardcopy

NASA conducted the Cirrus Regional Study of Tropical Anvils and Cirrus Layers (CRYSTAL) Florida Area Cirrus Experiment (FACE) during July 2002 for improved understanding of tropical cirrus. One of the goals was to improve the understanding of cirrus generation by convective updrafts. The reasons why some convective storms produce extensive cirrus anvils is only partially related to convective instability and the vertical transport ice mass by updrafts. Convective microphysics must also have an important role on cirrus generation, for example, there are hypotheses that homogeneous nucleation in convective updrafts is a major source of anvil ice particles. In this paper, we report on one intense CRYSTAL-FACE convective case on 16 July 2002 that produced extensive anvil. During CRYSTAL-FACE, up to 5 aircraft flying from low- to high-altitudes, were coordinated for the study of thunderstorm-generated cirrus. The NASA high-altitude (20 km) ER-2 aircraft with remote sensing objectives flew above the convection, and other aircraft such as the WB-57 performing in situ measurements flew below the ER-2. The ER-2 remote sensing instruments included two nadir viewing airborne radars. The CRS 94 GHz radar and the EDOP 9.6 GHz radar were flown together for the first time during CRYSTAL-FACE and they provided a unique opportunity to examine the structure of 16 July case from a dual-wavelength perspective. EDOP and CRS are complementary for studying convection and cirrus since CRS is more sensitive than EDOP for cirrus, and EDOP is considerably less attenuating in convective regions. In addition to the aircraft, coordinated ground-based radar measurements were taken with the NPOL S-Band (3 GHz) multiparameter radar. One of the initial goals was to determine whether dual-wavelength airborne measurements could identify supercooled water regions.
Author
Airborne Equipment; Airborne Radar; Anvil Clouds; Cirrus Clouds; Thunderstorms; Convection

20040170476 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Severe Weather Outbreak of 10 November 2002: Lightning and Radar Analysis of Storms in the Deep South

Buechler, D. E.; McCaul, E. W., Jr.; Goodman, S. J.; Blakeslee, R. J.; Bailey, J. C.; Gatlin, P.; [2004]; 1 pp.; In English; American Meteorological Society 22nd Conference on Severe Local Storms, 5-8 Oct. 2004, Hyannis, MA, USA; Copyright; Avail: Other Sources; Abstract Only

On the afternoon and evening of 10 November 2002, the Midwest and Deep South were struck by a major outbreak of severe storms that produced some 80 tornadoes. In terms of number of tornadoes, this was the largest outbreak in the USA since November 1992. Some 32 of the tornadoes occurred in Tennessee, Mississippi, Alabama and Georgia, including several long-track killers. We use the North Alabama Lightning Mapping Array (LMA) and other data sources to perform a comprehensive analysis of the structure and evolution of the outbreak. Most of the Southern tornadoes occurred in isolated, fast-moving supercell storms that formed in warm, moist air ahead of a major cold front. Storms tended to form in lines parallel to storm cell motion, resulting in many communities being hit multiple times by severe storms that evening. Supercells in Tennessee produced numerous strong tornadoes with short to medium-length track paths, while the supercells further south produced several very long-track tornadoes. Radar data indicate that the Tennessee storms tended to split frequently, apparently limiting their ability to sustain long-lived tornadoes, while storms further south split at most one time. The differences between these storms appear to be related to the presence of stronger jetstream winds in Tennessee relative to those present in Mississippi, Alabama and Georgia. LMA-derived flash rates associated with most of the supercell storm cores were about 1-2 flashes per second. Rapid increases in lightning rates (or 'jumps') occurred prior to tornado touchdown in many instances. Lightning 'holes' (lightning-free regions associated with the echo-free vault) occurred in two of the Tennessee supercells. The complexity of the relationship between lightning and storm severity is revealed by the behavior of one Alabama supercell, which produced a peak flash rate of nearly 14 flashes per second, well after the end of its long-track tornado, while interacting and ultimately merging with a daughter supercell on its southwest flank. Close examination of this powerful storm indicates that its prodigious flash rate was the result of strong flash activity over an unusually large area, rather than a concentrated core of extremely high flash rate activity.

Author

Storms (Meteorology); Meteorological Radar; Lightning; Tornadoes; Cores; Alabama; Tennessee

20040170489 NASA Marshall Space Flight Center, Huntsville, AL, USA

The GOES-R Lightning Mapper Sensor

Buechler, Dennis; Christian, Hugh; Goodman, Steve; [2004]; 1 pp.; In English; National Weather Association Annual Meeting, 16-21 Oct. 2004, Portland, OR, USA; No Copyright; Avail: Other Sources; Abstract Only

The Lightning Mapper Sensor on GOES-R builds on previous measurements of lightning from low earth orbit by the OTD (Optical Transient Detector) and LIS (Lightning Imaging Sensor) sensors. Unlike observations from low earth orbit, the GOES-R platform will allow continuous monitoring of lightning activity over the Continental USA and southern Canada, Central and South America, and portions of the Atlantic and Pacific Oceans. The LMS will detect total (cloud-to-ground and intracloud) lightning at storm scale resolution (approx. 8 km) using a highly sensitive Charge Coupled Device (CCD) detector array. Discrimination between lightning optical transients and a bright sunlit background scene is accomplished by employing spectral, spatial, and temporal filtering along with a background subtraction technique. The result is 24 hour detection capability of total lightning. These total lightning observations can be made available to users within about 20 seconds. Research indicates a number of ways that total lightning observations from LMS could benefit operational activities, including 1) potential increases in lead times and reduced false alarms for severe thunderstorm and tornado Warnings, 2) improved routing of &rail around thunderstorms, 3) support for spacecraft launches and landings, 4) improved ability to monitor tropical cyclone intensity, 5) ability to monitor thunderstorm intensification/weakening during radar outages or where radar coverage is poor, 6) better identification of deep convection for the initialization of numerical prediction models, 7) improved forest fire forecasts, 8) identification of convective initiation, 9) identification of heavy convective snowfall, and 10) enhanced temporal resolution of storm evolution (1 minute) than is available from radar observations. Total lightning data has been used in an operational environment since July 2003 at the Huntsville, Alabama National Weather Service office. Total lightning measurements are obtained by the North Alabama Lightning Mapping Array (LMA) and have successfully been used in warning decisions. Every 2 minutes, total lightning counts in 2 km by 2 km horizontal, 1 km vertical grids are available to forecasters on an AWIPS (Advanced Weather Interactive Processing System) workstation. Experience with the LMA total lightning data is used to illustrate the potential use of LMS data that would be available to forecasters across the US. This abstract is for submission as a presentation to the National Weather Association Annual Meeting to be held 16-21 October 2004

in Portland, OR. This abstract will be published in the conference proceedings.
Author (revised)
Satellite Imagery; GOES Satellites; Lightning; Satellite-Borne Instruments; Meteorological Instruments

20040170776 Army Research Lab., White Sands Missile Range, NM
An Analysis Method to Nowcast Three-Dimensional Meteorological Data for the U.S. Army IMETS
Henmi, Teizi; Dumais, Robert; Oct. 2004; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426857; ARL-TR-3354; ARL-TR-3354; No Copyright; Avail: CASI; A03, Hardcopy

An analysis method for creating three-dimensional meteorological data was developed for the U.S. Army Integrated Meteorological System (IMETS) for the purpose of nowcasting. The method uses data regularly obtained from the U.S. Air Force Weather Agency, which includes numerical forecast data generated by the Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model Version 5, along with routine surface and upper-air observations. The method is described in detail and, for the purpose of this study, applied to a region in the southeastern USA in order to demonstrate its general utility. The method is also applied to a region of Utah and evaluated statistically using local mesonet meteorological data.
DTIC
Meteorological Parameters; Nowcasting; Statistical Analysis

20040171094 Department of Energy, Washington, DC
Implementation and Evaluation of the Heffter Method to Calculate the Height of the Planetary Boundary Layer Above a Southern Great Plains Site
Nov. 30, 2002; In English
Report No.(s): DE2004-822178; No Copyright; Avail: National Technical Information Service (NTIS)

This paper explores the Heffter Method--an algorithm for finding the height of the Planetary Boundary Layer (PBL). The algorithm is applied to the Balloon Borne Sounding System (BBSS) data collected over the Southern Great Plains (SGP) Site of the Atmospheric Radiation Measurement (ARM) Program. After discussing the successes and shortcomings of the algorithm, the resulting PBL height estimates for dates in May of 2002 are related to CO(sub 2) concentration and wind data. The CO(sub 2) data used is from the Precision Gas System (PGS) while the wind data is a combination of data from the Portable CO(sub 2) Flux System on the SGP site and BBSS.
NTIS
Atmospheric Models; Boundary Layers

20040171096 Systems and Processes Engineering Corp., Boulder, CO, USA
Automated System for Measuring Microphysical and Radiative Cloud Characteristics from a Tethered Balloon
2004; In English
Report No.(s): DE2004-822044; No Copyright; Avail: National Technical Information Service (NTIS)

OAK-B135 The rate of climate change in polar regions is now felt to be a harbinger of possible global warming. Long-lived, relatively thin stratus clouds play a predominant role in transmitting solar radiation and trapping long wave radiation emitted from open water and melt ponds. In situ measurements of microphysical and radiative properties of Arctic and Antarctic stratus clouds are needed to validate retrievals from remote measurements and simulations using numerical models. While research aircraft can collect comprehensive microphysical and radiative data in clouds, the duration of these aircraft is relatively short (up to about 12 hours). During the course of the Phase II research, a tethered balloon system was developed that supports miniaturized meteorological, microphysical and radiation sensors that can collect data in stratus clouds for days at a time. The tethered balloon system uses a 43 cubic meter balloon to loft a 17 kg sensor package to altitudes up to 2 km. Power is supplied to the instrument package via two copper conductors in the custom tether. Meteorological, microphysical and radiation data are recorded by the sensor package. Meteorological measurements include pressure, temperature, humidity, wind speed and wind direction.
NTIS
Boundary Layers; Cloud Cover; Meteorological Parameters

20040171121 NASA Marshall Space Flight Center, Huntsville, AL, USA
Signatures in Lightning Activity during Tennessee Valley Severe Storms of 5-6 May 2003
Gatlin, Patrick N.; Goodman, Steven J.; [2004]; 4 pp.; In English; American Meteorological Society 22nd Conference on Severe Local Storms, 5-8 Oct. 2004, Hyannis, MA, USA; No Copyright; Avail: CASI; A01, Hardcopy

During the first week of May 2003, the Tennessee Valley experienced 14 tornadoes. Those that moved across the Tennessee Valley Region of northern Alabama and southern Tennessee provided an opportunity for study us- ing the North Alabama Lightning Mapping Array (LMA). On 5 May a classic supercell trekked across southern Tennessee spawning several tornadoes producing FO-F3 damage; on 6 May a high precipitation supercell moved across northern Alabama producing several FO-F1 tornadoes. The life cycle of these supercells will be discussed by presenting their electrical and radar evolution. Author

Tornadoes; Cloud-to-Cloud Discharges; Cloud-to-Ground Discharges

20040171134 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Impact of Current and Future Polar Orbiting Satellite Data on Numerical Weather Prediction at NASA/GSFC

Atlas, Robert; [2004]; 1 pp.; In English; Remote Sensing of the Atmosphere, Ocean, Environment and Space, 8-11 Nov. 2004, Honolulu, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

The lack of adequate observational data continues to be recognized as a major factor limiting both atmospheric research and numerical prediction on a variety of temporal and spatial scales. Since the advent of meteorological satellites in the 1960's, a considerable research effort has been directed toward the design of space-borne meteorological sensors, the development of optimal methods for the utilization of these data, (and an assessment of the influence of existing satellite data and the potential influence of future satellite observations on numerical weather prediction. This has included both Observing System Experiments (OSEs) and Observing System Simulation Experiments (OSSEs). OSEs are conducted to evaluate the impact of specific observations or classes of observations on analyses and forecasts. While OSEs are performed with existing data, OSSEs are conducted to evaluate the potential for future observing systems to improve-NWP, as well as to evaluate trade-offs in observing system design, and to develop and test improved methods for data assimilation. At the conference, results from OSEs to evaluate satellite data sets that have recently become available to the global observing system, such as AIRS and Seawinds, and results from OSSEs to determine the potential impact of space-based lidar winds will be presented. Author

Numerical Weather Forecasting; NASA Programs; Polar Orbits; Data Acquisition; Satellite Observation

20040171136 NASA Marshall Space Flight Center, Huntsville, AL, USA

Regional Assimilation of NASA Atmospheric Infrared Sounder (AIRS) Data

Chou, Shih-Hung; Lapenta, William; Jediovec, Gary J.; McCarty, William; Mecikalski, John R.; [2004]; 1 pp.; In English; 13th Conference on Satellite Meteorology and Oceanography, 20-23 Sep. 2004, Norfolk, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

The NASA Short-term Prediction Research and Transition (SPORT) Center seeks to accelerate the infusion of NASA Earth Science Enterprise (ESE) observations, data assimilation and modeling research into NW S forecast operations and decision-making. The Atmospheric Infrared Sounder (AIRS), is expected to advance climate research and weather prediction into the 21 st century. It is one of six instruments onboard Aqua, a satellite that is part of NASA s Earth Observing System. AIRS, along with two partner microwave sounding instruments, represents the most advanced atmospheric sounding system ever deployed in space. The system is capable of measuring the atmospheric temperature in the troposphere with radiosonde accuracies of 1 K over 1 km-thick layers under both clear and cloudy conditions, while the accuracy of the derived moisture profiles will exceed that obtained by radiosondes. It is imperative that the scientific community is prepared to take full advantage of next-generation satellite data that will become available within the next decade. The purpose of this paper is to describe a procedure designed to optimally assimilate AIRS data at high spatial resolution over both land and ocean. The assimilation system used in this study is the Local Analysis and Prediction System (LAPS) developed at the Forecast System Laboratory used extensively around the globe. Results will focus on quality control issues associated with AIRS, optimal assimilation strategies, and the impact of the AIRS data on subsequent numerical forecasts at 12 km produced by the next generation Weather Research and Forecast (WRF) model. Author

Atmospheric Sounding; Prediction Analysis Techniques; Forecasting; Earth Observing System (EOS); Spatial Resolution

20040171137 NASA Marshall Space Flight Center, Huntsville, AL, USA

Assessing the Usefulness of AIRS Radiance Observations in a 4D-Var Assimilation Scheme Using the Penn State/NCAR Mesoscale Model Version 5 (MM5) and a Stand Alone Radiative Transfer Algorithm (SARTA)

Carrier, M.; Zou, X.; Lapenta, W. M.; Jedlovec, G.; [2004]; 1 pp.; In English; 13th Conference on Satellite Meteorology and Oceanography, 20-24 Sep. 2004, Norfolk, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

Short-term precipitation forecast skill remains poor despite further advances in numerical modeling and data analysis. Utilizing indirect observations, such as the radiance observations obtained from the Atmospheric Infrared Sounder (AIRS), in a 4D-Var assimilation scheme may lead to a rapid improvement in the skill of 12-h QPF. In order to investigate the usefulness of AIRS observations, the adjoint code of a radiative transfer model (SARTA) is developed and linked to MM5 4D-Var system. A statistical comparison of the AIRS radiances with those calculated using the linked MMS-SARTA model is carried out to assess errors in the radiative transfer model, MM5 and AIRS data, and to develop a quality control scheme. Outliers and any bias that may exist in radiative transfer model, MM5 and AIRS data are identified. An adjoint sensitivity study, utilizing the SARTA adjoint model, is then done to identify the relative sensitivities of each spectral channel to such parameters as atmospheric temperature, pressure, and mixing ratio. Another sensitivity study is done using the MM5 alone to determine the sensitivity of the 12-h QPF to model parameters such as atmospheric temperature, pressure, and mixing ratio under various weather regimes (i.e. summertime convection, winter snowfall). Results from these two types of adjoint sensitivity studies are used to determine which AIRS channels contribute most to 12-h QPF under differing weather regimes. This information is useful when conducting 4D-Var experiments using a subset of the 2378 AIRS spectral channels. Finally, 4D-Var experiments are done to analyze the impact of the AIRS observations on the quality of the 12-h QPF results. This project falls under the data assimilation general session topic as specified by the conference organizers.
Author
Mesoscale Phenomena; Atmospheric Models

20040171139 NASA Goddard Space Flight Center, Greenbelt, MD, USA
'Hot Spots' of Land Atmosphere Coupling
Koster, Randal D.; Dirmeyer, Paul A.; Guo, Zhi-Chang; Bonan, Gordan; Chan, Edmond; Cox, Peter; Gordon, T. C.; Kanae, Shinjiro; Kowalczyk, Eva; Lawrence, David, et al.; [2004]; 10 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

Previous estimates of land-atmosphere interaction (the impact of soil moisture on precipitation) have been limited by a severe paucity of relevant observational data and by the model-dependence of the various computational estimates. To counter this limitation, a dozen climate modeling groups have recently performed the same highly-controlled numerical experiment as part of a coordinated intercomparison project. This allows, for the first time ever, a superior multi-model approach to the estimation of the regions on the globe where precipitation is affected by soil moisture anomalies during Northern Hemisphere summer. Such estimation has many potential benefits; it can contribute, for example, to seasonal rainfall prediction efforts.
Author
Climate Models; Air Land Interactions; Soil Moisture; Precipitation (Meteorology); Coupling

20040171143 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Initial Analysis of the Pixel-Level Uncertainties in Global MODIS Cloud Optical Thickness and Effective Particle Size Retrievals
Platnick, S.; King, Michael D.; Wind, B.; Gray, M. A.; Hubanks, P. A.; [2004]; 2 pp.; In English; Remote Sensing of Atmosphere, Ocean, Environment and Space, 8-11 Nov. 2004, Honolulu, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

Moderate Resolution Imaging Spectroradiometer (MODIS) retrievals of cloud optical thickness and effective particle radius employ well-known solar reflectance techniques using pre-calculated reflectance look-up tables. We evaluate the quantitative uncertainty in simultaneous retrievals of cloud optical thickness and particle size for this type of algorithm. The technique uses sensitivity calculations derived from the reflectance look-up tables, coupled with estimates for the effect of various error terms on the uncertainty in inferring the actual cloud-top reflectance. The error terms include the effects of instrument calibration, surface spectral albedo, and atmospheric corrections on both water and ice cloud retrievals. Because particle shapes in ice clouds are highly variable, the effect of particle shape is analyzed separately with a more approximate method. Results will deal exclusively with pixel-level uncertainties associated with plane-parallel clouds; real-world radiative departures from a plane-parallel model are an additional consideration. While we demonstrate the uncertainty technique with operational 1 km MODIS retrievals from the Terra and Aqua satellite platforms, the technique is applicable to any reflectance-based satellite- or air-borne sensor retrieval using similar spectral channels.
Author
MODIS (Radiometry); Optical Thickness; Ice Clouds; Solar Radiation; Reflectance; Imaging Spectrometers; Remote Sensing

20040171152 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Tall Precipitation Cells in Tropical Cyclone Eyewalls Are Associated with Tropical Cyclone Intensification
Kelley, Owen A.; Stout, John; Halverson, Jeffrey B.; [2004]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The association between tall precipitation and tropical cyclone intensification may have implications for the difficult task of forecasting the destructive potential of these storms. We propose a novel way to use radar-observed rain height to help predict tropical cyclone intensity. Then, we adapt this technique for use on the much more plentiful data from infrared and microwave instruments.
Author
Precipitation (Meteorology); Tropical Storms; Destruction

20040171154 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GPM Mission, its Scientific Agenda, and its Ground Validation Program
Smith Eric A.; [2004]; 3 pp.; In English; 2004 Annual Brazillian Meteorological Conference, 30 Aug. - 3 Sep. 2004, Sao Paulo, Brazil; No Copyright; Avail: CASI; A01, Hardcopy

The GPM mission is currently planned for start in the late 2010 time frame. From the perspective of NASA s Earth Science Enterprise (ESE) and within the framework of ESE's global water and energy cycle (GWEC) research program, its main scientific goal is to help answer pressing scientific problems concerning how global and regional water cycle processes and precipitation fluctuations and trends influence the variability intrinsic to climate, weather, and hydrology. These problems cut across a hierarchy of space-time scales and include improving understanding of climate-water cycle interactions, developing better techniques for incorporating satellite precipitation measurements into weather and climate predictions, and demonstrating that more accurate, more complete, and better sampled observations of precipitation and other water budget variables used as inputs can improve the ability of prognostic hydrometeorological models in the prediction of hazardous flood-producing storms, seasonal flood/draught conditions, and fresh water resource stores. The GPM mission will expand the scope of precipitation measurement through the use of a constellation of some 9 satellites, one of which will be an advanced TRMM-like core satellite carrying a dual-frequency Ku-Ka band precipitation radar (DPR) and an advanced, multifrequency passive microwave radiometer with vertical-horizontal polarization discrimination (GMI). The other constellation members will include a combination of new dedicated satellites and co-existing operational/research satellites carrying similar (but not identical) passive microwave radiometers. The goal of the constellation is to achieve 3-hour sampling at any spot on the globe -- continuously. The constellation s orbit architecture will consist of a mix of sun-synchronous and non-sun-synchronous satellites with the core satellite providing measurements of calibration-quality rainrates, plus cloud-precipitation microphysical processes, to be used in conjunction with more basic rain retrievals from the other constellation satellites to ensure bias-free constellation coverage.
Derived from text
Earth Sciences; NASA Space Programs; Space Missions; Precipitation Measurement; Ground Truth

20040171156 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Coupling the Community Atmospheric Model (CAM) with the Statistical Spectral Interpolation (SSI) System under ESMF
daSilva, Arlindo; [2004]; 1 pp.; In English; ESMF Meetings, 13-16 Jul. 2004; No Copyright; Avail: Other Sources; Abstract Only

The first set of interoperability experiments illustrates the role ESMF can play in integrating the national Earth science resources. Using existing data assimilation technology from NCEP and the National Weather Service, the Community Atmosphere Model (CAM) was able to ingest conventional and remotely sensed observations, a capability that could open the door to using CAM for weather as well as climate prediction. CAM, which includes land surface capabilities, was developed by NCAR, with key components from GSFC. In this talk we will describe the steps necessary for achieving the coupling of these two systems.
Author
Atmospheric Models; Interpolation; Remote Sensing

20040171160 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A New Approach to Using a Cloud-Resolving Model to Study the Interactions between Clouds, Precipitation and Aerosols
Tao, Wei-Kuo; Atlas, R.; Chern, J.; Shie, C.-H.; [2004]; 4 pp.; In English; 3rd International Ocean-Atmosphere Conference, 26 Jun. - 3 Jul. 2004, Beijing, China; No Copyright; Avail: CASI; A01, Hardcopy

Recently Grabowski and Khairoutdinov and Randall have proposed and demonstrated, the feasibility of using 2D CRMs (these did not include detailed land processes and used periodic lateral boundary conditions) as 'super-parameterizations or

a multi-scale modeling framework MMF' for cloud processes within atmospheric generation circulation models (GCMs). In the MMF, a fine-resolution 2D CRM takes the place of the single-column parameterization that is used in conventional GCMs. An overview of this approach is given by Randall et al.. Since a CRM can explicitly simulate cloud processes at the natural space and time scales of clouddynamical processes, it's possible to compute statistics of cloud fields, including radiances and radar backscatters, directly simulated/produced by the CRM. A seed fund is available at NASA Goddard to build a MMF based on a 2D GCE model and the Goddard fvGCM. A prototype MMF will be developed at end of 2004. The major objectives are to test and evaluate its performance using the GCE model as the super parameterization and compare its results with other super parameterizations, conventional GCMs and observations. Recently, a detailed spectral-bin microphysical scheme was implemented into the Goddard Cumulus Ensemble (WE) model. The GCE model is a CRM and it has been improved and applied to study the precipitation processes in the past two decades. Atmospheric aerosols are also described using number density size-distribution functions. The model is tested by studying the evolution of deep tropical clouds in the west Pacific warm pool region and summertime convection over a mid-latitude continent with different concentrations of CCN: a low 'clean' concentration and a high 'dirty' concentration. The impact of atmospheric aerosol concentration on cloud and precipitation will be investigated. In addition, the similarities and differences between bulk- and spectral-bin microphysics will be presented,

Author

Atmospheric Models; Cloud Physics; Precipitation (Meteorology); Aerosols; Two Dimensional Models

20040171164 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Version 8 SBUV Ozone Profile Trends Compared with Trends from a Zonally Averaged Chemical Model

Rosenfield, Joan E.; Frith, Stacey; Stolarski, Richard; [2004]; 37 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Linear regression trends for the years 1979-2003 were computed using the new Version 8 merged Solar Backscatter Ultraviolet (SBUV) data set of ozone profiles. These trends were compared to trends computed using ozone profiles from the Goddard Space Flight Center (GSFC) zonally averaged coupled model. Observed and modeled annual trends between 50 N and 50 S were a maximum in the higher latitudes of the upper stratosphere, with southern hemisphere (SH) trends greater than northern hemisphere (NH) trends. The observed upper stratospheric maximum annual trend is -5.5 +/- 0.9 % per decade (1 sigma) at 47.5 S and -3.8 +/- 0.5 % per decade at 47.5 N, to be compared with the modeled trends of -4.5 +/- 0.3 % per decade in the SH and -4.0 +/- 0.2% per decade in the NH. Both observed and modeled trends are most negative in winter and least negative in summer, although the modeled seasonal difference is less than observed. Model trends are shown to be greatest in winter due to a repartitioning of chlorine species and the increasing abundance of chlorine with time. The model results show that trend differences can occur depending on whether ozone profiles are in mixing ratio or number density coordinates, and on whether they are recorded on pressure or altitude levels.

Author

Ultraviolet Radiation; Backscattering; Ozone; Atmospheric Models

20040171172 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Simulation of the Onset of the Southeast Asian Monsoon During 1997 and 1998: The Impact of Surface Processes

Tao, W.-K.; Lau, W.; Baker, R.; [2004]; 1 pp.; In English; 7th Workshop on Regional Climate Simulation, 4-6 Oct. 2004, Cjimg-Li, Taiwan, Province of China; No Copyright; Avail: Other Sources; Abstract Only

The onset of the southeast Asian monsoon during 1997 and 1998 was simulated with a coupled mesoscale atmospheric model (MM5) and a detailed land surface model. The rainfall results from the simulations were compared with observed satellite data from the TRMM (Tropical Rainfall Measuring Mission) TMI (TRMM Microwave Imager) and GPCP (Global Precipitation Climatology Project). The simulation with the land surface model captured basic signatures of the monsoon onset processes and associated rainfall statistics. The sensitivity tests indicated that land surface processes had a greater impact on the simulated rainfall results than that of a small sea surface temperature change during the onset period. In both the 1997 and 1998 cases, the simulations were significantly improved by including the land surface processes. The results indicated that land surface processes played an important role in modifying the low-level wind field over two major branches of the circulation; the southwest low-level flow over the Indo-China peninsula and the northern cold front intrusion from southern China. The surface sensible and latent heat exchange between the land and atmosphere modified the low-level temperature distribution and gradient, and therefore the low-level. The more realistic forcing of the sensible and latent heat from the detailed land surface model improved the monsoon rainfall and associated wind simulation. The model results will be compared to the simulation of the 6-7 May 2000 Missouri flash flood event. In addition, the impact of model initialization and land surface

treatment on timing, intensity, and location of extreme precipitation will be examined.
Author
Monsoons; Southeast Asia; Simulation; Annual Variations; Mesoscale Phenomena; Atmospheric Models; Hydrometeorology

20040171181 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Convective Vorticity Vector Associated With Tropical Convection: A 2D Cloud-Resolving Modeling Study
Gao, Shou-Ting; Ping, Fan; Li, Xiao-Fan; Tao, Wei-Kuo; [2004]; 28 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Although dry/moist potential vorticity is a useful physical quantity for meteorological analysis, it cannot be applied to the analysis of 2D simulations. A convective vorticity vector (CVV) is introduced in this study to analyze 2D cloud-resolving simulation data associated with 2D tropical convection. The cloud model is forced by the vertical velocity, zonal wind, horizontal advection, and sea surface temperature obtained from the TOGA COARE, and is integrated for a selected 10-day period. The CVV has zonal and vertical components in the 2D x-z frame. Analysis of zonally-averaged and mass-integrated quantities shows that the correlation coefficient between the vertical component of the CVV and the sum of the cloud hydrometeor mixing ratios is 0.81, whereas the correlation coefficient between the zonal component and the sum of the mixing ratios is only 0.18. This indicates that the vertical component of the CVV is closely associated with tropical convection. The tendency equation for the vertical component of the CVV is derived and the zonally-averaged and mass-integrated tendency budgets are analyzed. The tendency of the vertical component of the CVV is determined by the interaction between the vorticity and the zonal gradient of cloud heating. The results demonstrate that the vertical component of the CVV is a cloud-linked parameter and can be used to study tropical convection.
Author
Convection; Atmospheric Circulation; Atmospheric Models; Cloud Physics; Vorticity

20040171183 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Temporal and Spatial Distribution of Liquid Water and Ice Clouds Observed by MODIS Onboard the Terra and Aqua Satellites
King, Michael D.; Platnick, S.; Gray, M. A.; Hubanks, P. A.; [2004]; 1 pp.; In English; Remote Sensing of the Atmosphere, Ocean, Environment and Space, 8-11 Nov. 2004, Honolulu, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

The Moderate Resolution Imaging Spectroradiometer (MODE) was developed by NASA and launched onboard the Terra spacecraft on December 18,1999 and the Aqua spacecraft on April 26,2002. MODIS scans a swath width sufficient to provide nearly complete global coverage every two days from each polar-orbiting, sun-synchronous, platform at an altitude of 705 km, and provides images in 36 spectral bands between 0.415 and 14.235 pm with spatial resolutions of 250 m (2 bands), 500 m (5 bands) and 1000 m (29 bands). In this paper, we describe the radiative properties of clouds as currently determined from satellites (cloud fraction, optical thickness, cloud top pressure, and cloud effective radius), and highlight the global and regional cloud microphysical properties currently available for assessing climate variability and forcing. These include the latitudinal distribution of cloud optical and radiative properties of both liquid water and ice clouds, as well as joint histograms of cloud optical thickness and effective radius for selected geographical locations around the globe.
Author
MODIS (Radiometry); Cloud Physics; Optical Thickness; Ice Clouds; Spatial Distribution; Imaging Spectrometers

20040171197 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MODIS Snow and Sea Ice Products
Hall, Dorothy K.; Riggs, George A.; Salomonson, Vincent V.; Earth Science Satellite Remote Sensing; [2004]; 32 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

In this chapter, we describe the suite of Earth Observing System (EOS) Moderate-Resolution Imaging Spectroradiometer (MODIS) Terra and Aqua snow and sea ice products. Global, daily products, developed at Goddard Space Flight Center, are archived and distributed through the National Snow and Ice Data Center at various resolutions and on different grids useful for different communities Snow products include binary snow cover, snow albedo, and in the near future, fraction of snow in a 5OO-m pixel. Sea ice products include ice extent determined with two different algorithms, and sea ice surface temperature. The algorithms used to develop these products are described. Both the snow and sea ice products, available since February 24,2000, are useful for modelers. Validation of the products is also discussed.
Author
Earth Observing System (EOS); Imaging Spectrometers; MODIS (Radiometry); Sea Ice; Snow Cover

20040171212 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA GEOS-3/TRMM Re-analysis: Capturing Observed Tropical Rainfall Variability in Global Analysis for Climate Research

Hou, Arthur Y.; [2004]; 1 pp.; In English; CGMS IPWG 2nd International Precipitation Working Group Workshop, 25-28 Oct. 2004, Monterey, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Understanding climate variability over a wide range of space-time scales requires a comprehensive description of the earth system. Global analyses produced by a fixed assimilation system (i.e., re-analyses) - as their quality continues to improve - have the potential of providing a vital tool for meeting this challenge. But at the present time, the usefulness of re-analyses is limited by uncertainties in such basic fields as clouds, precipitation, and evaporation - especially in the tropics, where observations are relatively sparse. Analyses of the tropics have long been shown to be sensitive to. the treatment of cloud precipitation processes, which remains a major source of uncertainty in current models. Yet, for many climate studies it is crucial that analyses can accurately reproduce the observed rainfall intensity and variability since a small error of 1 mm/d in surface rain translates into an error of approx. 30 W/sq m in energy (latent heat) flux. Currently, discrepancies between the observed and analyzed monthly-mean rain rates averaged to 100 km x 100 km resolution can exceed 4 mm/d (or 120 W/sq m), compared to uncertainties in surface radiative fluxes of approx. 10-20 W/sq m . Improving precipitation in analyses would reduce a major source of uncertainty in the global energy budget. Uncertainties in tropical precipitation have also been a major impediment in understanding how the tropics interact with other regions, including the remote response to El Nino/Southern Oscillation (ENSO) variability on interannual time scales, the influence of Madden-Julian Oscillation (MJO) and monsoons on intraseasonal time scales. A global analysis that can replicate the observed precipitation variability together with physically consistent estimates of other atmospheric variables provides the key to breaking this roadblock. NASA Goddard Space Flight Center has been exploring the use of satellite-based microwave rainfall measurements in improving global analyses and has recently produced a multi-year, 1 x 1 TRMM re-analysis , which assimilates 6-hourly TMI and SSM/I surface rain rates over tropical oceans using a ID variational continuous assimilation (VCA) procedure in the GEOS-3 global data assimilation system. The analysis period extends from 1 November 1997 through 3 1 December 2002. The goal is to produce a multi-year global analysis that is dynamically consistent with available tropical precipitation observations for the community to assess its utility in climate applications and identify areas for further improvements. A distinct feature of the GEOS-3RRMh4 re-analysis is that its precipitation analysis is not derived from a short-term forecast (as done in most operational systems) but is given by a time- continuous model integration constrained by precipitation observations within a 6-h analysis window, while the wind, temperature, and pressure fields are allowed to directly respond to the improved precipitation and associated latent heating structures within the same analysis window. In this talk, I will assess the impact VCA precipitation assimilation on analyses of climate signals ranging from a few weeks to interannual time scales and compare results against other operational and reanalysis products.

Author

Cloud Physics; Climatology; Data Systems

20040171214 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Impact of Subsampling on MODIS Level-3 Statistics of Cloud Optical Thickness and Effective Radius

Oreopoulos, Lazaros; [June 2004]; 33 pp.; In English

Contract(s)/Grant(s): NAG5-11631; No Copyright; Avail: CASI; A03, Hardcopy

The MODIS Level-3 optical thickness and effective radius cloud product is a gridded l deg. x 1 deg. dataset that is derived from aggregation and subsampling at 5 km of 1 km, resolution Level-2 orbital swath data (Level-2 granules). This study examines the impact of the 5 km subsampling on the mean, standard deviation and inhomogeneity parameter statistics of optical thickness and effective radius. The methodology is simple and consists of estimating mean errors for a large collection of Terra and Aqua Level-2 granules by taking the difference of the statistics at the original and subsampled resolutions. It is shown that the Level-3 sampling does not affect the various quantities investigated to the same degree, with second order moments suffering greater subsampling errors, as expected. Mean errors drop dramatically when averages over a sufficient number of regions (e.g., monthly and/or latitudinal averages) are taken, pointing to a dominance of errors that are of random nature. When histograms built from subsampled data with the same binning rules as in the Level-3 dataset are used to reconstruct the quantities of interest, the mean errors do not deteriorate significantly. The results in this paper provide guidance to users of MODIS Level-3 optical thickness and effective radius cloud products on the range of errors due to subsampling they should expect and perhaps account for, in scientific work with this dataset. In general, subsampling errors should not be a serious concern when moderate temporal and/or spatial averaging is performed.

Author

Optical Thickness; Radii; Statistical Analysis; Clouds (Meteorology)

20040171215 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Empirical Cumulus Parameterization Scheme for a Global Spectral Model

Rajendran, K.; Krishnamurti, T. N.; Misra, V.; Tao, W.-K.; [May 11, 2004]; 25 pp.; In English

Contract(s)/Grant(s): NOAA-1338-745-45; Copyright; Avail: CASI; A03, Hardcopy

Realistic vertical heating and drying profiles in a cumulus scheme is important for obtaining accurate weather forecasts. A new empirical cumulus parameterization scheme based on a procedure to improve the vertical distribution of heating and moistening over the tropics is developed. The empirical cumulus parameterization scheme (ECPS) utilizes profiles of Tropical Rainfall Measuring Mission (TRMM) based heating and moistening derived from the European Centre for Medium- Range Weather Forecasts (ECMWF) analysis. A dimension reduction technique through rotated principal component analysis (RPCA) is performed on the vertical profiles of heating (Q1) and drying (Q2) over the convective regions of the tropics, to obtain the dominant modes of variability. Analysis suggests that most of the variance associated with the observed profiles can be explained by retaining the first three modes. The ECPS then applies a statistical approach in which Q1 and Q2 are expressed as a linear combination of the first three dominant principal components which distinctly explain variance in the troposphere as a function of the prevalent large-scale dynamics. The principal component (PC) score which quantifies the contribution of each PC to the corresponding loading profile is estimated through a multiple screening regression method which yields the PC score as a function of the large-scale variables. The profiles of Q1 and Q2 thus obtained are found to match well with the observed profiles. The impact of the ECPS is investigated in a series of short range (1-3 day) prediction experiments using the Florida State University global spectral model (FSUGSM, T126L14). Comparisons between short range ECPS forecasts and those with the modified Kuo scheme show a very marked improvement in the skill in ECPS forecasts. This improvement in the forecast skill with ECPS emphasizes the importance of incorporating realistic vertical distributions of heating and drying in the model cumulus scheme. This also suggests that in the absence of explicit models for convection, the proposed statistical scheme improves the modeling of the vertical distribution of heating and moistening in areas of deep convection.

Author

Mathematical Models; Vertical Distribution; Heating; Drying; Statistical Analysis

20040171216 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Status of TRMM Ground Validation Program at NASA GSFC

Wolff, David B.; Amitai, E.; Marks, D. A.; Siberstein, D.; Pippitt, J.; [2004]; 4 pp.; In English; 2nd TRMM International Conference, 5-10 Sep. 2004, Nara, Japan; Copyright; Avail: CASI; A01, Hardcopy

The TRMM Ground Validation (GV) program at NASA GSFC has made considerable progress: over the last several years. The GV program now has a Complete record of Level I-HI products from the Kwajaiein and Melbourne, Florida sites. Current emphasis is to eliminate the remaining backlog for the Houston, Texas and Darwin, Australia sites. This paper provides details on the status of our data processing efforts, defines accuracy estimates of the various GV rain products, end shows comparisons between GV rain intensities and accumulations to satellite retrievals over the GV sites. We will show that the Version 6a TRMM TMI and PR, at leas! over ocean areas of the GV sites, are within +/- 10% of the Version 5 GV estimates at least over open Ocean areas, away from contaminating effects of land and coastal regions.

Author

Trmm Satellite; Ground Truth; Data Processing; Rain

20040171217 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Analysis of Summer 2002 Melt Extent on the Greenland Ice Sheet using MODIS and SSM/I Data

Hall, Dorothy K.; Williams, Richard S.; Steffen, Konrad; Chien, Janet Y. L.; [2004]; 5 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium 2004, 20-24 Sep. 2004, Anchorage, AK, USA; Copyright; Avail: CASI; A01, Hardcopy

Previous work has shown that the summer of 2002 had the greatest area of snow melt extent on the Greenland ice sheet ever recorded using passive-microwave data. In this paper, we compare the 0 deg. isotherm derived from the Moderate-Resolution Imaging Spectroradiometer (MODIS) instrument, with Special Sensor Microwave/Imager (SSM/I)-derived melt, at the time of the maximum melt extent in 2002. To validate the MODIS derived land-surface temperatures (LSTs), we compared the MODIS LSTs with air temperatures from nine stations (using 11 different data points) and found that they agreed to within 2.3 +/- 2.09 C, with station temperatures consistently lower than the MODIS LSTs. According to the MODIS LST, the maximum surface melt extended to approx. 2300 m in southern Greenland; while the SSM/I measurements showed that the maximum melt extended to nearly 2700 m in southeastern Greenland. The MODIS and SSM/I data are complementary

in providing detailed information about the progression of surface and near- surface melt on the Greenland ice sheet.
Author
Greenland; Melting; Ice

20040171221 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Review of Diagnostics for Water Sources in General Circulation Models (GCMs)
Bosilovich, M.; [2003]; 1 pp.; In English; IAEA International Workshop, 7-8 Apr. 2003, Vienna, Austria; No Copyright; Avail: Other Sources; Abstract Only

We will describe the uses of passive tracers in GCMs to compute the geographical sources of water for precipitation. We will present a summary of recent research and how this methodology can be applied in climate and climate change studies. We will also discuss the possibility of using passive tracers in conjunction with simulations and observations of stable observations.
Author
Water Circulation; Atmospheric General Circulation Models

20040171222 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Adjoint-Based Methods for Estimating CO2 Sources and Sinks from Atmospheric Concentration Data
Andrews, Arlyn E.; [2003]; 1 pp.; In English; Workshop on CO2 Modeling, 12-15 May 2003, Jena, Germany; No Copyright; Avail: Other Sources; Abstract Only

Work to develop adjoint-based methods for estimating CO2 sources and sinks from atmospheric concentration data was initiated in preparation for last year's summer institute on Carbon Data Assimilation (CDAS) at the National Center for Atmospheric Research in Boulder, CO. The workshop exercises used the GSFC Parameterized Chemistry and Transport Model and its adjoint. Since the workshop, a number of simulations have been run to evaluate the performance of the model adjoint. Results from these simulations will be presented, along with an outline of challenges associated with incorporating a variety of disparate data sources, from sparse, but highly precise, surface in situ observations to less accurate, global future satellite observations.
Author
Carbon Dioxide; Atmospheric Composition; Data Acquisition; Sinks

20040171228 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Clouds and Aerosols in the Climate System
King, Michael D.; [2004]; 1 pp.; In English; International Radiation Symposium, 23-28 Aug. 2004, Busan, Korea, Republic of; No Copyright; Avail: Other Sources; Abstract Only

Remote sensing of cloud and aerosol properties from space is reviewed for present and planned international satellite sensors. Techniques that are being used to enhance our ability to characterize the global distribution of cloud and aerosol properties include well-calibrated multispectral radiometers that rely on visible, near-infrared, and thermal infrared channels, sometimes including polarization as well. The availability of thermal channels to aid in cloud screening for aerosol properties is an important additional piece of information that has not always been incorporated into sensor designs. In this paper, we describe the radiative properties of clouds as currently determined from satellites (cloud fraction, optical thickness, cloud top pressure, and cloud effective radius), and highlight the global and regional cloud microphysical properties currently available for assessing climate variability and forcing. In addition, we will frustrate the radiative and microphysical properties of aerosol particles that are currently available from space-based observations, as well as enhancements to aerosol remote sensing over bright-reflecting surfaces that is anticipated in the next couple of years. Finally, we will describe the aerosol optical and radiative properties available from the globally distributed AERONET network of ground-based sun-sky radiometers.
Author
Aerosols; Climate; Cloud Physics; Remote Sensing; Earth Sciences

20040171229 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MODIS Measurements of the Effect of Aerosol on Clouds
Kaufman, Y.; [2004]; 1 pp.; In English; Aerosols and the Hydrological Cycle Meeting, 11-18 Jul,. 2004, Aspen, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

Analysis of MODIS data of aerosol and clouds over the Atlantic Ocean, the Pacific and Indian Ocean show that the

different types of aerosol affect not only the cloud microphysics but also the cloud fraction to a large extend. Analysis of detailed measurements and multiple regression analysis will be shown.
Author
MODIS (Radiometry); Aerosols

20040171235 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Precipitation Analysis at Fine Time Scales using TRMM and Other Satellites: Real-time and Research Products and Applications
Adler, Robert; Huffman, George; Bolvin, David; Nelkin, Eric; Curtis, Scott; Pierce, Harold; Gu, Guo-Jon; [2004]; 1 pp.; In English; 2nd TRMM International Science Conference; No Copyright; Avail: Other Sources; Abstract Only

Quasi-global precipitation analyses at fine time scales (3-hr) are described. TRMM observations (radar and passive microwave) are used to calibrate polar-orbit microwave observations from SSM/I (and other satellites instruments, including AMSR and AMSU) and geosynchronous IR observations. The individual data sets are then merged using a priority order based on quality to form the TRMM Multi-satellite Precipitation Analysis (MPA). Raingauge information is used to help constrain the satellite-based estimates over land. The TRMM standard research product (Version 6 3B-42 of the TRMM products) will be available for the entire TRMM period (January 1998-present) by the end of 2004. The real-time version of this merged product has been produced over the past two years and is available on the U.S. TRMM web site (trmm.gsfc.nasa.gov) at 0.25' latitude-longitude resolution over the latitude range from 5O0N-50'S. Validation of daily totals indicates good results, with limitations noted in mid-latitude winter over land and regions of shallow, orographic precipitation. Various applications of these estimates are described, includmg: 1) detecting potential floods in near real-time; 2) analyzing Indian Ocean precipitation variations related to the initiation of El Nino; 3) determining characteristics of the African monsoon; and 4) analysis of diurnal variations.
Author
Precipitation (Meteorology); Microwave Imagery; Temperate Regions; Diurnal Variations

20040171247 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Tropical Convective Responses to Microphysical and Radiative Processes: A Sensitivity Study With a 2D Cloud Resolving Model
Li, Xiao-Fan; Sui, C.-H.; Lau, K.-M.; Tao, W.-K.; [March 2004]; 41 pp.; In English
Contract(s)/Grant(s): NSC-91-2621-Z-008-008; No Copyright; Avail: CASI; A03, Hardcopy

Prognostic cloud schemes are increasingly used in weather and climate models in order to better treat cloud-radiation processes. Simplifications are often made in such schemes for computational efficiency, like the scheme being used in the National Centers for Environment Prediction models that excludes some microphysical processes and precipitation-radiation interaction. In this study, sensitivity tests with a 2D cloud resolving model are carried out to examine effects of the excluded microphysical processes and precipitation-radiation interaction on tropical thermodynamics and cloud properties. The model is integrated for 10 days with the imposed vertical velocity derived from the Tropical Ocean Global Atmosphere Coupled Ocean-Atmosphere Response Experiment. The experiment excluding the depositional growth of snow from cloud ice shows anomalous growth of cloud ice and more than 20% increase of fractional cloud cover, indicating that the lack of the depositional snow growth causes unrealistically large mixing ratio of cloud ice. The experiment excluding the precipitation-radiation interaction displays a significant cooling and drying bias. The analysis of heat and moisture budgets shows that the simulation without the interaction produces more stable upper troposphere and more unstable mid and lower troposphere than does the simulation with the interaction. Thus, the suppressed growth of ice clouds in upper troposphere and stronger radiative cooling in mid and lower troposphere are responsible for the cooling bias, and less evaporation of rain associated with the large-scale subsidence induces the drying in mid and lower troposphere.
Author
Clouds (Meteorology); Two Dimensional Models; Convection; Tropical Regions; Radiation Distribution; Sensitivity Analysis; Precipitation (Meteorology)

20040171257 NASA Goddard Space Flight Center, Greenbelt, MD, USA
THOR: Cloud Thickness from Off beam Lidar Returns
Cahalan, Robert F.; McGill, Matthew; Kolasinski, John; Varnai, Tamas; Yetzer, Ken; [June 2004]; 67 pp.; In English; No Copyright; Avail: CASI; A04, Hardcopy

Conventional wisdom is that lidar pulses do not significantly penetrate clouds having optical thickness exceeding about

tau = 2, and that no returns are detectable from more than a shallow skin depth. Yet optically thicker clouds of tau much greater than 2 reflect a larger fraction of visible photons, and account for much of Earth s global average albedo. As cloud layer thickness grows, an increasing fraction of reflected photons are scattered multiple times within the cloud, and return from a diffuse concentric halo that grows around the incident pulse, increasing in horizontal area with layer physical thickness. The reflected halo is largely undetected by narrow field-of-view (FoV) receivers commonly used in lidar applications. THOR - Thickness from Off-beam Returns - is an airborne wide-angle detection system with multiple FoVs, capable of observing the diffuse halo, detecting wide-angle signal from which physical thickness of optically thick clouds can be retrieved. In this paper we describe the THOR system, demonstrate that the halo signal is stronger for thicker clouds, and validate physical thickness retrievals for clouds having z \g 20, from NASA P-3B flights over the Department of Energy/Atmospheric Radiation Measurement/Southern Great Plains site, using the lidar, radar and other ancillary ground-based data.
Author
Cloud Cover; Beams (Radiation); Optical Radar; Optical Thickness

20040171259 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High-Resolution Mesoscale Simulations of the 6-7 May 2000 Missouri Flash Flood: Impact of Model Initialization and Land Surface Treatment
Baker, R. David; Wang, Yansen; Tao, Wei-Kuo; Wetzel, Peter; Belcher, Larry R.; [2004]; 30 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

High-resolution mesoscale model simulations of the 6-7 May 2000 Missouri flash flood event were performed to test the impact of model initialization and land surface treatment on timing, intensity, and location of extreme precipitation. In this flash flood event, a mesoscale convective system (MCS) produced over 340 mm of rain in roughly 9 hours in some locations. Two different types of model initialization were employed: 1) NCEP global reanalysis with 2.5-degree grid spacing and 12-hour temporal resolution, and 2) Eta reanalysis with 40- km grid spacing and $hour temporal resolution. In addition, two different land surface treatments were considered. A simple land scheme. (SLAB) keeps soil moisture fixed at initial values throughout the simulation, while a more sophisticated land model (PLACE) allows for r interactive feedback. Simulations with high-resolution Eta model initialization show considerable improvement in the intensity of precipitation due to the presence in the initialization of a residual mesoscale convective vortex (hlCV) from a previous MCS. Simulations with the PLACE land model show improved location of heavy precipitation. Since soil moisture can vary over time in the PLACE model, surface energy fluxes exhibit strong spatial gradients. These surface energy flux gradients help produce a strong low-level jet (LLJ) in the correct location. The LLJ then interacts with the cold outflow boundary of the MCS to produce new convective cells. The simulation with both high-resolution model initialization and time-varying soil moisture test reproduces the intensity and location of observed rainfall.
Author
Floods; Flux Density; Jet Streams (Meteorology); Soil Moisture; Mathematical Models

20040171260 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Implementation of a Message Passing Interface into a Cloud-Resolving Model for Massively Parallel Computing
Juang, Hann-Ming Henry; Tao, Wei-Kuo; Zeng, Xi-Ping; Shie, Chung-Lin; Simpson, Joanne; Lang, Steve; [2 Jun. 2004]; 65 pp.; In English; Copyright; Avail: CASI; A04, Hardcopy

The capability for massively parallel programming (MPP) using a message passing interface (MPI) has been implemented into a three-dimensional version of the Goddard Cumulus Ensemble (GCE) model. The design for the MPP with MPI uses the concept of maintaining similar code structure between the whole domain as well as the portions after decomposition. Hence the model follows the same integration for single and multiple tasks (CPUs). Also, it provides for minimal changes to the original code, so it is easily modified and/or managed by the model developers and users who have little knowledge of MPP. The entire model domain could be sliced into one- or two-dimensional decomposition with a halo regime, which is overlaid on partial domains. The halo regime requires that no data be fetched across tasks during the computational stage, but it must be updated before the next computational stage through data exchange via MPI. For reproducible purposes, transposing data among tasks is required for spectral transform (Fast Fourier Transform, FFT), which is used in the anelastic version of the model for solving the pressure equation. The performance of the MPI-implemented codes (i.e., the compressible and anelastic versions) was tested on three different computing platforms. The major results are: 1) both versions have speedups of about 99% up to 256 tasks but not for 512 tasks; 2) the anelastic version has better speedup and efficiency because it requires more computations than that of the compressible version; 3) equal or approximately-equal numbers of slices between the x- and y- directions provide the fastest integration due to fewer data exchanges; and 4) one-dimensional slices in the x-direction

result in the slowest integration due to the need for more memory relocation for computation.
Author
Clouds (Meteorology); Cumulus Clouds; Massively Parallel Processors; Atmospheric Models; Message Processing

20040171265 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Graupel and Snow Determination in Convection Using Dual-Wavelength Radar
Heymsfield, Gerald; Tian, L.; Heymsfield, A.; Belcher, L.; Li, L.; [2004]; 1 pp.; In English; 2nd TRMM International Science Conference, 5-10 Sep. 2004, Nara, Japan; No Copyright; Avail: Other Sources; Abstract Only

Convective storms contain significant amounts of snow and graupel that each have different scattering properties for radar and radiometer remote sensing. TRMM TMI algorithms have relied heavily on radiative transfer calculations based on cloud model predicted microphysics information. In general, without in situ aircraft measurements, it is very difficult to separate snow and graupel using remote measurements. At the 94 GHZ frequency, snow is weakly attenuating while graupel is strongly attenuating. With a non-attenuating frequency such as X-band, one can distinguish Mie scattering from larger hydrometeors as well as attenuation from graupel. The presence of supercooled water will also cause attenuation of the 94 GHz radar signal, but this is mainly in convective updrafts. We will present preliminary results aimed at distinguishing snow from graupel using dual-wavelength (9.6 GHz, 94 GHz) measurements from aircraft overflights of convective storms in Florida. Measurements were made with the 9.6 GHz ER-2 Doppler Radar (EDOP) and the 94 GHz Cloud Radar System (CRS) over a number of different precipitation systems. Analysis of the vertical profiles at the two wavelengths provides information on snow and graupel regions, as well as supercooled water. The presentation will include examples from different cases and discussion of the results.
Author
Graupel; Snow; Clouds (Meteorology); Radar Attenuation; Storms (Meteorology); Meteorological Radar

20040171266 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Warm Rain Processes Over the Tropical Oceans and Implications on Climate Change
Lau, William K. M.; Wu, H. T.; [2004]; 1 pp.; In English; ICCP 2004, 18-23 Jul. 2004, Bologna, Italy; No Copyright; Avail: Other Sources; Abstract Only

In this talk, we will first show results from TRMM regarding the characteristics of warm rains over the tropical oceans, and the dependence of rate of warm rain production on sea surface temperature. Results lead to the hypothesis that warm rain production efficiency, i.e., autoconversion, may be increased in a warm climate. We use the GEOS-II GCM to test this hypothesis. Our modeling results show that in a climate with increased rate of autoconversion, the total rain amount is increased, with warm rain contributing to a larger portion of the increase. The abundant rainout of warm precipitation at middle to low levels causes a reduction of high cloud cover due to the depletion of water available for ice-phase rain production. As a result, more isolated, but more intense penetrative convection develops. Results also show that increased autoconversion reduces the convective adjustment time scale tends, implying a faster recycling of atmospheric water. Most interestingly, the increased low level heating associated with warm rain leads to more energetic Madden and Julian oscillations in the tropics, with well-defined eastward propagation. While reducing the autoconversion leads to an abundant mix of westward and eastward tropical disturbance on daily to weekly time scales. The causes of the sensitivity of the dynamical regimes to the microphysics parameterization in the GCM will be discussed.
Author
Climate Change; Oceans; Rain; Tropical Regions; Atmospheric General Circulation Models

20040171269 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity of Precipitation Processes of Microphysics and Resolution in a Cloud-Resolving Model
Tao, Wei-Kuo; [2003]; 1 pp.; In English; International Workshop on NWP Models for Heavy Precipitation in Asia and Pacific Areas, 4-6 Feb. 2003, Tokyo, Japan; No Copyright; Avail: Other Sources; Abstract Only

The Goddard Cumulus Ensemble (GCE) model is used to examine the impact of various microphysical schemes, and vertical and horizontal resolution ion the development, intensity and rainfall associated with mesoscale convective systems, idealized hurricanes and an ensemble f clouds. The model variables include horizontal and vertical velocities, potential temperatures, perturbation pressure, turbulent kinetic energy, and mixing ratios of all water phases (vapor, liquid, and ice). The major characteristics of the GCE model are the explicit representation of warm rain and ice microphysical processes, and their complex interactions with solar and infrared radiative transfer processes, and with surface processes. For idealized hurricane, an axisymmetric version of the GCE model was developed and used successfully to simulate the tropical cyclogenesis process

using both a Rankin vortex and saturated air within a specified radius as initial conditions. For mesoscale convective systems, the 3-D version of the GCE model was used to simulated squall lines that developed in the western Pacific, eastern Atlantic and central US. For the cloud ensemble, the GCE model was integrated for several days in order to have good sampling of cloud statistics. In this paper, the sensitivities of hurricane intensity to various microphysical processes and model grid resolution will be examined. This will be mainly achieved by performing sensitivity tests using various horizontal (from 1- to 5-km) and vertical resolutions (from 20- to 200-m in the lower troposphere to 200- to 500-m in the middle and upper troposphere). Sensitivity tests using various microphysical schemes (warm rain only, and three ice with either graupel or hail) will also be performed. The thermodynamic and water budget associated with various types of precipitation systems will also be evaluated. The budgets will be calculated for different regions (i.e., convective and stratiform regions).
Author
Clouds (Meteorology); Cumulus Clouds; Atmospheric Models; Rain; Hurricanes; Cyclogenesis; Resolution; Radiative Transfer

20040171270 Defence Science and Technology Organisation, Fishermans Bend, Australia
Wind Tunnel Simulations of the Mock Urban Setting Test: Experimental Procedures and Data Analysis
Gailis, Ralph; July 2004; 64 pp.; In English
Report No.(s): DSTO-TR-1532; Copyright; Avail: Other Sources

The MUST experiment was a large outdoor field study in atmospheric dispersion, attempting to simulate a31 urban boundary layer by the construction of a regular array of shipping containers. The current report gives details of a wind tunnel dispersion study of the MUST array, aimed at bridging some of the gaps between laboratory and full-scale outdoor trials. The experimental setup and wind tunnel instrumentation are discussed in detail, the measurements made together with the organization of the dataset is fully described, and a comprehensive description of the data analysis techniques is given. Emphasis is placed on the scaling arguments used to compare data between a wind tunnel and full-scale study, and on methods of uncertainty analysis to provide a rigorous underpinning to the dataset. The report serves as a complete documentation for users of the MUST wind tunnel simulation dataset, which can be obtained by contacting the author.
Author
Boundary Layers; Data Processing; Meteorology; Cities

20040171277 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Warm Rain Processes Over the Tropical Oceans and Implications on Climate Change: Results from TRMM and GOES GCM
Lau, William K. M.; Wu, H. T.; [2004]; 1 pp.; In English; Workshop on Monsoon Systems of the Americas, 14-20 Sep. 2004, Montevideo, Uruguay; No Copyright; Avail: Other Sources; Abstract Only

In this talk, we will first show results from TRMM data regarding the characteristics of warm rains over the tropical oceans, and the dependence of rate of warm rain production on sea surface temperature. Results lead to the hypothesis that warm rain production efficiency, i.e., autoconversion, may be increased in a warm climate. We use the GEOS-II GCM to test this hypothesis. Our modeling results show that in a climate with increased rate of autoconversion, the total rain amount is increased, with warm rain contributing to a larger portion of the increase. The abundant rainout of warm precipitation causes a reduction of low and middle cloud amount due to rainout, and reduced high clouds due to less water vapor available for ice-phase convection. However, clod radiation feedback caused by the increased rainfall efficiency, leads to differential vertical heating/cooling producing a more unstable atmosphere, allowing, more intense, but isolated penetrative convection, with contracted anvils to develop. Results also show that increased autoconversion reduces the convective adjustment time scale, resulting in faster recycling of atmospheric water. Most interestingly, the increased low level heating associated with warm rain leads to more energetic Madden and Julian oscillations in the tropics, with well-defined eastward propagation. While reducing the autoconversion leads to an abundant mix of westward and eastward tropical disturbances on daily to weekly time scales. The crucial link of precipitation microphysical processes to climate change including the effects of aerosols will be discussed.
Author
Climate Change; Rain; Tropical Regions; Oceans; Sea Surface Temperature

20040171278 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Latent Heating Structures Derived from TRMM
Tao, W.-K.; Smith, E. A.; Adler, R.; Hou, A.; Kakar, R.; Krishnamurti, T.; Kummerow, C.; Lang, S.; Olson, W.; Satoh, S., et al.; [2004]; 2 pp.; In English; 2nd TRMM International Conference, 5-10 Sep. 2004, Nara, Japan; Copyright; Avail: Other Sources; Abstract Only

Rainfall is the fundamental variable within the Earth's hydrological cycle because it is both the main forcing term leading to variations in continental and oceanic surface water budgets. The vertical distribution of latent heat release, which is accompanied with rain, modulates large-scale meridional and zonal circulations within the tropics as well as modifying the energetic efficiency of mid-latitude weather systems. Latent heat release itself is a consequence of phase changes between the vapor, liquid, and frozen states of water.This paper focuses on the retrieval of latent heat release from satellite measurements generated by the Tropical Rainfall Measuring Mission 0. The TRMM observatory, whose development was a joint US-Japan space endeavor, was launched in November 1997. TRMM measurements provide an accurate account of rainfall over the global tropics, information which can be .used to estimate the four-dimensional structure of latent heating across the entire tropical and sub-tropical regions. Various algorithm methodologies for estimating latent heating based on rain rate measurements from TRMM observations are described. The strengths and weaknesses of these algorithms, as well as the latent heating products generated by these algorithms, are also discussed along with validation analyses of the products. The investigation paper provides an overview of how TRMM-derived latent heating information is currently being used in conjunction with global weather and climate models, and concludes with remarks designed to stimulate further research on latent heating retrieval

Author

Latent Heat; Vertical Distribution; Hydrological Cycle; Heat Transfer

20040171286 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Characteristics of Heavy Summer Rainfall in Southwestern Taiwan in Relation to Orographic Effects

Chen, Ching-Sen; Chen, Wan-Chin; Tao, Wei-Kuo; [2004]; 37 pp.; In English

Contract(s)/Grant(s): NSC-90-2111-M-008-038; No Copyright; Avail: CASI; A03, Hardcopy

On the windward side of southwestern Taiwan, about a quarter to a half of all rainfall during mid-July through August from 1994 to 2000 came from convective systems embedded in the southwesterly monsoon flow. k this study, the causes of two heavy rainfall events (daily rainfall exceeding 100 mm day over at least three rainfall stations) observed over the slopes and/or lowlands of southwestern Taiwan were examined. Data from European Center for Medium-Range Weather Forecasts /Tropical Ocean- Global Atmosphere (EC/TOGA) analyses, the rainfall stations of the Automatic Rainfall and Meteorological Telemetry System (ARMTS) and the conventional surface stations over Taiwan, and the simulation results from a regional-scale numerical model were used to accomplish the objectives. In one event (393 mm day on 9 August 1999), heavy rainfall was observed over the windward slopes of southern Taiwan in a potentially unstable environment with very humid air around 850 hPa. The extreme accumulation was simulated and attributed to orographic lifting effects. No preexisting convection drifted in from the Taiwan Strait into western Taiwan.

Author

Air Water Interactions; Mathematical Models; Scale Models

20040171288 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Effect of Surface Heterogeneity on Cloud Absorption Estimates

Chiu, Jui-Yuan C.; Marshak, Alexander; Wiscombe, Warren J.; [2004]; 3 pp.; In English; Copyright; Avail: CASI; A01, Hardcopy

This study presents a systematic and quantitative analysis of the effect of inhomogeneous surface albedo on shortwave cloud absorption estimates. We use 3D radiative transfer modeling with gradually complex clouds over a simplified surface to calculate cloud absorption. We find that averaging surface albedo always underestimates cloud absorption, and thus accounting for surface heterogeneity always enhances cloud absorption. However, the impact on cloud absorption estimates is not enough to explain the discrepancy between measured and model calculated shortwave cloud absorptions.

Author

Heterogeneity; Radiative Transfer; Cloud Dispersal; Albedo; Surface Properties

20040171375 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cloud Inhomogeneity from MODIS

Oreopoulos, Lazaros; Cahalan, Robert F.; [September 2004]; 49 pp.; In English

Contract(s)/Grant(s): DE-AI02-00ER-62939; NAG5-11631; No Copyright; Avail: CASI; A03, Hardcopy

Two full months (July 2003 and January 2004) of MODIS Atmosphere Level-3 data from the Terra and Aqua satellites are analyzed in order to characterize the horizontal variability of cloud optical thickness and water path at global scales. Various options to derive cloud variability parameters are discussed. The climatology of cloud inhomogeneity is built by first

calculating daily parameter values at spatial scales of l degree x 1 degree, and then at zonal and global scales, followed by averaging over monthly time scales. Geographical, diurnal, and seasonal changes of inhomogeneity parameters are examined separately for the two cloud phases, and separately over land and ocean. We find that cloud inhomogeneity is weaker in summer than in winter, weaker over land than ocean for liquid clouds, weaker for local morning than local afternoon, about the same for liquid and ice clouds on a global scale, but with wider probability distribution functions (PDFs) and larger latitudinal variations for ice, and relatively insensitive to whether water path or optical thickness products are used. Typical mean values at hemispheric and global scales of the inhomogeneity parameter nu (roughly the mean over the standard deviation of water path or optical thickness), range from approximately 2.5 to 3, while for the inhomogeneity parameter chi (the ratio of the logarithmic to linear mean) from approximately 0.7 to 0.8. Values of chi for zonal averages can occasionally fall below 0.6 and for individual gridpoints below 0.5. Our results demonstrate that MODIS is capable of revealing significant fluctuations in cloud horizontal inhomogenity and stress the need to model their global radiative effect in future studies.
Author
Inhomogeneity; MODIS (Radiometry); Cloud Physics; Climatology

20040171391 NASA Goddard Space Flight Center, Greenbelt, MD, USA
ENSO Bred Vectors in Coupled Ocean-Atmosphere General Circulation Models
Yang, S. C.; Cai, Ming; Kalnay, E.; Rienecker, M.; Yuan, G.; Toth, ZA.; January 2004; 41 pp.; In English
Contract(s)/Grant(s): NAG5-55825; NAG5-12418; Copyright; Avail: CASI; A03, Hardcopy

The breeding method has been implemented in the NASA Seasonal-to-Interannual Prediction Project (NSIPP) Coupled General Circulation Model (CGCM) with the goal of improving operational seasonal to interannual climate predictions through ensemble forecasting and data assimilation. The coupled instability as cap'tured by the breeding method is the first attempt to isolate the evolving ENSO instability and its corresponding global atmospheric response in a fully coupled ocean-atmosphere GCM. Our results show that the growth rate of the coupled bred vectors (BV) peaks at about 3 months before a background ENSO event. The dominant growing BV modes are reminiscent of the background ENSO anomalies and show a strong tropical response with wind/SST/thermocline interrelated in a manner similar to the background ENSO mode. They exhibit larger amplitudes in the eastern tropical Pacific, reflecting the natural dynamical sensitivity associated with the presence of the shallow thermocline. Moreover, the extratropical perturbations associated with these coupled BV modes reveal the variations related to the atmospheric teleconnection patterns associated with background ENSO variability, e.g. over the North Pacific and North America. A similar experiment was carried out with the NCEP/CFS03 CGCM. Comparisons between bred vectors from the NSIPP CGCM and NCEP/CFS03 CGCM demonstrate the robustness of the results. Our results strongly suggest that the breeding method can serve as a natural filter to identify the slowly varying, coupled instabilities in a coupled GCM, which can be used to construct ensemble perturbations for ensemble forecasts and to estimate the coupled background error covariance for coupled data assimilation.
Author
Air Water Interactions; Atmospheric General Circulation Models; El Nino; Southern Oscillation; Vectors (Mathematics); Coupled Modes

20040171392 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Cirrus Simulations of CRYSTAL-FACE 23 July 2002 Case
Starr, David; Lin, Ruei-Fong; Demoz, Belay; Lare, Andrew; [2004]; 4 pp.; In English; 14th International Conference on Clouds and Precipitation, 19-23 Jul. 2004, Bologna, Italy; No Copyright; Avail: CASI; A01, Hardcopy

A key objective of the Cirrus Regional Study of Tropical Anvils and Cirrus Layers - Florida Area Cirrus Experiment (CRYSTAL-FACE) is to understand relationships between the properties of tropical convective cloud systems and the properties and lifecycle of the extended cirrus anvils they produce. We report here on a case study of 23 July 2002 where a sequence of convective storms over central Florida produced an extensive anvil outflow. Our approach is to use a suitably-initialized cloud- system simulation with MM5 (Starr et al., companion paper in this volume) to define initial conditions and time-dependent forcing for a simulation of anvil evolution using a two-dimensional fine-resolution (100 m) cirrus cloud model that explicitly accounts for details of cirrus microphysical development (bin or spectra model) and fully interactive radiative processes. The cirrus model follows Lin (1997). The microphysical components are described in Lin et al. (2004) - see Lin et a1 (this volume). Meteorological conditions and observations for the 23 July case are described in Starr et al. (this volume). The goals of the present study are to evaluate how well we can simulate a cirrus anvil lifecycle, to evaluate the importance of various physical processes that operate within the anvil, and to evaluate the importance of environmental conditions in regulating anvil lifecycle. CRYSTAL-FACE produced a number of excellent case studies of anvil systems that will allow environmental factors, such as static stability or wind shear in the upper troposphere, to be examined. In the present

study, we strive to assess the importance of propagating gravity waves, likely produced by the deep convection itself, and radiative processes, to anvil lifecycle and characteristics.
Derived from text
Anvils; Cirrus Clouds; Tropical Regions; Florida; Simulation

20040171395 NASA Goddard Space Flight Center, Greenbelt, MD, USA
AROTAL Ozone and Temperature Vertical Profile Measurements from the NASA DC-8 during the SOLVE II Campaign
McGee, Thomas J.; Twigg, Laurence; Sumnicht, Grant; Hoegy, Walter; Burris, John; Silbert, Donald; Heaps, William; Neuber, R.; Trepte, C. R.; [2004]; 2 pp.; In English; International Laser Radar Conference, 10-17 Jul. 2004, Matera, Italy; No Copyright; Avail: CASI; A01, Hardcopy

The AROTAL instrument (Airborne Raman Ozone Temperature and Aerosol Lidar) - a collaboration between scientists at NASA Goddard Space Flight Center, and Langley Research Center - was flown on the NASA DC-8 during the SOLVE II Campaign during January and February, 2003. The flights were flown from the Arena Arctica in Kiruna, Sweden. We report measurements of temperature and ozone profiles showing approximately a 600 ppbv loss in ozone near 17.5 km, over the time frame of the aircraft campaign. Comparisons of ozone profiles from AROTAL are made with the SAGE III instrument.
Author
Temperature Measurement; Aerosols; Atmospheric Composition; Atmospheric Temperature; Temperature Profiles

20040171396 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Stratospheric-Tropospheric Interaction and the 2002 Ozone Hole
Newman, Paul A.; [2003]; 1 pp.; In English; The Role of the Stratosphere in Tropospheric Climate, 29 Apr. - 2 May 2003, Whistler, BC, Canada; No Copyright; Avail: Other Sources; Abstract Only

The 2002 ozone hole was remarkable for its small size and early break-up. This small size resulted from a series of wave events over the course of the 2002 winter. The major event of the 2002 winter was the major warming in late September 2002. This warming resulted from an extremely strong wave event that propagated out of the troposphere, reversed the zonal mean flow, and warmed the polar vortex. This late-September event was the culmination of a series of large wave events which occurred over the course of the 2002 winter. These waves collectively warmed the vortex and decelerated the stratospheric flow. In this talk, we will trace the origin of these wave events, and we will also analyze the feedback of the large disruption of the stratospheric flow on the troposphere.
Author
Ozone Depletion; Stratosphere; Troposphere; Climatology

20040171405 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Impacts of Air-Sea Interaction on Tropical Cyclone Track and Intensity
Wu, Liguang; Wang, Bin; Braun, Scott A.; [2004]; 44 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The influence of hurricane-ocean coupling on intensity and track of tropical cyclones (TCs) is investigated through idealized numerical experiments using a coupled hurricane-ocean model. The focus is placed on how air-sea interaction affects TC tracks and intensity. It is found that the symmetric sea surface temperature (SST) cooling is primarily responsible for the TC weakening in the coupled experiments because the induced asymmetric circulation associated with the asymmetric SST anomalies is weak and shallow. The track difference between the coupled and fixed SST experiments is generally small because of the competing processes. One is associated with the modified TC asymmetries. The asymmetric SST anomalies - weaken the surface fluxes in the rear and enhance the fluxes in the front. As a result, the enhanced diabatic heating is located on the southern side for a westward-moving TC, tending to shift the TC southward. The symmetric SST anomalies weakens the TC intensity and thus the dymmetrization process, leading to more prominent TC asymmetries. The other is associated with the weakening of the beta drift resulting from the weakening of the TC outer strength. In the coupled experiment, the weakening of the beta drift leads to a more northward shift. By adjusting the vortex outer strength of the initial vortices, the beta drift can vary while the effect of air-sea interaction changes little. Two types of track differences simulated in the previous numerical studies are obtained.
Author
Cyclones; Tropical Storms; Air Sea Ice Interactions; Ocean Models

20040171416 NASA Marshall Space Flight Center, Huntsville, AL, USA
A Climatological Study of Cloud to Ground Lightning Strikes in the Vicinity of the Kennedy Space Center
Burns, Lee; Decker, Ryan; [2004]; 28 pp.; In English; 11th AMS Conference on Aviation, Range and Aerospace Meteorology, 4-8 Oct. 2004, Hyannis, MA, USA; Copyright; Avail: CASI; A03, Hardcopy

Lightning strike location and peak current are monitored operationally in the Kennedy Space Center (KSC)/Cape Canaveral Air Force Station (CCAFS) area by the Cloud to Ground Lightning Surveillance System (CGLSS). The present study compiles ten years of CGLSS data into a climatological database of all strikes recorded within a 20-mile radius of space shuttle launch platform LP39A, which serves as a convenient central point. The period of record (POR) for the database runs from January 1, 1993 to December 31, 2002. Histograms and cumulative probability curves are produced to determine the distribution of occurrence rates for the spectrum of strike intensities (given in kA). Further analysis of the database provides a description of both seasonal and interannual variations in the lightning distribution.
Author
Cape Kennedy Launch Complex; Climate; Cloud-to-Ground Discharges

20040171417 NASA Marshall Space Flight Center, Huntsville, AL, USA
Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development
Johnson, Dale L.; Vaughan, William W.; [2004]; 11 pp.; In English; 11th AMS Conference on Aviation, Range and Aerospace Meteorology, 4-8 Oct. 2004, Hyannis, MA, USA; Copyright; Avail: CASI; A03, Hardcopy

Aerospace Meteorology provides the identification of that aspect of meteorology that is concerned with the definition and modeling of atmospheric parameters for use in aerospace vehicle development, mission planning and operational capability assessments. One of the principal sources of this information is the NASA-HDBK-1001 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development'. This handbook was approved by the NASA Chief Engineer in 2000 as a NASA Preferred Technical Standard . Its technical contents were based on natural environment statistics/models and criteria developed mostly in the early 1990's. A task was approved to completely update the handbook to reflect the current state-of-the-art in the various terrestrial environment climatic areas.
Derived from text
Terrestrial Radiation; Meteorological Parameters; Atmospheric Models

20040171418 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations
Chin, Mian; Dubovik, Oleg; Holben, Brent; Torres, Omar; Anderson, Tad; Quinn, Patricia; Ginoux, Paul; [2004]; 1 pp.; In English; 2004 Fall AGU Conference, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Aerosol absorption in the atmosphere poses a major uncertainty in assessing the aerosol climate effects. This uncertainty arises from the poorly quantified aerosol sources, especially black carbon emissions, and our limited knowledge of aerosol mixing state and optical properties. Here we use a global model GOCART to simulate atmospheric aerosols, including sulfate, black carbon, organic carbon, dust, and sea salt. We compare the model calculated total aerosol optical thickness, extinction, and absorption with those quantities from the ground-based sun photometer measurements from AERONET, satellite retrievals from the TOMS instrument, and field observations from ACE-Asia. We will examine the most sensitive factors in determining the aerosol absorption. and the consequences of assessing the aerosol radiative forcing and atmospheric heating associated with those factors.
Author
Aerosols; Climate; Carbon; Sulfates; Absorption

20040171419 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Wind Profiles Obtained with a Molecular Direct Detection Doppler Lidar During IHOP-2002
Gentry, Bruce M.; Chen, Huai-Lin; Li, Steven X.; Mathur, Savyasachee; Dobler, Jeremy; Hasselbrack, William; Comer, Joseph; [2004]; 3 pp.; In English; International Laser Radar Conference, Matera, Italy; Copyright; Avail: CASI; A01, Hardcopy

The Goddard Lidar Observatory for Winds (GLOW) is a mobile direct detection Doppler lidar system which uses the double edge technique to measure the Doppler shift of the molecular backscattered laser signal at a wavelength of 355 nm. In the spring of 2002 GLOW was deployed to the western Oklahoma profiling site (36 deg 33.500 min. N, 100 deg. 36.371

min. W) to participate in the International H2O Project (IHOP). During the IHOP campaign over 240 hours of wind profiles were obtained with the GLOW lidar in support of a variety of scientific investigations.
Author
Wind Profiles; Optical Radar; Doppler Effect

20040171420 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The 22 May Dryline in IHOP2002: The Role of Lidars in Quantifying the Convective Variability
Demoz, Belay; Miller, David; DiGiroiamo, Paolo; Whiteman, David; Evans, Keith; Flamant, Cyrille; Geerts, Bart; Weckwerth, Tammy; Starr, David; Schwemmer, Geary, et al.; [2004]; 4 pp.; In English; 22nd International Radar Laser Conference, 12-16 Jul. 2004, Matera, Italy; No Copyright; Avail: CASI; A01, Hardcopy

Details of convective and mesoscale variability of a dryline on 22 May 2002 are characterized. Convective plumes (or updrafts) were found to be moister than downdrafts by about 1g/kg and contained magnitudes of 1.5 m/s at 2 km altitude. A synthesis of aircraft, lidar and other ancillary data collected during the dryline are discussed.
Author
Mesoscale Phenomena; Vertical Air Currents; Optical Radar; Airborne Radar

20040171423 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Simulation of the Onset of the Southeast Asian Monsoon during 1997 and 1998: The Impact of Surface Processes
Tao, W.-K.; Wang, Y.; Lau, W.; Baker, R. D.; [2004]; 1 pp.; In English; 7th Workshop on Regional Climate Simulation, 27-29 Sep. 2004, Jhong-Li, Taiwan, Province of China; No Copyright; Avail: Other Sources; Abstract Only

The onset of the southeast Asian monsoon during 1997 and 1998 was simulated with a coupled mesoscale atmospheric model (MM5) and a detailed land surface model. The rainfall results from the simulations were compared with observed satellite data from the TRMM (Tropical Rainfall Measuring Mission) TMI (TRMM Microwave Imager) and GPCP (Global Precipitation Climatology Project). The simulation with the land surface model captured basic signatures of the monsoon onset processes and associated rainfall statistics. The sensitivity tests indicated that land surface processes had a greater impact on the simulated rainfall results than that of a small sea surface temperature change during the onset period. In both the 1997 and 1998 cases, the simulations were significantly improved by including the land surface processes. The results indicated that land surface processes played an important role in modifying the low-level wind field over two major branches of the circulation; the southwest low-level flow over the Indo-China peninsula and the northern cold front intrusion from southern China. The surface sensible and latent heat exchange between the land and atmosphere modified the low-level temperature distribution and gradient, and therefore the low-level. The more realistic forcing of the sensible and latent heat from the detailed land surface model improved the monsoon rainfall and associated wind simulation. The model results will be compared to the simulation of the 6-7 May 2000 Missouri flash flood event. In addition, the impact of model initialization and land surface treatment on timing, intensity, and location of extreme precipitation will be examined.
Author
Monsoons; Atmospheric Models; Southeast Asia

20040171427 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Spatial Distribution of Large Cloud Drops
Marshak, Alexander; Knyazikhin, Yuri; Larsen, Michael; Wiscombe, Warren; [2004]; 1 pp.; In English; International Radiation Symposium 2004, 23-28 Aug. 2004, Busan, Korea, Republic of; Copyright; Avail: Other Sources; Abstract Only

The analysis of aircraft measurements of individual drop sizes in clouds suggests that for sufficiently small volumes the mean number of cloud drops with a given radius is proportional to volume powered by a drop-size dependent exponent. For abundant small drops present, the exponent is 1 as assumed in conventional approach. However, for rarer large drops, the exponents fall below unity. We show striking examples of the spatial distribution of large cloud drops using models that simulate the observed power laws. In contrast to currently used models that assume homogeneity and therefore a Poisson distribution of cloud drops, these models show strong drop clustering, the more so the larger the drops. The degree of clustering is determined by the observed exponents. The strong clustering of large drops arises naturally from the observed power-law statistics. This clustering has vital consequences for rain physics explaining how rain can form so fast and also helps explain why remotely sensed cloud drop size is generally biased.
Author
Drop Size; Clouds (Meteorology); Spatial Distribution

20040171428 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cloud-Vegetation Radiative Interaction: What Can We Learn from it about Cloud Optical Properties?

Marshak, Alexander; Knyazikhin, Yuri; Evans, Keith; Wiscombe, Warren; [2004]; 1 pp.; In English; International Radiation Symposium 2004, 23-28 Aug. 2004, Busan, Korea, Republic of; Copyright; Avail: Other Sources; Abstract Only

Because of their radiative interactions, the vegetation canopy and the atmosphere are coupled together; each serves as a boundary condition to the radative transfer equations in the adjacent medium. To better understand radiative processes in these media we need an accurate description of their interactions. This presentation outlines a technique needed to describe interactions between vegetation and clouds and exploits it to retrieve cloud optical depth from ground-based radiance measurements. measurements of zenith radiance in the RED and NIR spectral regions. In addition to an algebraic combinations of spectral radiances such as Normalized Difference Cloud Index (NDCI) that can result in poor retrievals due to its insensitivity to cloud fraction, both RED and NIR radiances as points on the 'RED vs. NIR' plane are proposed to be used for retrieval. The proposed method is applied to a multi-channel sunphotometer (as a part of AERONET) measurements at the ARM site in Oklahoma. In addition to cloud optical depth, the new method also infers a 'radiatively effective' cloud fraction.

Author

Canopies (Vegetation); Cloud Physics; Optical Properties; Optical Thickness; Radiance

20040171435 Rocky Mountain Chinese Society of Science and Engineering, CO, USA

Measurement of Global Precipitation: Introduction to International GPM Program

Hwang, P.; June 2004; 1 pp.; In English; RMCSSE Annual Conference, 17 Jul. 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

The Global Precipitation Measurement (GPM) Program is an international cooperative effort whose objectives are to (a) obtain better understanding of rainfall processes, and (b) make frequent rainfall measurements on a global basis. The National Aeronautics and Space Administration (NASA) of the USA and the Japanese Aviation and Exploration Agency (JAXA) have entered into a cooperative agreement for the formulation and development of GPM. This agreement is a continuation of the partnership that developed the highly successful Tropical Rainfall Measuring Mission (TRMM) that was launched in November 1997; this mission continues to provide valuable scientific and meteorological information on rainfall and the associated processes. International collaboration on GPM from other space agencies has been solicited, and discussions regarding their participation are currently in progress. NASA has taken lead responsibility for the planning and formulation of GPM. Key elements of the Program to be provided by NASA include a Core satellite instrumented with a multi-channel microwave radiometer, a Ground Validation System and a ground-based Precipitation Processing System (PPS). JAXA will provide a Dual-frequency Precipitation Radar for installation on the Core satellite and launch services. Other USA agencies and international partners may participate in a number of ways, such as providing rainfall measurements obtained from their own national space-borne platforms, providing local rainfall measurements to support the ground validation activities, or providing hardware or launch services for GPM constellation spacecraft.

Author

Precipitation Measurement; Meteorological Radar; NASA Programs; Microwave Radiometers

20040171436 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Dryline on 22 May 2002 During IHOP: Convective Scale Measurements at the Profiling Site

Demoz, Belay; Flamant, Cyrille; Miller, David; Evans, Keith; Fabry, Federic; DiGirolamo, Paolo; Whiteman, David; Geerts, Bart; Weckwerth, Tammy; Brown, William, et al.; [2004]; 56 pp.; In English; Copyright; Avail: CASI; A04, Hardcopy

A unique set of measurements of wind, water vapor mixing ratio and boundary layer height variability was observed during the first MOP dryline mission of 22 May 2002. Water vapor mixing ratio from the Scanning Raman Lidar (SRL), high-resolution profiles of aerosol backscatter from the HARLIE and wind profiles from the GLOW are combined with the vertical velocity derived from the NCAR/ISS/MAPR and the high-resolution FMCW radar to reveal the convective variability of the cumulus cloud-topped boundary layer. A combined analysis of the in-situ and remote sensing data from aircraft, radiosonde, lidars, and radars reveals moisture variability within boundary layer updraft and downdraft regions as well as characterizes the boundary layer height variability in the dry and moist sides of the dryline. The profiler site measurements will be tied to aircraft data to reveal the relative intensity and location of these updrafts to the dry line. This study provides unprecedented high temporal and spatial resolution measurements of wind, moisture and backscatter within a dryline and the associated convective boundary layer.

Author

Water Vapor; Mixing Ratios; Wind Profiles; Optical Radar; Spatial Resolution; Temporal Resolution

20040171445 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Global Precipitation Measurement (GPM) Ground Validation: Plans and Preparations

Schwaller, M.; Bidwell, S.; Durning, F. J.; Smith, E.; June 2004; 1 pp.; In English; 8th International Precipitation Conference, 9-11 Aug. 2004, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

The Global Precipitation Measurement (GPM) program is an international partnership led by the National Aeronautics and Space Administration (NASA) and the Japan Aerospace Exploration Agency (JAXA). GPM will improve climate, weather, and hydro-meteorological forecasts through more frequent and more accurate measurement of precipitation across the globe. This paper describes the concept, the planning, and the preparations for Ground Validation within the GPM program. Ground Validation (GV) plays an important role in the program by investigating and quantitatively assessing the errors within the satellite retrievals. These quantitative estimates of retrieval errors will assist the scientific community by bounding the errors within their research products. The two fundamental requirements of the GPM Ground Validation program are: (1) error characterization of the precipitation retrievals and (2) continual improvement of the satellite retrieval algorithms. These two driving requirements determine the measurements, instrumentation, and location for ground observations. This paper outlines GV plans for estimating the systematic and random components of retrieval error and for characterizing the spatial p d temporal structure of the error and plans for algorithm improvement in which error models are developed and experimentally explored to uncover the physical causes of errors within the retrievals. This paper discusses NASA locations for GV measurements as well as anticipated locations from international GPM partners. NASA's primary locations for validation measurements are an oceanic site at Kwajalein Atoll in the Republic of the Marshall Islands and a continental site in north-central Oklahoma at the U.S. Department of Energy's Atmospheric Radiation Measurement Program site.

Author

Precipitation (Meteorology); Atmospheric Radiation; Radiation Measurement; Errors; Forecasting; Error Analysis

20040171462 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Mesoscale Simulations of CRYSTAL-FACE 23 July 2002 Case

Starr, David; Lin, Ruei-Fong; Lare, Andrew; Demoz, Belay; Rickenbach, Thomas; Wang, Dong-Hai; Li, Li-Hua; Arnold, G. Thomas; Wang, Yan-Sen; [2004]; 4 pp.; In English; 14th International Conference on Clouds and Precipitation, 19-23 Jul. 2004, Bologna, Italy; No Copyright; Avail: CASI; A01, Hardcopy

A key objective of the Cirrus Regional Study of Tropical Anvils and Cirrus Layers - Florida Area Cirrus Experiment (CRYSTAL-FACE) is to understand the relationships between properties of tropical convective cloud systems and the lifecycle of the extended cirrus anvils they produce. We report here on a case study of 23 July 2002 where a line of land-based convective storms was generated between Lake Okeechobee and the Florida east coast as a result of complex interactions between lake and sea breeze fronts and outflow boundaries. A central goal of this study is to develop a description of convective input to the anvil system and to quantify the ongoing dynamical forcing of anvil processes by mesoscale and large-scale dynamics. This information is then used to force high-resolution cloud simulations with a model that explicitly resolves cloud microphysical processes (bin model) for study of cirrus anvil microphysical development.

Author

Mesoscale Phenomena; Atmospheric Models; Cirrus Clouds; Anvil Clouds

20040171475 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cirrus Simulations of CRYSTAL-FACE 23 July 2002 Case

Starr, David; Lin, Ruci-Fong; Demoz, Belay; Lare, Andrew; [2004]; 4 pp.; In English; 14th International Conference on Clouds and Precipitation, 19-23 Jul. 2003, Bologna, Italy; No Copyright; Avail: CASI; A01, Hardcopy

A key objective of the Cirrus Regional Study of Tropical Anvils and Cirrus Layers - Florida Area Cirrus Experiment (CRYSTAL-FACE) is to understand relationships between the properties of tropical convective cloud systems and the properties and lifecycle of the extended cirrus anvils they produce. We report here on a case study of 23 July 2002 where a sequence of convective storms over central Florida produced an extensive anvil outflow. Our approach is to use a suitably-initialized cloud-system simulation with MM5 to define initial conditions and time-dependent forcing for a simulation of anvil evolution using a two-dimensional fine-resolution (100 m) cirrus cloud model that explicitly accounts for details of cirrus microphysical development (bin or spectra model) and fully interactive radiative processes. The cirrus model follows Lin. Meteorological conditions and observations for the 23 July case are described in this volume. The goals of the present study are to evaluate how well we can simulate a cirrus anvil lifecycle, to evaluate the importance of various physical processes that operate within the anvil, and to evaluate the importance of environmental conditions in regulating anvil lifecycle. CRYSTAL-FACE produced a number of excellent case studies of anvil systems that will allow environmental factors, such as static stability or wind shear in the upper troposphere, to be examined. In the present study, we strive to assess

the importance of propagating gravity waves, likely produced by the deep convection itself, and radiative processes, to anvil lifecycle and characteristics.
Author
Atmospheric Models; Cirrus Clouds; Anvil Clouds; Clouds (Meteorology)

20040171486 NASA Langley Research Center, Hampton, VA, USA
Tropospheric Airborne Meteorological Data Reporting (TAMDAR) Icing Sensor Performance During the 2003 Alliance Icing Research Study (AIRS II)
Murray, John J.; Schaffner, Philip R.; Minnis, Patrick; Nguyen, Louis; Delnore, Victor E.; Daniels, Taumi S.; Grainger, C. A.; Delene, D.; Wolff, C. A.; [2004]; 8 pp.; In English; 11th Conference on Aviation, Range, and Aerospace Meteorology, 4-8 Oct. 2004, Hyannis, MA, USA
Contract(s)/Grant(s): 728-40-10
Report No.(s): P8.5; No Copyright; Avail: CASI; A02, Hardcopy

The Tropospheric Airborne Meteorological Data Reporting (TAMDAR) sensor was deployed onboard the University of North Dakota Citation II aircraft in the Alliance Icing Research Study (AIRS II) from Nov 19 through December 14, 2003. TAMDAR is designed to measure and report winds, temperature, humidity, turbulence and icing from regional commercial aircraft (Daniels et. al., 2004). TAMDAR icing sensor performance is compared to a) in situ validation data from the Citation II sensor suite, b) Current Icing Potential products developed by the National Center for Atmospheric Research (NCAR) and available operationally on the NOAA Aviation Weather Center s Aviation Digital Data Server (ADDS) and c) NASA Advanced Satellite Aviation-weather Products (ASAP) cloud microphysical products.
Author
Troposphere; Meteorological Parameters; In Situ Measurement; Ice Formation

20040171489 NASA Langley Research Center, Hampton, VA, USA
Parametric Study for Increasing On-Station Duration via Unconventional Aircraft Launch Approach
Kuhl, Christopher A.; Moses, Robert W.; Croom, Mark A.; Sandford, Stephen P.; October 13, 2004; 7 pp.; In English; SPIE's 4th International Asia-Pacific Symposium on Remote Sensing of the Atmosphere, Ocean, Environment, and Space, 8-12 Nov. 2004, Honolulu, HI, USA
Contract(s)/Grant(s): 090-20-23
Report No.(s): SPIE-5661-28; No Copyright; Avail: CASI; A02, Hardcopy

The need for better atmospheric predictions is causing the atmospheric science community to look for new ways to obtain longer, higher-resolution measurements over several diurnal cycles. The high resolution, in-situ measurements required to study many atmospheric phenomena can be achieved by an Autonomous Aerial Observation System (AAOS); however, meeting the long on-station time requirements with an aerial platform poses many challenges. Inspired by the half-scale drop test of the deployable Aerial Regional-scale Environmental Survey (ARES) Mars airplane, a study was conducted at the NASA Langley Research Center to examine the possibility of increasing on-station time by launching an airplane directly at the desired altitude. The ARES Mars airplane concept was used as a baseline for Earth atmospheric flight, and parametric analyses of fundamental configuration elements were performed to study their impact on achieving desired on-station time with this class of airplane. The concept involved lifting the aircraft from the ground to the target altitude by means of an air balloon, thereby unburdening the airplane of ascent requirements. The parameters varied in the study were aircraft wingspan, payload, fuel quantity, and propulsion system. The results show promising trends for further research into aircraft-payload design using this unconventional balloon-based launch approach.
Author
Atmospheric Chemistry; Atmospheric Physics; Diurnal Variations; Environmental Surveys

20040171500 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Interannual Variations in Earth's Low-Degree Gravity Field and the Connections With Geophysical/Climatic Changes
Chao, Benjamin F.; Cox, Christopher M.; [2004]; 1 pp.; In English; American Geophysical Union Meeting, 17-21 May 2004, Montreal, Canada; No Copyright; Avail: Other Sources; Abstract Only

Long-wavelength time-variable gravity recently derived from satellite laser ranging (SLR) analysis have focused to a large extent on the effects of the recent (since 1998) large anomalous change in J2, or the Earth's oblateness, and the potential causes. However, it is relatively more difficult to determine whether there are corresponding signals in the shorter wavelength zonal harmonics from the existing SLR-derived time variable gravity results, although it appears that geophysical fluid mass

transport is being observed. For example, the recovered J3 time series shows remarkable agreement with NCEP-derived estimates of atmospheric gravity variations. Likewise, some of the non-zonal spherical harmonic components have significant interannual signal that appears to be related to mass transport. The non-zonal degree-2 components show reasonable temporal correlation with atmospheric signals, as well as climatic effects such as El Nino Southern Oscillation. We will present recent updates on the J2 evolution, as well as a look at other low-degree components of the interannual variations of gravity, complete through degree 4. We will examine the possible geophysical and climatic causes of these low-degree time-variable gravity related to oceanic and hydrological mass transports, for example some anomalous but prominent signals found in the extratropic Pacific ocean related to the Pacific Decadal Oscillation.
Author
Annual Variations; Climate Change; Earth Gravitation; Periodic Variations

20040171503 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Elevation Changes of Ice Caps in the Canadian Arctic Archipelago
Abdalati, W.; Krabill, W.; Frederick, E.; Manizade, S.; Martin, C.; Sonntag, J.; Swift, R.; Thomas, R.; Yungel, J.; Koerner, R.; [2004]; 41 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Precise repeat airborne laser surveys were conducted over the major ice caps in the Canadian Arctic Archipelago in the spring of 1995 and 2000 in order to measure elevation changes in the region. Our measurements reveal thinning at lower elevations (below 1600 m) on most of the ice caps and glaciers, but either very little change or thickening at higher elevations in the ice cap accumulation zones. Recent increases in precipitation in the area can account for the slight thickening where it was observed, but not for the thinning at lower elevations. For the northern ice caps on the Queen Elizabeth Islands, thinning was generally less than 0.5 m/yr , which is consistent with what would be expected from the warm temperature anomalies in the region for the 5-year period between surveys and appears to be a continuation of a trend that began in the mid 1980s. Further south, however, on the Barnes and Penny ice caps on Baffin Island, this thinning was much more pronounced at over 1 m/yr in the lower elevations. Here temperature anomalies were very small, and the thinning at low elevations far exceeds any associated enhanced ablation. The observations on Barnes, and perhaps Penny are consistent with the idea that the observed thinning is part of a much longer term deglaciation, as has been previously suggested for Barnes Ice Cap. Based on the regional relationships between elevation and elevation-change in our data, the 1995-2000 mass balance for the region is estimated to be 25 cu km/yr of ice, which corresponds to a sea level increase of 0.064 mm/ yr . This places it among the more significant sources of eustatic sea level rise, though not as substantial as Greenland ice sheet, Alaskan glaciers, or the Patagonian ice fields.
Author
Arctic Regions; Archipelagoes; Ice; Mass Distribution; Glaciers

20040171505 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Clouds Aerosols Internal Affaires: Increasing Cloud Fraction and Enhancing the Convection
Koren, Ilan; Kaufman, Yoram; Remer, Lorraine; Rosenfeld, Danny; Rudich, Yinon; [2004]; 1 pp.; In English; 2004 American Geophysical Union Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Clouds developing in a polluted environment have more numerous, smaller cloud droplets that can increase the cloud lifetime and liquid water content. Such changes in the cloud droplet properties may suppress low precipitation allowing development of a stronger convection and higher freezing level. Delaying the washout of the cloud water (and aerosol), and the stronger convection will result in higher clouds with longer life time and larger anvils. We show these effects by using large statistics of the new, 1km resolution data from MODIS on the Terra satellite. We isolate the aerosol effects from meteorology by regression and showing that aerosol microphysical effects increases cloud fraction by average of 30 presents for all cloud types and increases convective cloud top pressure by average of 35mb. We analyze the aerosol cloud interaction separately for high pressure trade wind cloud systems and separately for deep convective cloud systems. The resultant aerosol radiative effect on climate for the high pressure cloud system is: -10 to -13 W/sq m at the top of the atmosphere (TOA) and -11 to -14 W/sq m at the surface. For deeper convective clouds the forcing is: -4 to -5 W/sq m at the TOA and -6 to -7 W/sq m at the surface.
Author
Aerosols; Convection; Cloud Physics; Convection Clouds; Pollution; Wind (Meteorology)

20040171506 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Large Fluctuations in Speed on Jakobshavn Isbrae, Greenland
Joughin, Ian; Abdalati, Waleed; Fahnestock, Mark; [2003]; 11 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

We have assembled an 18-year velocity record for Jakobshavn Isbrae, Greenland. From a 1985 speed of approx. 7000 m/yr, the glacier had slowed by approx. 1000 m/ yr in 1992, which coincided with independently observed thickening in the early 1990s . The glacier then sped up by approx. 4000 m/yr between 1997 and 2000, during which time other measurements show rapid thinning . From 2000 to 2003, the glacier s floating ice tongue almost entirely disintegrated, as speed increased to 12,600 m/yr. If the retreat of the ice tongue caused the acceleration, then similar losses of floating ice tongues since the Little Ice Age may explain the current rapid thinning observed for many of Greenland s outlet glaciers.
Author
Glaciers; Ice; Melting

20040171507 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Estimate of the Aerosol Anthropogenic Component and Focusing from Satellite Data
Kaufman, Yoram; Remer, Lorraine A.; Chin, Mian; [2004]; 1 pp.; In English; 2004 American Geophysical Union Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Satellite measurements of aerosol do not contain information on the chemical composition needed to resolve anthropogenic vs. natural aerosol components. Besides, the same chemical species can have natural and anthropogenic origins. However the ability of the new satellite instruments (MODIS, MISR, POLDER) to distinguish fine from coarse aerosols over the oceans, can be used as a signature of the presence of anthropogenic component and used to measure the fraction of the aerosol originating from anthropogenic activity with an uncertainty of 10 percent for aerosol optical thickness larger than 0.1. We develop the methods and investigated it using model calculations (GOCART) and satellite data (MODIS). Preliminary application to 2 years of global MODIS data shows that 0.200.08 of the aerosol optical thickness and radiative effect has anthropogenic origin. The resultant aerosol forcing over cloud free oceans is 1.30.6 W/sq m, larger than model simulations. Further research until the presentation will probably modify these values.
Author
Aerosols; Satellite Observation; Optical Thickness; Air Pollution; Computerized Simulation; Chemical Composition

20040171524 NASA Goddard Space Flight Center, Greenbelt, MD, USA
3D Cloud Radiative Effects on Aerosol Optical Thickness Retrievals in Cumulus Cloud Fields in the Biomass Burning Region in Brazil
Wen, Guo-Yong; Marshak, Alexander; Cahalan, Robert F.; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Aerosol amount in clear regions of a cloudy atmosphere is a critical parameter in studying the interaction between aerosols and clouds. Since the global cloud cover is about 50%, cloudy scenes are often encountered in any satellite images. Aerosols are more or less transparent, while clouds are extremely reflective in the visible spectrum of solar radiation. The radiative transfer in clear-cloudy condition is highly three- dimensional (3D). This paper focuses on estimating the 3D effects on aerosol optical thickness retrievals using Monte Carlo simulations. An ASTER image of cumulus cloud fields in the biomass burning region in Brazil is simulated in this study. The MODIS products (i-e., cloud optical thickness, particle effective radius, cloud top pressure, surface reflectance, etc.) are used to construct the cloud property and surface reflectance fields. To estimate the cloud 3-D effects, we assume a plane-parallel stratification of aerosol properties in the 60 km x 60 km ASTER image. The simulated solar radiation at the top of the atmosphere is compared with plane-parallel calculations. Furthermore, the 3D cloud radiative effects on aerosol optical thickness retrieval are estimated.
Author
Radiative Transfer; Aerosols; Cumulus Clouds; Cloud Cover; Solar Radiation; Visible Spectrum; MODIS (Radiometry)

20040171550 NASA Goddard Space Flight Center, Greenbelt, MD, USA
3-D Radiative Transfer in Clouds
Wiscombe, Warren; [2004]; 1 pp.; In English; Computational Methods Workshop, 11-16 Sep. 2004, Lake Tahoe, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The development of the subject of 3D radiative transfer in clouds will be reviewed, starting from the 1970s when the first papers using simple cubic clouds were published. The two main lines of development, Monte Carlo and numerical-analytical, will be reviewed. The theme will be the extraction of simple results from all the complexity of 3D radiation modeling.
Author
Monte Carlo Method; Radiative Transfer; Numerical Analysis; Clouds (Meteorology)

20040171551 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Statistical Studies on Thin Cirrus from MODIS Data

Li, Rong-Rong; Kaufman, Yoram; Remer, Lorraine; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The 1.38 micron channel on the MODerate resolution Imaging Spectroradiomater (MODIS) is an ideal channel to identify and quantify thin cirrus on a global basis. This channel is used to produce the cirrus reflectance product in MOD06 and also used extensively by the MODIS aerosol algorithms to mask clouds for the MOD04 product. The aerosol product uses a lower threshold of the 1.38 micron channel reflectance of 0.01. A cirrus channel reflectance of 0.01 corresponds to approximately an aerosol optical thickness of 0.10. Therefore, the ambiguity due to the minor cirrus contamination may introduce artificial optical thickness in the aerosol products. The questions arise: How prevalent are the thinnest cirrus clouds over the globe? Do they persist over specific regions and seasons? Can we distinguish between the noise of the channel and the actual cloudiness by extrapolating the cloudiness signal to very dark scenes, statistically. We analyze the Terra data, over land and ocean to answer these questions.

Author

Cirrus Clouds; Cloud Cover; Channels (Data Transmission); Aerosols; MODIS (Radiometry); Imaging Spectrometers

20040171552 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Internally Consistent MODIS Estimate of Aerosol Clear-Sky Radiative Effect Over the Global Oceans

Remer, Lorraine A.; Kaufman, Yoram J.; [2004]; 1 pp.; In English; 2004 American Geophysical Union Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Modern satellite remote sensing, and in particular the MODerate resolution Imaging Spectroradiometer (MODIS), offers a measurement-based pathway to estimate global aerosol radiative effects and aerosol radiative forcing. Over the Oceans, MODIS retrieves the total aerosol optical thickness, but also reports which combination of the 9 different aerosol models was used to obtain the retrieval. Each of the 9 models is characterized by a size distribution and complex refractive index, which through Mie calculations correspond to a unique set of single scattering albedo, assymetry parameter and spectral extinction for each model. The combination of these sets of optical parameters weighted by the optical thickness attributed to each model in the retrieval produces the best fit to the observed radiances at the top of the atmosphere. Thus the MODIS Ocean aerosol retrieval provides us with (1) An observed distribution of global aerosol loading, and (2) An internally-consistent, observed, distribution of aerosol optical models that when used in combination will best represent the radiances at the top of the atmosphere. We use these two observed global distributions to initialize the column climate model by Chou and Suarez to calculate the aerosol radiative effect at top of the atmosphere and the radiative efficiency of the aerosols over the global oceans. We apply the analysis to 3 years of MODIS retrievals from the Terra satellite and produce global and regional, seasonally varying, estimates of aerosol radiative effect over the clear-sky oceans.

Author

Aerosols; Atmospheric Effects; Atmospheric Models; Estimates; Satellite Observation

20040171553 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The NASA Cold Land Processes Pathfinder Mission (CLPP)

Cline, D.; McDonald, K.; Kim, E.; [2004]; 1 pp.; In English; IGARSS 04, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

The Cold Land Processes Pathfinder (CLPP) mission concept has been developed to measure hydrologic properties of the Cryosphere. The science driver for the mission is to understand the variability of global water cycling and its consequences for local water resources and climate. The CLPP mission is designed to reduce uncertainty of cold-region precipitation, storage, controls, and feedbacks to the land, atmosphere, and ocean, which in turn will improve prediction of future changes in water cycle dynamics. It will provide the first high-resolution global measurements of Earth's changing snow conditions to: 1) quantify the variability of processes in cold regions, 2) improve understanding of past changes, and 3) enable breakthroughs in prediction of future water resources, weather, and climate. The CLPP concept consists of active (C- and Ku-band) and passive (K- and Ka-band) microwave sensors (with high and moderate spatial resolution respectively) to observe snow water equivalent and snow wetness at local process scales. The CLPP global sampling framework provides necessary capability to relate observed local scale snow characteristics to atmospheric forcings, improve predictive models operating at multiple scales, and to tie the short-term CLPP record to the long-term low-resolution remote sensing climate record of global snow properties.

Author

Water Resources; Cryospheres; Mission Planning; Moisture Content; Ice Environments

20040171555 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Assimilation of Stratospheric Meteorological and Constituent Observations: A Review

Rood, Richard B.; Pawson, Steven; [2004]; 1 pp.; In English; SPARC 2004, 31 Jul. - 7 Aug. 2004, Victoria, British Columbia, Canada; No Copyright; Avail: Other Sources; Abstract Only

This talk reviews the assimilation of meteorological and constituent observations of the stratosphere. The first efforts to assimilate observations into stratospheric models were during the early 1980s, and a number of research studies followed during the next decade. Since the launch of the Upper Atmospheric Research Satellite (UARS) in 1991, model-assimilated data sets of the stratospheric meteorological state have been routinely available. These assimilated data sets were critical in bringing together observations from the different instruments on UARS as well as linking UARS observations to measurements from other platforms. Using trajectory-mapping techniques, meteorological assimilation analyses are, now, widely used in the analysis of constituent observations and have increased the level of quantitative study of stratospheric chemistry and transport. During the 1990s the use of winds and temperatures from assimilated data sets became standard for offline chemistry and transport modeling. variability in middle latitudes. The transport experiments, however, reveal a set of shortcomings that become obvious as systematic errors are integrated over time. Generally, the tropics are not well represented, mixing between the tropics and middle latitudes is overestimated, and the residual circulation is not accurate. These shortcomings reveal underlying fundamental challenges related to bias and noise. Current studies using model simulation and data assimilation in controlled experimentation are highlighting the issues that must be addressed if assimilated data sets are to be convincingly used to study interannual variability and decadal change. observations. The primary focus has been on stratospheric ozone, but there are efforts that investigate a suite of reactive chemical constituents. Recent progress in ozone assimilation shows the potential of assimilation to contribute to the validation of ozone observations and, ultimately, the retrieval of ozone profiles from space-based radiance measurements. Assimilated data sets provide accurate analyses of synoptic and planetary Scale At the same time, stratospheric assimilation is evolving to include constituent

Author

Assimilation; Stratosphere; Synoptic Meteorology

20040171556 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A New, More Physically Based Algorithm, for Retrieving Aerosol Properties over Land from MODIS

Levy, Robert C.; Kaufman, Yoram J.; Remer, Lorraine A.; Mattoo, Shana; [2004]; 1 pp.; In English; 2004 American Geophysical Union Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The MOD Imaging Spectrometer (MODIS) has been successfully retrieving aerosol properties, beginning in early 2000 from Terra and from mid 2002 from Aqua. Over land, the retrieval algorithm makes use of three MODIS channels, in the blue, red and infrared wavelengths. As part of the validation exercises, retrieved spectral aerosol optical thickness (AOT) has been compared via scatterplots against spectral AOT measured by the global Aerosol Robotic NETwork (AERONET). On one hand, global and long term validation looks promising, with two-thirds (average plus and minus one standard deviation) of all points falling between published expected error bars. On the other hand, regression of these points shows a positive y-offset and a slope less than 1.0. For individual regions, such as along the U.S. East Coast, the offset and slope are even worse. Here, we introduce an overhaul of the algorithm for retrieving aerosol properties over land. Some well-known weaknesses in the current aerosol retrieval from MODIS include: a) rigid assumptions about the underlying surface reflectance, b) limited aerosol models to choose from, c) simplified (scalar) radiative transfer (RT) calculations used to simulate satellite observations, and d) assumption that aerosol is transparent in the infrared channel. The new algorithm attempts to address all four problems: a) The new algorithm will include surface type information, instead of fixed ratios of the reflectance in the visible channels to the mid-IR reflectance. b) It will include updated aerosol optical properties to reflect the growing aerosol retrieved from eight-plus years of AERONE'. operation. c) The effects of polarization will be including using vector RT calculations. d) Most importantly, the new algorithm does not assume that aerosol is transparent in the infrared channel. It will be an inversion of reflectance observed in the three channels (blue, red, and infrared), rather than iterative single channel retrievals. Thus, this new formulation of the MODIS aerosol retrieval over land includes more physically based surface, aerosol and radiative transfer with fewer potentially erroneous assumptions.

Author

Algorithms; Aerosols; Atmospheric Models; Infrared Spectra; Imaging Spectrometers

20040171579 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Warm Rain Processes over the Tropical Oceans and Implications on Climate Change: Results from TRMM and GEOS GCM

Lau, William K. M.; Wu, H. T.; [2004]; 1 pp.; In English; Second TRMM International Science Conference, 4-10 Sep. 2004, Nara, Japan; No Copyright; Avail: Other Sources; Abstract Only

In this talk, we will first show results from TRMM data regarding the characteristics of warm rains over the tropical oceans, and the dependence of rate of warm rain production on sea surface temperature. Results lead to the hypothesis that warm rain production efficiency, i.e., autoconversion, may be increased in a warm climate. We use the GEOS-II GCM to test this hypothesis. Our modeling results show that in a climate with increased rate of autoconversion, the total rain amount is increased, with warm rain contributing to larger portion of the increase. The abundant rainout of warm precipitation causes a reduction of low and middle cloud amount due to rainout, and reduced high clouds due to less water vapor available for ice-phase convection. However, clod radiation feedback caused by the increased rainfall efficiency, leads to differential vertical heating/cooling producing a more unstable atmosphere, allowing, more intense, but isolated penetrative convection, with contracted anvils to develop. Results also show that increased autoconversion reduces the convective adjustment time scale, resulting in faster recycling of atmospheric water. Most interestingly, the increased low level heating associated with warm rain leads to more energetic Madden and Julian oscillations in the tropics, with well-defined eastward propagation. While reducing the autoconversion leads to an abundant mix of westward and eastward tropical disturbances on daily to weekly time scales. The crucial link of precipitation microphysical processes to climate change including the effects of aerosols will be discussed.

Author

Rain; Climate Change; Tropical Meteorology; Marine Meteorology

20040171587 NASA Goddard Space Flight Center, Greenbelt, MD, USA

First Look at the Upper Tropospheric Ozone Mixing Ratio from OMI Estimated using the Cloud Slicing Technique

Bhartia, Pawan K.; Ziemke, Jerry; Chandra, Sushil; Joiner, Joanna; Vassilkov, Alexandra; Taylor, Steven; Yang, Kai; Ahn, Chang-Woo; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

The Cloud Slicing technique has emerged as a powerful tool for the study of ozone in the upper troposphere. In this technique one looks at the variation with cloud height of the above-cloud column ozone derived from the backscattered ultraviolet instruments, such as TOMS, to determine the ozone mixing ratio. For this technique to work properly one needs an instrument with relatively good horizontal resolution with very good signal to noise in measuring above-cloud column ozone. In addition, one needs the (radiatively) effective cloud pressure rather than the cloud-top pressure, for the ultraviolet photons received by a satellite instrument are scattered from inside the cloud rather than from the top. For this study we use data from the OMI sensor, which was recently launched on the EOS Aura satellite. OMI is a W-Visible backscattering instrument with a nadir pixel size of 13 x 24 km. The effective cloud pressure is derived from a new algorithm based on Rotational Raman Scattering and O2-O2, absorption in the 340-400 nm band of OMI.

Author

Troposphere; Total Ozone Mapping Spectrometer; Ozone; Cloud Height Indicators; Mixing Ratios

20040171590 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Merging the MODIS and NESDIS Monthly Snow-Cover Records to Study Decade-Scale Changes in Northern Hemisphere Snow Cover

Hall, Dorothy K.; Foster, James L.; Robinson, David A.; Riggs, George A.; [2004]; 1 pp.; In English; IGARSS 2004, 19-25 Sep. 2004, Anchorage, AK, USA; Copyright; Avail: Other Sources; Abstract Only

A decade-scale record of Northern Hemisphere snow cover has been available from the National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite Data and Information Service (NESDIS) and has been reconstructed and validated by Rutgers University following adjustments for inconsistencies that were discovered in the early years of the data set. This record provides weekly, monthly (and, in recent years, daily) snow cover from 1966 to the present for the Northern Hemisphere. With the December 1999 launch of NASA's Earth observing System (EOS) Terra satellite, snow maps are being produced globally, using automated algorithms, on a daily, weekly and monthly basis from the Moderate-Resolution Imaging Spectroradiometer (MODIS) instrument. The resolution of the MODIS monthly snow maps (0.05deg or about 5 km) is an improvement over that of the NESDIS-derived monthly snow maps (\gapprox.10 km) the maps, it is necessary to study the datasets carefully to determine if it is possible to merge the datasets into a continuous record. The months in which data are available for both the NESDIS and MODIS maps (March 2000 to the present) will be compared

quantitatively to analyze differences in North American and Eurasian snow cover. Results from the NESDIS monthly maps show that for North America (including all 12 months), there is a trend toward slightly less snow cover in each succeeding decade. Interannual snow-cover extent has varied significantly since 2000 as seen in both the NESDIS and MODIS maps. As the length of the satellite record increases through the MODIS era, and into the National Polar-orbiting Environmental Satellite System (NPOESS) era, it should become easier to identify trends in areal extent of snow cover, if present, that may have climatic significance. Thus it is necessary to analyze the validity of merging the NESDIS and MODIS, and, in the future, the NPOESS datasets for determination of long-term continuity in measurement of Northern Hemisphere snow cover.
Author
Snow Cover; Earth Observing System (EOS); MODIS (Radiometry); Climatology; Imaging Spectrometers

20040171592 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Can One Satellite Data Set Validation Another? Validation of Envisat SCIAMACHY Data by Comparisons with NOAA-16 SBUV/2 and ERS-2 GOME
Hilsenrath, E.; Bojkov, B. R.; Labow, G.; Weber, M.; Burrows, J.; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Validation of satellite data remains a high priority for the construction of climate data sets. Traditionally ground based measurements have provided the primary comparison data for validation. For some atmospheric parameters such as ozone, a thoroughly validated satellite data record can be used to validate a new instrument s data product in addition to using ground based data. Comparing validated data with new satellite data has several advantages; availability of much more data, which will improve precision, larger geographical coverage, and the footprints are closer in size, which removes uncertainty due to different observed atmospheric volumes. To demonstrate the applicability and some limitations of this technique, observations from the newly launched SCIAMACHY instrument were compared with the NOM-16 SBW/2 and ERS-2 GOME instruments. The SBW/2 data had all ready undergone validation by comparing to the total ozone ground network. Overall the SCIAMACHY data were found to low by 3% with respect to satellite data and 1% low with respect to ground station data. There appears to be seasonal and or solar zenith angle dependences in the comparisons with SBW/2 where differences increase with higher solar zenith angles. It is known that accuracies in both satellite and ground based total ozone algorithms decrease at high solar zenith angles. There is a strong need for more accurate measurement from and the ground under these conditions. At the present time SCIAMACHY data are limited and longer data set with more coverage in both hemispheres is needed to unravel the cause of these differences.
Author
Data Acquisition; Meteorological Parameters; Ozone; Algorithms

20040171593 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Non-coincident Inter-instrument Comparisons of Ozone Measurements Using Quasi-conservative Coordinates
Lait, L. R.; Newman, P. A.; Schoeberl, M. R.; McGee, T.; Twigg, T.; Browell, E.; Bevilacqua, R.; Andersen, S. B.; DeBacker, H.; Benesova, A., et al.; [2004]; 19 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Ozone measurements from ozonesondes, AROTAL, DIAL, and POAM III instruments during the SOLVE-2/ VINTERSOL period are composited in a time-varying, flow-following quasi-conservative (PV-6) coordinate space; the resulting composites from each instrument are mapped onto the other instruments locations and times. The mapped data are then used to intercompare data from the different instruments. Overall, the four data sets are found to be in good agreement. AROTAL shows somewhat lower values below 16 km, and DIAL has a positive bias at the upper limits of its altitude range. These intercomparisons are consistent with those obtained from more conventional near-coincident profiles, where available. Although the PV-theta mapping technique entails larger uncertainties of individual profile differences compared to direct near-coincident comparisons, the ability to include much larger numbers of comparisons can make this technique advantageous.
Author
Coordinates; Ozone; Bias

20040171594 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Observations of Florida Convective Storms Using Dual Wavelength Airborne Radar
Heymsfield, G. M.; Heymsfield, A. J.; Belcher, L.; [2004]; 4 pp.; In English; 14th International Conference on Clouds and Precipitation, 18-23 Jul. 2004, Bologna, Italy; No Copyright; Avail: CASI; A01, Hardcopy

NASA conducted the Cirrus Regional Study of Tropical Anvils and Cirrus Layers (CRYSTAL) Florida Area Cirrus

Experiment (FACE) during July 2002 for improved understanding of tropical cirrus. One of the goals was to improve the understanding of cirrus generation by convective updrafts. The reasons why some convective storms produce extensive cirrus anvils is only partially related to convective instability and the vertical transport ice mass by updrafts. Convective microphysics must also have an important role on cirrus generation, for example, there are hypotheses that homogeneous nucleation in convective updrafts is a major source of anvil ice particles. In this paper, we report on one intense CRYSTAL-FACE convective case on 16 July 2002 that produced extensive anvil.
Derived from text
Cirrus Clouds; Anvil Clouds; Vertical Air Currents; Convection

20040171595 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Impact Studies of a 2 C Global Warming on the Arctic Sea Ice Cover
Comiso, Josefino C.; [2004]; 20 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The possible impact of an increase in global temperatures of about 2 C, as may be caused by a doubling of atmospheric CO2, is studied using historical satellite records of surface temperatures and sea ice from late 1970s to 2003. Updated satellite data indicate that the perennial ice continued to decline at an even faster rate of 9.2 % per decade than previously reported while concurrently, the surface temperatures have steadily been going up in most places except for some parts of northern Russia. Surface temperature is shown to be highly correlated with sea ice concentration in the seasonal sea ice regions. Results of regression analysis indicates that for every 1 C increase in temperature, the perennial ice area decreases by about 1.48 x 10(exp 6) square kilometers with the correlation coefficient being significant but only -0.57. Arctic warming is estimated to be about 0.46 C per decade on average in the Arctic but is shown to be off center with respect to the North Pole, and is prominent mainly in the Western Arctic and North America. The length of melt has been increasing by 13 days per decade over sea ice covered areas suggesting a thinning in the ice cover. The length of melt also increased by 5 days per decade over Greenland, 7 days per decade over the permafrost areas of North America but practically no change in Eurasia. Statistically derived projections indicate that the perennial sea ice cover would decline considerably in 2025, 2035, and 2060 when temperatures are predicted by models to reach the 2 C global increase.
Author
Arctic Regions; Global Warming; Sea Ice; Climatology

20040171597 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Forward and Backscattering Measurements of Rainfall using the NASA Microwave Link
Rincon, Rafael F.; Lang, Roger; Meneghini, Robert; [2004]; 1 pp.; In English; 2004 IEEE Geoscience and Remote Sensing Symposium, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

This paper will present results from a study on the feasibility of making backscatter measurements from rainfall with the NASA/Microwave Link system at Wallops Island, VA. The study entails the implementation of an FMCW radar at the Link frequencies to enable simultaneous forward and backscatter measurements from rain. The Microwave Link system has been successfully employed in the development and testing of rainfall retrieval techniques. As presently configured, the Microwave Link measures attenuation and phase-shift due to rain over a 2.3 km path between the transmitting and receiving antennas. By their very nature, these measured quantities are averaged over the propagation path. As a result, the rainfall estimates obtained from the Link data are also averaged over the propagation path. However, rainfall is a highly variable process in space (as well as time). In order to gain a more detailed knowledge of its microphysics finer spatial resolutions are required. The backscatter measurements would enable range profiling over the Link path permitting a detailed study of the rainfall process. The backscatter measurements will be used in conjunction with the forward measurements and the measurements from a ground-based network of disdrometers and rain gauges located under the propagation path to develop new microwave retrieval techniques, and to test established single-frequency and dual-frequency radar retrieval algorithms relevant to the ongoing TRMM and up coming GPM missions.
Author
Rain; Backscattering; Precipitation Particle Measurement; Raindrops; Estimates; Measurement

20040171598 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time-Variable Gravity from Satellite Laser-Ranging: The Low-Degree Components and Their Connections with Geophysical/Climatic Changes
Chao, Benjamin F.; Cox, Christopher M.; [2004]; 6 pp.; In English; Gravity, Geoid and Space Missions, 30 Aug. - 3 Sep. 2004, Porto, Portugal; No Copyright; Avail: CASI; A02, Hardcopy

Satellite laser-ranging (SLR) has been observing the tiny variations in Earth s global gravity for over 2 decades. The oblateness of the Earth's gravity field, J2, has been observed to undergo a secular decrease of J2 due mainly to the post-glacial rebound of the mantle. Sometime around 1998 this trend reversed quite suddenly. This reversal persisted until 2001, at which point the atmosphere-corrected time series appears to have reversed yet again towards normal. This anomaly signifies a large interannual change in global mass distribution. A number of possible causes have been considered, with oceanic mass redistribution as the leading candidate although other effects, such as glacial melting and core effects may be contributing. In fact, a strong correlation has been found between the J2 variability and the Pacific decadal oscillation. It is relatively more difficult to solve for corresponding signals in the shorter wavelength harmonics from the existing SLR-derived time variable gravity results, although it appears that geophysical fluid mass transport is being observed. For example, the recovered J3 time series shows remarkable agreement with NCEP-derived estimates of atmospheric gravity variations. Likewise, some of the non-zonal harmonic components have significant interannual signal that appears to be related to mass transport related to climatic effects such as El Nino Southern Oscillation. We will present recent updates on the J2 evolution, as well as a monthly time sequence of low-degree component map of the time-variable gravity complete through degree 4, and examine possible geophysical/climatic causes.
Author
Climate Change; Geophysics; Satellite Laser Ranging; Variability; Earth Gravitation

20040171609 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Microphysical Timescales in Clouds and their Application in Cloud-Resolving Modeling
Zeng, Xi-Ping; Tao, Wei-Kuo; Simpson, Joanne; [October 06, 2004]; 33 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Computational phenomena (i.e., spurious supersaturation and negative mixing ratio of cloud water) usually exist in cloud-resolving models when the time step for explicit integration is larger than a microphysical timescale in clouds. In this paper, the microphysical timescales in clouds are studied, showing that the timescale of water vapor condensation (or cloud water evaporation) is smaller than 10 s - the order of a typical time step for cloud-resolving models. To avoid spurious computational phenomena in cloud-resolving modeling, it is suggested that moist entropy be used as a prognostic thermodynamic variable, and temperature be diagnosed from that and other prognostic variables. A simple numerical model with moist entropy as a prognostic variable, for example, is presented to show that spurious computational phenomena are removed when moist entropy is used as a prognostic variable.
Author
Mixing Ratios; Water Vapor; Clouds (Meteorology); Supersaturation; Entropy; Thermodynamics

20040171616 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Nucleation in Synoptically Forced Cirrostratus
Lin, R.-F.; Starr, D. OC.; Reichardt, J.; DeMott, P. J.; [18 August 2004]; 49 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Formation and evolution of cirrostratus in response to weak, uniform and constant synoptic forcing is simulated using a one-dimensional numerical model with explicit microphysics, in which the particle size distribution in each grid box is fully resolved. A series of tests of the model response to nucleation modes (homogeneous-freezing-only/heterogeneous nucleation) and heterogeneous nucleation parameters are performed. In the case studied here, nucleation is first activated in the prescribed moist layer. A continuous cloud-top nucleation zone with a depth depending on the vertical humidity gradient and one of the nucleation parameters is developed afterward. For the heterogeneous nucleation cases, intermittent nucleation zones in the mid-upper portion of the cloud form where the relative humidity is on the rise, because existent ice crystals do not uptake excess water vapor efficiently, and ice nuclei (IN) are available. Vertical resolution as fine as 1 m is required for realistic simulation of the homogeneous-freezing-only scenario, while the model resolution requirement is more relaxed in the cases where heterogeneous nucleation dominates. Bulk microphysical and optical properties are evaluated and compared. Ice particle number flux divergence, which is due to the vertical gradient of the gravity-induced particle sedimentation, is constantly and rapidly changing the local ice number concentration, even in the nucleation zone. When the depth of the nucleation zone is shallow, particle number concentration decreases rapidly as ice particles grow and sediment away from the nucleation zone. When the depth of the nucleation zone is large, a region of high ice number concentration can be sustained. The depth of nucleation zone is an important parameter to be considered in parametric treatments of ice cloud generation.
Author
Cirrostratus Clouds; Freezing; Nucleation; Heterogeneity; Ice Nuclei; Water Vapor; Ice Clouds

20040171619 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Cold Land Processes Experiment (CLPX-1): Analysis and Modelling of LSOS Data (IOP3 Period)

Tedesco, Marco; Kim, Edward J.; Cline, Don; Graf, Tobias; Koike, Toshio; Hardy, Janet; Armstrong, Richard; Brodzik, Mary; [2004]; 4 pp.; In English; IGARSS 04 (International Geoscience and Remote Sensing Symposium), 20-24 Sept. 2004, Anchorage, AK, USA; Copyright; Avail: CASI; A01, Hardcopy

Microwave brightness temperatures at 18.7,36.5, and 89 GHz collected at the Local-Scale Observation Site (LSOS) of the NASA Cold-Land Processes Field Experiment in February, 2003 (third Intensive Observation Period) were simulated using a Dense Media Radiative Transfer model (DMRT), based on the Quasi Crystalline Approximation with Coherent Potential (QCA-CP). Inputs to the model were averaged from LSOS snow pit measurements, although different averages were used for the lower frequencies vs. the highest one, due to the different penetration depths and to the stratigraphy of the snowpack. Mean snow particle radius was computed as a best-fit parameter. Results show that the model was able to reproduce satisfactorily brightness temperatures measured by the University of Tokyo s Ground Based Microwave Radiometer system (CBMR-7). The values of the best-fit snow particle radii were found to fall within the range of values obtained by averaging the field-measured mean particle sizes for the three classes of Small, Medium and Large grain sizes measured at the LSOS site.

Author

Radiative Transfer; Microwave Radiometers; Brightness Temperature; Snow

20040171631 Hokkaido Univ., Sapporo, Japan

Data Report: Low Temperature Science

1998; ISSN 0385-3683; 98 pp.; In English; In Japanese; Copyright; Avail: Other Sources

Contents include the following: Meteorological Data Report at Chaivo, northern Sakhalin. Meteorological Observations at Marine Towers in Mombetsu. Distributions of pack ice in the Okhotsk Sea off Hokkaido observed using a sea-ice radar network. Sea Ice Conditions and Meteorological Observations at Saroma-ko Lagoon. Comparison of the Meteorological Conditions between the Two Sites around Saroma-ko Lagoon.

CASI

Meteorological Parameters; Ice; Low Temperature; Sea Ice

20040171651 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Intra-seasonal Oscillations (ISO) of Zonal-Mean Meridional Winds and Temperatures as Measured by UARS

Huang, Frank T.; Mayr, Hans G.; Reber, Carl A.; [8 August 2004]; 13 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Based on an empirical analysis of measurements with the High Resolution Doppler Imager (HRDI) on the UARS spacecraft in the upper mesosphere (95 km), persistent and regular intra-seasonal oscillations (ISO) with periods of about 2 to 4 months have recently been reported in the zonal-mean meridional winds. Similar oscillations have also been discussed independently in a modeling study, and they were attributed to wave-mean-flow interactions. The observed and modeled meridional wind ISOs were largely confined to low latitudes. We report here an analysis of concurrent temperature measurements on UARS, which produces oscillations similar to those seen in the meridional winds. Although the temperature oscillations are observed at lower altitudes (55 km), their phase variations with latitude are qualitatively consistent with the inferred properties seen in the meridional winds and thus provide independent evidence for the existence of ISOs in the mesosphere.

Author

Flow Characteristics; Meridional Flow; Mesosphere; Temperature Measurement; Wave Propagation

20040171654 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Sensitivity of the FVGCM to Changes in Ozone

Stolarski; Pawson, S.; Nielsen, J. Eric; Douglass, A.; Newman, P.; [2004]; 1 pp.; In English; SPARC 3rd General Assembly, 31 Jul. - 9 Aug. 2004, Victoria, Canada; No Copyright; Avail: Other Sources; Abstract Only

We have carried out an experiment with the finite volume general circulation model (FVGCM). This experiment consisted of two different imposed changes in the climatological ozone fields assumed in the radiation code. for conditions with no significant ozone hole. This distribution was obtained from a 50-year simulation of the full stratospheric ozone chemistry, with a time-dependent chlorine loading, done with our off-line chemical transport model (CTM). Three years (1978-1980) of this simulation were averaged to form a monthly, zonal-mean ozone distribution that was used in the 20-year integration of the FVGCM for 'unperturbed' conditions. The second 20-year GCM integration included a fully-developed ozone hole. This ozone distribution was from three years, 1998-2000, from the same CTM simulation. The goal of this work is to determine

the coupled response of the chemistry and dynamics of the stratosphere. These experiments are the first step in understanding the coupled response. An important initial question concerns the significance of the signals: if 20-year integrations turn out to be too short, the runs will be extended.
Author
Atmospheric General Circulation Models; Ozone Depletion; Time Dependence; Climatology

20040171655 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Comparison of Local Scale Measured and Modeled Brightness Temperatures and Snow Parameters from the CLPX 2003 by Means of a Dense Medium Radiative Transfer Theory Model
Tedescol, Marco; Kim, Edward J.; Cline, Don; Graf, Tobias; Koike, Toshio; Armstrong, Richard; Brodzik, Mary J.; Hardy, Janet; [2004]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Microwave remote sensing offers distinct advantages for observing the cryosphere. Solar illumination is not required, and spatial and temporal coverage are excellent from polar-orbiting satellites. Passive microwave measurements are sensitive to the two most useful physical quantities for many hydrological applications: physical temperature and water content/state. Sensitivity to the latter is a direct result of the microwave sensitivity to the dielectric properties of natural media, including snow, ice, soil (frozen or thawed), and vegetation. These considerations are factors motivating the development of future cryospheric satellite remote sensing missions, continuing and improving on a 26-year microwave measurement legacy. Perhaps the biggest issues regarding the use of such satellite measurements involve how to relate parameter values at spatial scales as small as a hectare to observations with sensor footprints that may be up to 25 x 25 km. The NASA Cold-land Processes Field Experiment (CLPX) generated a dataset designed to enhance understanding of such scaling issues. CLPX observations were made in February (dry snow) and March (wet snow), 2003 in Colorado, USA, at scales ranging from plot scale to 25 x 25 km satellite footprints. Of interest here are passive microwave observations from ground-based, airborne, and satellite sensors, as well as meteorological and snowpack measurements that will enable studies of the effects of spatial heterogeneity of surface conditions on the observations. Prior to performing such scaling studies, an evaluation of snowpack forward modelling at the plot scale (least heterogeneous scale) is in order. This is the focus of this paper. Many forward models of snow signatures (brightness temperatures) have been developed over the years. It is now recognized that a dense medium radiative transfer (DMRT) treatment represents a high degree of physical fidelity for snow modeling, yet dense medium models are particularly sensitive to snowpack structural parameters such as grain size, density, and depth---parameters that may vary substantially within a snowpack. Microwave radiometric data and snow pit measurements collected at the Local-Scale Observation Site (LSOS) during the third Intensive Observation Period (IOP3) of the CLPX have been used to test the capabilities of a DMRT model using the Quasi Crystalline Approximation with Coherent Potential (QCA-CP). The radiometric measurements were made by the University of Tokyo s Ground Based Microwave Radiometer-7 (GBMR-7) system. We evaluate the degree to which a DMRT-based model can accurately reproduce the GBMR-7 brightness temperatures at different frequencies and incidence angles.
Author
Meteorological Parameters; Ice Environments; Snow Cover; Brightness Temperature

20040171656 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Hurricane Forecasting with the High-resolution NASA Finite-volume General Circulation Model
Atlas, R.; Reale, O.; Shen, B.-W.; Lin, S.-J.; Chern, J.-D.; Putman, W.; Lee, T.; Yeh, K.-S.; Bosilovich, M.; Radakovich, J.; [2004]; ISSN 0094-8276; 12 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

A high-resolution finite-volume General Circulation Model (fvGCM), resulting from a development effort of more than ten years, is now being run operationally at the NASA Goddard Space Flight Center and Ames Research Center. The model is based on a finite-volume dynamical core with terrain-following Lagrangian control-volume discretization and performs efficiently on massive parallel architectures. The computational efficiency allows simulations at a resolution of a quarter of a degree, which is double the resolution currently adopted by most global models in operational weather centers. Such fine global resolution brings us closer to overcoming a fundamental barrier in global atmospheric modeling for both weather and climate, because tropical cyclones and even tropical convective clusters can be more realistically represented. In this work, preliminary results of the fvGCM are shown. Fifteen simulations of four Atlantic tropical cyclones in 2002 and 2004 are chosen because of strong and varied difficulties presented to numerical weather forecasting. It is shown that the fvGCM, run at the resolution of a quarter of a degree, can produce very good forecasts of these tropical systems, adequately resolving problems like erratic track, abrupt recurvature, intense extratropical transition, multiple landfall and reintensification, and interaction among vortices.
Author
Hurricanes; Forecasting; Atmospheric General Circulation Models; High Resolution

20040171658 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Local Scale Radiobrightness Modelling during Intensive Observing Period-4 of the Cold Land Processes Experiment-1

Kim, Edward J.; Tedesco, Marco; deRoo, Roger; England, Anthony W.; Gu, Haoyu; Pham, Hanh; Boprie, David; Graf, Tobias; Koike, Toshio; Armstrong, Richard, et al.; [2004]; 1 pp.; In English; IGARSS 04, 20 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

The NASA Cold Land Processes Field Experiment (CLPX-1) was designed to provide microwave remote sensing observations and ground truth for studies of snow and frozen ground remote sensing, particularly issues related to scaling. CLPX-1 was conducted in the spring of 2003 in Colorado, USA. Initial forward model validation work is concentrating on the Local-Scale Observation Site (LSOS), a 0.8 ha study site consisting of open meadows separated by trees where the most detailed measurements were made of snow depth and temperature, density, and grain size profiles. This paper will focus on the ability of forward Dense Medium Radiative Transfer (DMRT) modelling, combined with snowpack measurements to reproduce the radiobrightness signatures observed by the University of Michigan s Truck-Mounted Radiometer System at 19 and 37 GHz during the 4th Intensive Observing Period (IOP4) in March, 2003. Unlike the earlier IOP3, conditions during IOP4 include both wet and dry periods, providing a valuable test of DMRT model performance. Observations of upwelling and downwelling tree radiobrightness will be used to formulate a simple model for the effect of trees within the field of view. In addition, a comparison will be made for the one day of coincident observations by the University of Tokyo s Ground- Based Microwave Radiometer-7 (GBMR-7). These analyses will help guide the choice of future snow retrieval algorithms and the design of future Cold Lands observing systems.

Author

Microwave Imagery; Remote Sensing; Snow Cover; Upwelling Water

20040171661 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Analysis of Temperature and Wind Measurements from the TIMED Mission: Comparison with UARS Data

Huang, Frank; Mayr, Hans; Killeen, Tim; Russell, Jim; Reber, Skip; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We report on an analysis of temperature and wind data based respectively on measurements with the SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) and TIDI (TIMED Doppler Interferometer) instruments on the TIMED (Thermosphere-Ionosphere-Mesosphere-Energetics and Dynamics) mission. Comparisons are made with corresponding results obtained from the HRDI (High Resolution Doppler Imager), MLS (Microwave Limb Sounder) and CLAES (Cryogenic Limb Array Etalon Spectrometer) instruments on the UARS (Upper Atmosphere Research Satellite) spacecraft. The TIMED and UARS instruments have important common and uncommon properties in their sampling of the data as a function local solar time. For comparison between the data from the two satellite missions, we present the derived diurnal tidal and zonal-mean variations of temperature and winds, obtained as functions of season, latitude, and altitude. The observations are also compared with results from the Numerical Spectral Model (NSM).

Author

Wind Measurement; Diurnal Variations; Interferometers; Microwave Sounding; Wind (Meteorology)

20040171662 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Precession Index and a Nonlinear Energy Balance Climate Model

Rubincam, David; [2004]; 2 pp.; In English; Western Pacific Geophysics Meeting, 16-20 Aug. 2004, Honolulu, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

A simple nonlinear energy balance climate model yields a precession index-like term in the temperature. Despite its importance in the geologic record, the precession index e sin (Omega)S, where e is the Earth's orbital eccentricity and (Omega)S is the Sun's perigee in the geocentric frame, is not present in the insolation at the top of the atmosphere. Hence there is no one-for-one mapping of 23,000 and 19,000 year periodicities from the insolation to the paleoclimate record; a nonlinear climate model is needed to produce these long periods. A nonlinear energy balance climate model with radiative terms of form T n, where T is surface temperature and n less than 1, does produce e sin (omega)S terms in temperature; the e sin (omega)S terms are called Seversmith psychroterms. Without feedback mechanisms, the model achieves extreme values of 0.64 K at the maximum orbital eccentricity of 0.06, cooling one hemisphere while simultaneously warming the other; the hemisphere over which perihelion occurs is the cooler. In other words, the nonlinear energy balance model produces long-term cooling in the northern hemisphere when the Sun's perihelion is near northern summer solstice and long-term warming in the northern hemisphere when the aphelion is near northern summer solstice. (This behavior is similar to the inertialess gray body which radiates like T 4, but the amplitude is much lower for the energy balance model because of its thermal inertia.) This seemingly paradoxical behavior works against the standard Milankovitch model, which requires cool northern summers (Sun

far from Earth in northern summer) to build up northern ice sheets, so that if the standard model is correct it must be more efficient than previously thought. Alternatively, the new mechanism could possibly be dominant and indicate southern hemisphere control of the northern ice sheets, wherein the southern oceans undergo a long-term cooling when the Sun is far from the Earth during northern summer. The cold water eventually flows north, cooling the northern hemisphere. This might explain why the northern oceans lag the southern ones when it comes to orbital forcing.
Author
Climate Models; Surface Temperature; Thermal Emission; Paleoclimatology; Climate Change

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OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20040171146 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Great White Ocean
Parkinson, Claire L.; Our Changing Planet; [1999], pp. 8-9; In English; No Copyright; Avail: CASI; A01, Hardcopy

Satellite data have revealed overall decreases in the Arctic sea ice cover since the late 1970s, although with substantial interannual variability. The ice reductions are likely tied to an overall warming in the Arctic region over the same time period, although both the warming and the ice reductions could be connected to large-scale oscillations within the system. Should the ice reductions continue, consequences to the Arctic ecosystems and climate could be considerable.
Author
Arctic Ocean; Sea Ice; Data Acquisition; Ecosystems

20040171200 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Understanding Sea Level Changes
Chao, Benjamin F.; [2004]; 1 pp.; In English; Asia Oceanica Geosciences Society 1st Annual Meeting, 5-9 Jul. 2004, Singapore; No Copyright; Avail: Other Sources; Abstract Only

Today more than 100 million people worldwide live on coastlines within one meter of mean sea level; any short-term or long-term sea level change relative to vertical ground motion is of great societal and economic concern. As palm-environment and historical data have clearly indicated the existence and prevalence of such changes in the past, new scientific information regarding to the nature and causes and a prediction capability are of utmost importance for the future. The 10-20 cm global sea-level rise recorded over the last century has been broadly attributed to two effects: (1) the steric effect (thermal expansion and salinity-density compensation of sea water) following global climate; (2) mass-budget changes due to a number of competing geophysical and hydrological processes in the Earth-atmosphere-hydrosphere-cryosphere system, including water exchange from polar ice sheets and mountain glaciers to the ocean, atmospheric water vapor and land hydrological variations, and anthropogenic effects such as water impoundment in artificial reservoirs and extraction of groundwater, all superimposed on the vertical motions of solid Earth due to tectonics, rebound of the mantle from past and present deglaciation, and other local ground motions. As remote-sensing tools, a number of space geodetic measurements of sea surface topography (e.g., TOPEX/Poseidon, Jason), ice mass (e.g., ICESat), time-variable gravity (e.g. GRACE), and ground motions (SLR, VLBI, GPS, InSAR, Laser altimetry, etc.) become directly relevant. Understanding sea level changes 'anywhere, anytime' in a well-defined terrestrial reference frame in terms of climate change and interactions among ice masses, oceans, and the solid Earth, and being able to predict them, emerge as one of the scientific challenges in the Solid Earth Science Working Group (SESWG, 2003) conclusions.
Author
Sea Level; Climatology; Earth Sciences; Celestial Geodesy; Geophysics

20040171263 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Contrasting Indian Ocean SST Variability With and Without ENSO Influence: A Coupled Atmosphere-Ocean GCM Study
Yu, Jin-Yi; Lau, K. M.; [May 20, 2004]; 33 pp.; In English
Contract(s)/Grant(s): NOAA-NA-03-OAR4310061; No Copyright; Avail: CASI; A03, Hardcopy

In this study, we perform experiments with a coupled atmosphere-ocean general circulation model (CGCM) to examine ENSO's influence on the interannual sea surface temperature (SST) variability of the tropical Indian Ocean. The control

experiment includes both the Indian and Pacific Oceans in the ocean model component of the CGCM (the Indo-Pacific Run). The anomaly experiment excludes ENSOs influence by including only the Indian Ocean while prescribing monthly-varying climatological SSTs for the Pacific Ocean (the Indian-Ocean Run). In the Indo-Pacific Run, an oscillatory mode of the Indian Ocean SST variability is identified by a multi-channel singular spectral analysis (MSSA). The oscillatory mode comprises two patterns that can be identified with the Indian Ocean Zonal Mode (IOZM) and a basin-wide warming/cooling mode respectively. In the model, the IOZM peaks about 3-5 months after ENSO reaches its maximum intensity. The basin mode peaks 8 months after the IOZM. The timing and associated SST patterns suggests that the IOZM is related to ENSO, and the basin- wide warming/cooling develops as a result of the decay of the IOZM spreading SST anomalies from western Indian Ocean to the eastern Indian Ocean. In contrast, in the Indian-Ocean Run, no oscillatory modes can be identified by the MSSA, even though the Indian Ocean SST variability is characterized by east-west SST contrast patterns similar to the IOZM. In both control and anomaly runs, IOZM-like SST variability appears to be associated with forcings from fluctuations of the Indian monsoon. Our modeling results suggest that the oscillatory feature of the IOZM is primarily forced by ENSO.
Author
Sea Surface Temperature; Variability; El Nino; Southern Oscillation; Atmospheric General Circulation Models; Air Water Interactions; Indian Ocean

20040171449 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Use of GOES, SSM/I, TRMM Satellite Measurements Estimating Water Budget Variations in Gulf of Mexico - Caribbean Sea Basins
Smith, Eric A.; [2004]; 1 pp.; In English; 2nd International TRMM Scientific Conference, 6-10 Sep. 2004, Nara, Japan; No Copyright; Avail: Other Sources; Abstract Only

This study presents results from a multi-satellite/multi-sensor retrieval system designed to obtain the atmospheric water budget over the open ocean. A combination of 3ourly-sampled monthly datasets derived from the GOES-8 5-channel Imager, the TRMM TMI radiometer, and the DMSP 7-channel passive microwave radiometers (SSM/I) have been acquired for the combined Gulf of Mexico-Caribbean Sea basin. Whereas the methodology has been tested over this basin, the retrieval system is designed for portability to any open-ocean region. Algorithm modules using the different datasets to retrieve individual geophysical parameters needed in the water budget equation are designed in a manner that takes advantage of the high temporal resolution of the GOES-8 measurements, as well as the physical relationships inherent to the TRMM and SSM/I passive microwave measurements in conjunction with water vapor, cloud liquid water, and rainfall. The methodology consists of retrieving the precipitation, surface evaporation, and vapor-cloud water storage terms in the atmospheric water balance equation from satellite techniques, with the water vapor advection term being obtained as the residue needed for balance. Thus, the intent is to develop a purely satellite-based method for obtaining the full set of terms in the atmospheric water budget equation without requiring in situ sounding information on the wind profile. The algorithm is validated by cross-checking all the algorithm components through multiple- algorithm retrieval intercomparisons. A further check on the validation is obtained by directly comparing water vapor transports into the targeted basin diagnosed from the satellite algorithms to those obtained observationally from a network of land-based upper air stations that nearly uniformly surround the basin, although it is fair to say that these checks are more effective m identifying problems in estimating vapor transports from a leaky operational radiosonde network than in verifying the transport estimates determined from the satellite algorithm system Total columnar atmospheric water budget results are presented for an extended annual cycle consisting of the months of October-97, January-98, April-98, July-98,October-98, and January 1999. These results are used to emphasize the changing relationship in E-P, as well as in the varying roles of storage and advection in balancing E-P both on daily and monthly time scales and on localized and basin space scales. Results from the algorithm-to-algorithm intercomparisons are also presented in the context of sensitivity testing to help understand the intrinsic uncertainties in evaluating the water budget terms by an all-satellite algorithm approach.
Author
Water Balance; Satellite Observation; GOES Satellites; Trmm Satellite; Water Vapor; Caribbean Sea; Structural Basins

20040171577 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
Development of a High-Stability Microstrip-based L-band Radiometer for Ocean Salinity Measurements
Pellerano, Fernando A.; Horgan, Kevin A.; Wilson, William J.; Tanner, Alan B.; [2004]; 3 pp.; In English; 2004 IEEE Geoscience and Remote Sensing Symposium, 20-24 Sep. 2004, Anchorage, AK, USA
Contract(s)/Grant(s): IIP 258-80-36
Report No.(s): IGARSS2004-130-11430; No Copyright; Avail: CASI; A01, Hardcopy

The development of a microstrip-based L-band Dicke radiometer with the long-term stability required for future ocean salinity measurements to an accuracy of 0.1 psu is presented. This measurement requires the L-band radiometers to have calibration stabilities of less than or equal to 0.05 K over 2 days. This research has focused on determining the optimum radiometer requirements and configuration to achieve this objective. System configuration and component performance have been evaluated with radiometer test beds at both JPL and GSFC. The GSFC testbed uses a cryogenic chamber that allows long-term characterization at radiometric temperatures in the range of 70 - 120 K. The research has addressed several areas including component characterization as a function of temperature and DC bias, system linearity, optimum noise diode injection calibration, and precision temperature control of components. A breadboard radiometer, utilizing microstrip-based technologies, has been built to demonstrate this long-term stability.
Author
Microwave Radiometers; Dicke Radiometers; Oceans; Salinity; Component Reliability; Breadboard Models

20040171617 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Global Autocorrelation Scales of the Partial Pressure of Oceanic CO2
Li, Zhen; Adamec, David; Takahashi, Taro; Sutherland, Stewart C.; [2004]; 27 pp.; In English
Contract(s)/Grant(s): NRA-00-OES-08; NAG5-11357; Copyright; Avail: CASI; A03, Hardcopy

A global database of approximately 1.7 million observations of the partial pressure of carbon dioxide in surface ocean waters (pCO2) collected between 1970 and 2003 is used to estimate its spatial autocorrelation structure. The patterns of the lag distance where the autocorrelation exceeds 0.8 is similar to patterns in the spatial distribution of the first baroclinic Rossby radius of deformation indicating that ocean circulation processes play a significant role in determining the spatial variability of pCO2. For example, the global maximum of the distance at which autocorrelations exceed 0.8 averages about 140 km in the equatorial Pacific. Also, the lag distance at which the autocorrelation exceed 0.8 is greater in the vicinity of the Gulf Stream than it is near the Kuroshio, approximately 50 km near the Gulf Stream as opposed to 20 km near the Kuroshio. Separate calculations for times when the sun is north and south of the equator revealed no obvious seasonal dependence of the spatial autocorrelation scales. The pCO2 measurements at Ocean Weather Station (OWS) 'P', in the eastern subarctic Pacific (50 N, 145 W) is the only fixed location where an uninterrupted time series of sufficient length exists to calculate a meaningful temporal autocorrelation function for lags greater than a few days. The estimated temporal autocorrelation function at OWS 'P', is highly variable. A spectral analysis of the longest four pCO2 time series indicates a high level of variability occurring over periods from the atmospheric synoptic to the maximum length of the time series, in this case 42 days. It is likely that a relative peak in variability with a period of 3-6 days is related to atmospheric synoptic period variability and ocean mixing events due to wind stirring. However, the short length of available time series makes identifying temporal relationships between pCO2 and atmospheric or ocean processes problematic.
Author
Carbon Dioxide Concentration; Sea Water; Ocean Surface; Geographic Distribution

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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*.

20040170502 Instituto Politecnico de Setubal, Setubal, Portugal
A Preliminary Study Of A New Classification To Build Homogeneous Patient's Groups In Home-Based Care
Robardet, Celine; Verdier, Christine; ICEIS 2001; [2001], pp. 25; In English; See also 20040170490; Copyright; Avail: Other Sources

In the context of home based care evaluation, we propose a new methodology for creating homogeneous groups of patients. This tool has the particularity of providing two related partitions, one that gathers patients with similar descriptors, and the other that groups together the descriptors, which characterized similar patients. The two partitions are linked by the fact that at each set of descriptors fits a set of patients. These groups can be used for any types of evaluation in health care: cost, quality of care and so on.
Author
Health; Patients; Computer Programs; Medical Services

20040170658 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD

Time-Lapse Confocal Imaging of Development of Bacillus anthracis in Macrophages

Ruthel, Gordon; Ribot, Wilson J.; Bavari, Sina; Hoover, Timothy A.; Mar. 19, 2004; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426566; No Copyright; Avail: Defense Technical Information Center (DTIC)

Macrophages attempt to battle infection with Bacillus anthracis spores by phagocytosis of the spores. However, it is believed that B. anthracis spores may survive phagocytosis and may actually use the macrophages that ingest them as a means of transport to lymph nodes. Thus far, the events that occur after spores undergo phagocytosis have remained unclear. To elucidate the fate of spores internalized by macrophages, we have used time-lapse confocal microscopy to follow individual fluorescent spores over time. By use of this method, we have determined that some phagocytized spores survive beyond germination, to become bacilli that then replicate within the macrophages.

DTIC

Bacillus; Imaging Techniques; Infectious Diseases; Macrophages; Spores

20040170659 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Overcoming Resistance to Change: An Analysis to the Department of Defense's Anthrax Vaccine Immunization Program

Johnson, Irene C.; Jun. 2004; 78 pp.; In English

Report No.(s): AD-A426569; AFIT/GIR/ENV/04J-12; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this research was to investigate the impact of change on organizations, in the absence of a preparedness program and to develop strategies for overcoming resistance to change, in the midst of a proposed initiative that has become stalled as a result of mistrust and cynicism. The results of this research suggests a framework of management techniques that will offer leadership approaches to resurrecting a stalled change initiative and overcoming personnel's resistance to a proposed change project, in order for the project to be more widely accepted. A series of personal interviews and focus groups, a qualitative method approach, was used to gather information, gain insight, develop possible strategies, and suggest a framework for moving forward with a proposed change initiative in the midst of resistance. Data was primarily collected from mid-level to senior leadership. In addition, an extensive literature review was conducted to gain insight about known prescriptive methods, previously suggested strategies, and other published similarities and differences in the areas Change Management, Organizational Change, Resistance to Change, Overcoming Resistance to Change, and Organizational Development. It is hoped that the Armed Forces and the Department of Defense will benefit from future development of these proposed change management strategies.

DTIC

Immunology; Infectious Diseases; Vaccines

20040170676 Army Research Lab., Aberdeen Proving Ground, MD

A Hybrid Explicit/Implicit Solvent Technique for Biomolecular Simulations

Lee, Michael S.; Olson, Mark A.; Aug. 2004; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426626; ARL-TR-3268; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this work, we design and use a new biomolecular simulation technique that combines explicit solvent molecules and implicit solvent theory. We employ a multigrid approach to speed up the computationally expensive long-range electrostatic energy terms ubiquitous to the classical simulation of biomolecules. It is shown that the multigrid technique affords an order-of-magnitude speedup over conventional cutoff approaches. Our algorithm makes possible a new class of biomolecular simulations that was previously untenable (i.e., the calculation of solvation energies of entire proteins using explicit water molecules). We present comparisons of protein solvation energies obtained from our method and a popular implicit solvent model.

DTIC

Simulation; Solvents

20040170696 RAND Health, Santa Monica, CA

The Societal Promise of Improving Care for Depression

Jan. 2004; 4 pp.; In English

Report No.(s): AD-A426691; RAND/RB-9055; No Copyright; Avail: CASI; A01, Hardcopy

Depression is now the second-leading cause of disability worldwide. It brings about as much loss in functioning as most

chronic diseases, for example, diabetes or heart disease. Depression costs employers more than $51 billion per year in absenteeism and lost productivity, not including high medical and pharmaceutical bills. Treatment (medication and psychotherapy) is effective for 70 to 80 percent of depressed patients. But studies over the past decade have consistently found low rates of detection and appropriate treatment in primary care settings, where most depressed patients go if they seek care. Overall, only about one-fourth of people with depression receive appropriate treatment -- care that is consistent with accepted clinical guidelines. Rates are particularly low among underserved minority groups. A team of RAND experts, led by Kenneth Wells, designed and evaluated 'Partners in Care,' a real-world trial to determine whether diverse primary care clinics could implement practical programs for improving depression care. Partners in Care (PIC) evaluated how two quality improvement programs for depression affected quality of care, health- related outcomes, employment, and ethnic disparities in clinical outcomes. The study involved 181 physicians in 46 primary care clinics located across the country. Within each location, the clinics were randomly assigned either to conduct care as usual, or to implement one of two quality improvement interventions: medication management or psychotherapy. Their key findings are as follows: (1) over two years the quality improvement programs improved the quality of care that patients received; (2) the programs also improved patients' health and quality of life, and increased the amount of time that patients worked; (3) the programs modestly increased health care costs, but they were relatively cost-effective compared with other accepted interventions; and (4) the programs reduced ethnic disparities in health outcomes.
DTIC
Clinical Medicine; Disorders; Drugs; Medical Services; Mental Health; Minorities; Psychotherapy

20040170701 Texas Univ. Health Science Center, Houston, TX
A Comparison of Postoperative Pain With Preemptive Administration of Intravenous Ketorolac Versus Oral Ibuprofen in Patients Undergoing Interval Laparoscopic Bilateral Tubal Sterilization
Harm, Patricia S.; Gibbons, Michael T.; Oct. 2000; 157 pp.; In English
Contract(s)/Grant(s): HSC-SN-99-45
Report No.(s): AD-A426710; No Copyright; Avail: CASI; A08, Hardcopy

A major goal of anesthesia practitioners is to provide a comfortable and expedient recovery from the effects of surgery and anesthesia. This includes the challenge fostered by managed-care of facilitating earlier discharges while also managing postoperative pain. Moreover, consumer knowledge and technological advances are pressing the health care community to seek higher levels of patient satisfaction and cost containment. Elective surgery patients are acquiring greater expectations regarding the perioperative care they receive, which includes absence of recall, minimal pain or discomfort, and absence of nausea following surgery. Each year over 10 million women in the USA alone elect to have surgical sterilization. This is usually accomplished laparoscopically despite the problems of post- laparoscopic pain, which can be severe enough to warrant an unplanned admission. Anesthesia researchers have sought pharmacologic methods in order to address this challenge, with a contemporary approach being preemptive analgesia. Non- steroidal anti-inflammatory drugs have been shown to inhibit the release of chemical mediators of pain and inflammation following tissue trauma. This results in the reduction of untoward physiologic and psychological effects, improved patient outcomes, and diminishes the economic effects secondary to unplanned hospital admissions. Ketorolac and ibuprofen have both been studied in this patient population when given preemptively with mixed results; presently there is no conclusive evidence as to which drug is more effective. This prospective, randomized, double-blind clinical trial.
DTIC
Anesthesia; Drugs; Intravenous Procedures; Medical Services; Pain; Patients; Physiological Effects; Sterilization

20040170702 Defence Science and Technology Organisation, Victoria
Comparison of DNA Vaccine Delivery Systems: Intramuscular Injection Versus Gene Gun Administration
McAllister, Jane; Proll, David; Jun. 2004; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426713; DSTO-TN-0567; DODA-AR-013-132; No Copyright; Avail: CASI; A03, Hardcopy

This study aimed to compare the effects of intra- muscular immunization (IM) using needle injection with intra- dermal (ID) immunization using a ballistic gene gun. Serum levels of antigen' specific IgG were assessed by ELISA, following immunization with plasmid DNA encoding beta- galactosidase. It was observed that mice that were vaccinated ID displayed higher titres of antigen-specific IgG than IM vaccinated mice. This is despite the fact that only one hundredth the amount of DNA was used for ID immunization, compared to IM immunization In addition, the size of the gold microcarriers coupled to the DNA, that were used in the gene gun immunizations also influenced antibody production, with the larger 1.6 micron particles resulting in the highest levels of IgG. Vaccination via gene gun is therefore an efficient method of immunization, not only for fast, safe and accurate antigen delivery, but also for activation of the humoral immune response. As a result, gene gun

immunization will be utilized in our research program aimed at developing vaccines against biowarfare agents, whenever a strong antibody response is required.
DTIC
Deoxyribonucleic Acid; Immunology; Injection; Vaccines

20040170703 Texas Univ. Health Science Center, Houston, TX
There is no Difference in the Incidence of Postoperative Nausea and Vomiting (PONV) When Ondansetron (ZOFRAN) is Administered Prior to Induction or Emergence from General Anesthesia
Peuterbaugh, Catherine; West, Bradley; Nov. 1997; 101 pp.; In English
Report No.(s): AD-A426716; HSC-SN-00-000; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this study was to determine if ondansetron is more effective in the prevention of PONV when administered prior to induction versus prior to emergence from general endotracheal anesthesia. This was a prospective, randomized, double-blind study of ASA I-Ill patients. Group I received ondansetron at induction (n = 75) and Group II received ondansetron at emergence (n = 75). A general anesthesia protocol was followed and data was collected in the recovery room and at 24 hours. Group I had a 28.1 % incidence of nausea in the PACU and 1.2 hours of nausea for the 24 hours post emergence, while Group II had a 23.4% incidence in the PACU and 1.5 hours respectively. Vomiting in the PACU for the Group I was 4.8 % and 25% at 24 hours post emergence. Group II had a 1.6% incidence of vomiting in the PACU and 14 % at 24 hours. No significant difference was found between these two groups of mostly of female patients. When ondansetron 4 mg IV is administered at induction or emergence from general endotracheal anesthesia, patients experience a similar incidence of PONV in the recovery room and up to 24 hours post emergence.
DTIC
Anesthesia; Medical Services; Nausea; Vomiting

20040170713 Children's Hospital Medical Center, Cincinnati, OH
Interferon-Beta 1a and SARS Coronavirus Replication
Hensley, Lisa E .; Fritz, Elizabeth A.; Jahrling, Peter B.; Karp, Christopher L.; Huggins, John W.; Feb. 2004; 4 pp.; In English
Contract(s)/Grant(s): R21-AI053539
Report No.(s): AD-A426745; No Copyright; Avail: Defense Technical Information Center (DTIC)

A global outbreak of severe acute respiratory syndrome (SARS) caused by a novel coronavirus began in March 2003. The rapid emergence of SARS and the substantial illness and death it caused have made it a critical public health issue. Because no effective treatments are available, an intensive effort is under way to identify and test promising antiviral drugs. Here, we report that recombinant human interferon-beta 1a potently inhibits SARS coronavirus replication in vitro.
DTIC
Interferon; Respiratory System; Signs and Symptoms

20040170714 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD
Detergent-Resistant Membrane Microdomains Facilitate Ib Oligomer Formation and Biological Activity of Clostridium perfringens Iota-Toxin
Hale, Martha L.; Marvaud, Jean-Christophe; Popoff, Michael R.; Stiles, Bradley G.; Apr. 2004; 12 pp.; In English
Report No.(s): AD-A426747; No Copyright; Avail: Defense Technical Information Center (DTIC)

Clostridium perfringens iota-toxin consists of two separate proteins identified as a cell binding protein, iota b (Ib), which forms high-molecular-weight complexes on cells generating Na(+)/K(+)-permeable pores through which iota a (Ia), an ADP-ribosyltransferase, presumably enters the cytosol. Identity of the cell receptor and membrane domains involved in Ib binding, oligomer formation, and internalization is currently unknown. In this study, Vero (toxin-sensitive) and MRC-5 (toxin-resistant) cells were incubated with Ib, after which detergent-resistant membrane microdomains (DRMs) were extracted with cold Triton X-100. Western blotting revealed that Ib oligomers localized in DRMs extracted from Vero, but not MRC-5, cells while monomeric Ib was detected in the detergent-soluble fractions of both cell types. The Ib protoxin, previously shown to bind Vero cells but not form oligomers or induce cytotoxicity, was detected only in the soluble fractions. Vero cells pretreated with phosphatidylinositol-specific phospholipase C before addition of Ib indicated that glycosylphosphatidyl inositol-anchored proteins were minimally involved in Ib binding or oligomer formation. While pretreatment of Vero cells with filipin (which sequesters cholesterol) had no effect, methyl-beta- cyclodextrin (which extracts cholesterol) reduced Ib binding

and oligomer formation and delayed iota-toxin cytotoxicity. These studies showed that iota-toxin exploits DRMs for oligomer formation to intoxicate cells.
DTIC
Activity (Biology); Bacteria; Cells (Biology); Detergents; Membranes; Oligomers; Toxins and Antitoxins

20040170715 Texas Univ. Health Science Center, Houston, TX
A Descriptive Study of the Percentage of Oxygen Delivered Using the Mercury Tube-Valve-Mask Breathing Circuit at 2 L/min Flow Rates
Mitchell, Brent E.; Baker, Raymond; Gardner, Stephanie M.; Holloway, Aaron F.; Todd, Larry A.; Dec. 2002; 98 pp.; In English
Report No.(s): AD-A426750; HSC-SN-01-008; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this study was to determine the efficacy of the Mercury tube-valve-mask oxygen delivery system at 2 L/min, 3 L/min and 4 L/min flows using an oxygen concentrator (Oxygen 93 % USP) and Oxygen 99% USP. A descriptive design was used. Eighteen healthy volunteers (ages 28-43) were recruited from the students and faculty at the Army Medical Department Center and School in San Antonio, Texas. The trials consisted of the subject breathing through the Mercury tube-valve-mask breathing circuit at 2 L/min, 3 L/min and 4 L/min flow rates using an oxygen concentrator (Oxygen 93 % USP) and Oxygen 99% USP. Each subject was randomly assigned to order of oxygen source and flow rate, received all 6 trials, and served as their own control. The subject breathed from the oxygen source and flow rate selected until a sustained fraction inspired oxygen concentration%(FiO2) was determined. Once the sustained FiO2 was determined and there was less than 10% variation in FiO2, a three-minute trial began. Data collection consisted of the subjects FiO2, respiratory rate, tidal volume and minute volume. It was hypothesized that the Mercury tube-valve-mask breathing circuit would deliver a FiO2 of 0.40, 0.50, and 0.60 at flow rates of 2 L/min, 3 L/min, and 4 L/min, respectively. A chi-square goodness-of-fit test was used to determine if 85% of the subjects achieved the desired FiO2 at the predetermined flow rate. The 85% criterion was not reached in any of the conditions tested. The mean FiO2 at 2 L/min was 0.35 with Oxygen 93% USP and 0.36 with Oxygen 99% USP. The mean FiO2 at 3 L/min was 0.45 with Oxygen 93% USP and 0.45 with Oxygen 99% USP. The mean FiO2 at 4 L/min was 0.52 with Oxygen 93% USP and 0.53 with Oxygen 99% USP. Although the predicted values of FiO2 were not met, it was found that the Mercury tube-valve- mask breathing circuit was capable of delivering higher concentrations of oxygen than traditional oxygen delivery systems.
DTIC
Circuits; Flow Velocity; Masks; Medical Services; Military Operations; Oxygen; Ratios; Respiration; Valves

20040170721 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Anxiety, Depression, and Functional Status Are the Best Predictors of Health Status Patients With Heart Failure
DeJong, Marla J.; Moser, Debra K.; Chung, Misook L.; Oct. 4, 2004; 8 pp.; In English
Report No.(s): AD-A426765; No Copyright; Avail: CASI; A02, Hardcopy

Although mortality related to heart failure (HF) is high, the number of patients living with HF increases annually. Therefore, health status is an increasingly important concept in the management of HF. In fact, most symptomatic patients are more concerned about their everyday health status than the length of their life. Yet, most investigators conduct intervention studies that are designed to reduce mortality. As a result, health status is poorly understood for patients with HF. Thus, we conducted this study to identify predictors of health status. Methods: In this correlational study, we interviewed 87 patients (age 73 +-11 years; 48% female; ejection fraction EF 38 +-15%; New York Heart Association NYHA class III/IV 53%) immediately prior to discharge from a hospitalization for HF. Health status was conceptualized as health-related quality of life HRQOL (measured using the Minnesota Living with Heart Failure Questionnaire), actual physical activity level (measured over 24 hours using the Mini Mitter actigraph), and level of symptom burden (measured using the Dyspnea-Fatigue Index). Hierarchical multiple regression techniques were used to deterrnine sociodemographic (sex, age, living alone), clinical (comorbidities, NYHA class, EF), health perception, and emotional (anxiety, depression, and hostility measured using the Brief Symptom Inventory) variables associated with health status. Results: The model for each indicator of health status accounted for 37%, 52%, and 17% of the variance in HRQOL, symptom burden, and physical activity level, respectively. Variables independently associated with each indicator of health status are shown in the table. Based on the standardized beta coefficients, the three strongest predictors of health status were anxiety, NYHA class, and depression. Conclusions: Although emotional variables are not routinely assessed clinically, clearly they have a major impact on health status.
DTIC
Anxiety; Failure; Health; Heart; Heart Diseases; Medical Science; Patients; Predictions

20040170725 Sloan-Kettering Inst. for Cancer Research, New York, NY

Modifiers of the Efficacy of Risk-Reducing Salpingo-Oophorectomy for the Prevention of Breast and Ovarian Cancer in Carriers of BRCA1 and BRCA2 Mutations

Kauff, Noah D.; May 2004; 31 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0375

Report No.(s): AD-A426778; No Copyright; Avail: CASI; A03, Hardcopy

The principal investigator was funded via a Physician-Scientist Training Award to participate in a comprehensive training plan to foster the transition to independent clinical breast cancer researcher. This plan included 1) conduct of a prospective study examining modifiers of the efficacy of risk-reducing salpingo-oophorectomy for the prevention of breast and ovarian cancer in carriers of BRCA mutations; and 2) participation in coursework in research methodology, biostatistics, molecular biology, and ethics. Progress from 5/1/ 2003 - 4/30/2004 includes: 1) Accrual at a greater than expected rate to the planned research study; 2) Participation in a clinical cancer research methods course with production of a new research proposal for the Gynecologic Oncology Group; 3) Co-authored manuscript examining prostate cancer risk of men with BRCA mutations; and 4) Conducted a pilot study suggesting that women from BRCA-negative hereditary breast cancer families are not at increased risk for ovarian cancer.

DTIC

Breast; Cancer; Genes; Mammary Glands; Mutations; Ovaries; Prevention; Risk

20040170726 Purdue Univ., West Lafayette, IN

Summer Undergraduate Training Program in Breast Cancer

Loudon, G. M.; May 2004; 9 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0555

Report No.(s): AD-A426779; No Copyright; Avail: CASI; A02, Hardcopy

Year 2002 of the Undergraduate Training Program in Breast Cancer Research has been completed successfully. In addition to the eight students funded by this grant, two additional students were recruited and funded by the Dean of Pharmacy. Nine different mentors were involved. In the two years of the program thus far, 13 of the 22 participants have been women, who are underrepresented in the biomedical research community. Students carried out research in their mentors' laboratories, attended a weekly journal club, attended a weekly seminar of guest speakers, presented a formal oral report on their work, and wrote a final report. Three grant submissions, one pending and two funded, have resulted in part from work sponsored by this program. Participants have been listed as coauthors thus far on two presentations at meetings. Two program participants thus far are enrolled in graduate school in the life sciences.

DTIC

Breast; Cancer; Education; Life Sciences; Mammary Glands; Summer

20040170729 Duke Univ., Durham, NC

Apoptotic Regulation

Richardson, David A.; Kornbluth, Sally A.; Jul. 2003; 9 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9177

Report No.(s): AD-A426783; No Copyright; Avail: CASI; A02, Hardcopy

Reaper is a potent inducer of apoptotic cell death in the fruit fly Drosoophila melanogaster. Our lab unexpectedly discovered that Reaper also induces apoptosis in cultured human cells and cell free extracts prepared using eggs from the frog Xenopus laevis. In the Xenopus model system Reaper must bind another protein, Scythe, to induce apoptosis. Scythe forms a stable complex with the chaperone protein Hsp70 and inhibits its activity. Upon Reaper-Scythe binding, Hsp70 is released and free to refold protein substrates. Here we present evidence that the proapoptotic Bcl-2 family member BAX can be a target of the Reaper-Scythe-Hsp70 pathway. BAX is required for apoptosis mediated by mitochondrial cytochrome c release, and BAX is activated by regulated conformational change. BAX remains an attractive effector of the Reaper- Scythe proapoptotic pathway and further work will more completely characterize this novel mode of proapoptotic signaling.

DTIC

Apoptosis; Blood; Drosophila; Proteins

20040170732 Texas Univ. Health Science Center, Houston, TX

A Comparison of the Effects of Preemptive Oral Dextromethorphan on Perceived Postoperative Pain in Male and Female Patients Undergoing Arthroscopic Knee surgery

Eads, James A.; Grieves, Mark; Peck, Brandi L.; Persons, Brent J.; Dec. 2003; 122 pp.; In English

Report No.(s): AD-A426786; HSC-SN-02-039; AMDCS-NA-2003-02; No Copyright; Avail: CASI; A06, Hardcopy

Postoperative pain leads to increased morbidity, length of stay, and health care costs. Several studies have shown that preemptively administered N-methyl-D-aspartate (NMDA) antagonists, such as ketimine, are effective in decreasing perception of postoperative pain. To date, there have not been any human studies to investigate a gender difference m NMDA receptor antagonism. The purpose of this study was to compare the gender differences in the effects of preemptive ketimine on perceived pain in males and females undergoing selected ENT surgical procedures. This prospective, double-blinded study compared perceived pain in male and female subjects drawn from a convenience sample of patients at a major military medical center. The surgeries there patients were presenting for were tonsillectomy, adenoidectomy, tonsillectomy and adenoidectomy (T&A) and uvulopalatopharyngoplasty (UPPP). 41 subjects were randomly assigned to either a treatment group receiving . lmg/kg ketimine or a control group receiving a placebo of .9% saline. The study drug was administered between induction and incision. Pain perception following surgery was measured using a Numeric Rating Scale (NRS) on arrival to the post anesthesia care unit (PACU), and at four subsequent data points (1, 4, 12, 24 hours after PACU arrival time). ANOVA and Friedman tests were used to analyze the NRS scores. The ANOVA test did not show a significant difference (p = .768) in postoperative pain perception between males and females who received preemptive ketimine. The Friedman test did not show a significant difference (p = .27) in the level of postoperative pain perception within the groups over the five data collection points.

DTIC

Drugs; Females; Males; Pain; Patients; Stress Relieving; Surgery

20040170734 North Carolina Univ., Chapel Hill, NC

Estrogen Receptor Alterations in Benign Breast Lesions and the Risk of Subsequent Breast Cancer

Conway-Dorsey, Kathleen; May 2004; 11 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0522

Report No.(s): AD-A426789; No Copyright; Avail: CASI; A03, Hardcopy

Enhanced estrogen responsiveness of the breast, which may contribute to breast cancer development, could result from changes in estrogen receptor ER-alpha or ER-beta expression, or mutation of ER which may lead to receptor hypersensitivity, e.g., the ER-alpha A908G mutation. We are investigating whether ER markers may serve independently or jointly with histopathology to improve predictive capability for breast cancer. The present study is based on a cohort of 6800 women biopsied for benign breast disease at the Mayo Clinic between 1967 and 1981, and were followed until 1987 for breast cancer. During this time period, 226 cases of breast cancer were identified, and age/race-matched women who did not develop cancer were selected as controls. We have measured expression of ER-a by immunohistochemistry in benign breast lesions and surrounding normal breast epithelium of postmenopausal cases and controls, and have been screening benign and malignant breast tissues for the ER-a A908G mutation. Thus far, we have identified the A908G mutation in benign breast biopsies exhibiting hyperplasia and/or apocrine metaplasia, and in malignant breast tumors, including lobular tumors. Immunohistochemical expression of ER-beta has not been successful, therefore, we propose to genotype CYP19/aromatase for the C/T variant in exon 10 in cases and controls.

DTIC

Breast; Cancer; Estrogens; Lesions; Mammary Glands; Risk

20040170735 Baylor Coll. of Medicine, Houston, TX

Analysis of the DNA Damage Signaling Network Important for Prevention of Breast Cancer

Elledge, Stephen J.; Jun. 2004; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0134

Report No.(s): AD-A426790; No Copyright; Avail: CASI; A03, Hardcopy

Women with germilne mutations in the breast and ovarian cancer gene 1 (Brcal) have an approximately 50% lifetime risk of developing ovarian cancer and almost 90% chance of breast cancer. Brcal mutations account for a significant percentage of all breast cancer cases. It appears that the main role for the Brcal protein in cells is to prevent the accumulation of mutations in key growth regulatory genes in response to DNA damage. BRCAl is phosphorylated in response to DNA damage by an elaborate surveillance mechanism, called a checkpoint that detects DNA damage and prevents the accumulation of mutation. We are investigating the role these phosphorylation events play in the regulation of BRCAl. We have napped phosphorylation sites and will mutate them to determine their function. We are also planning to investigate the mechanism through which the BRCAl protein localizes to sites of DNA damage within cells.

DTIC

Breast; Cancer; Damage; Deoxyribonucleic Acid; Genes; Mammary Glands; Ovaries; Prevention

20040170736 Northwestern Univ., Evanston, IL

The Role of PRIP in Breast Cancer

Zhu, Yijun; Reddy, Janardan K.; Jul. 2004; 51 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0355

Report No.(s): AD-A426791; No Copyright; Avail: CASI; A04, Hardcopy

Estrogen plays an important role in the normal breast and breast cancer development. Estrogens exert their cellular effects through ER that is a member of nuclear receptor superfamily. PRIP (Peroxisome proliferator receptor interacting protein) is a nuclear receptor coactivator that is amplified and overexpressed in breast cancer. The proposal was to investigate how the PRIP dysregulation contributes to abnormal growth and neoplastic development of breast. During the 3-year period, we dismpted PRIP gene in mice by homologous recombination. Mice nullizygous for PRIP died between embryonic day 11.5 and 12. 5 (post coitum), indicating that PRIP like PBP, CBP, and p300 is an essential and nonredundant coactivator. We generated a conditional null mutation of PHP in mammary gland. Null mutation of PRIP in mammary gland causes defective mammopoiesis, demonstrating that PRIP is important for the normal mammary gland development. We isolated PIMT and PRMT2 as two components in the estrogen receptor transcriptional activation, advancing our understanding of estrogen signaling pathway. We found that PRIP overexpression occurs in about 60% and gene amplification occurs 10% of the breast cancers, suggesting that this coactivator plays an important role in the breast cancer development.

DTIC

Breast; Cancer; Estrogens; Mammary Glands

20040170738 Texas Univ., Houston, TX

Adenovirus-Mediated p202 Gene Transfer in Breast Cancer Gene Therapy

Ding, Yi; May 2004; 19 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0451

Report No.(s): AD-A426793; No Copyright; Avail: CASI; A03, Hardcopy

The HIN-200 family are IFN-inducible proteins that share a signature 200-amino acid motif of type a and/or b. Three human (IFI16, MNDA, and AIM2) and four mouse (p202, p203, p204, and D3) HIN-200 family proteins have been identified. Genes encoding HIN-200 family proteins in both mouse and human are located at chromosome 1q21-23 and form a gene cluster. HIN- 200 proteins are primarily nuclear proteins involved in transcriptional regulation of genes important for cell cycle control, differentiation, and apoptosis. Our previous studies have established that p202 suppressed tumor growth, reduced tumorigenicity, induced apoptosis, and suppressed metastasis and tumor angiogenesis of many human cancer cell lines. The main goal of this project is to study the anti-tumor activity of p202 (aim 1), and the potential application to breast cancer gene therapy (aim 2). Aim 3 is based on our recent discovery of a novel human HIN-200 gene, IFIX (IFN-Inducible protein X). Our preliminary data showed the expression of IFIX is reduced in breast tumor tissues and breast cancer cell lines and that the enforced expression of IFIX in breast cancer cell lines reduces their growth and tumorigenicity. We also demonstrated the treatment efficacy of an IFIX-based gene therapy in an orthotopic breast cancer model. Together, we hypothesize that IFIX functions as a tumor suppressor and may be developed as a therapeutic agent in breast cancer treatment. The new aim will further test the above hypothesis.

DTIC

Adenoviruses; Breast; Cancer; Gene Therapy; Mammary Glands

20040170749 Arizona Univ., Tucson, AZ

Immunotoxicology of JP-8 Jet Fuel

Harris, David T.; Sep. 29, 2004; 20 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0149

Report No.(s): AD-A426816; AFRL-SR-AR-TR-04-0502; No Copyright; Avail: CASI; A03, Hardcopy

We have examined the immunotoxicological effects of JP-8 jet fuel exposure. Inbred C57BL6 mice were exposed to varying concentration (100-250 mg/m3) of aerosolized JP-8 jet fuel varying periods of time, using a variety of experimental models. Animal exposure was performed via nose-only presentation while the animals were held in individual subject loading tubes. The tubes were nose cone fitted to receiving adapters that originated from a common anodized aluminum exposure chamber. Nose only exposure was utilized to minimize ingestion of jet fuel during self-grooming, and to simulate human occupational exposures. Animals were rotated on a daily basis through the 12 adapter positions on the exposure chamber. This rotation was done to minimize proximity to the jet fuel source as a variable in exposure concentration or composition. Exposure concentration was determined by a seven-stage cascade impactor, and was measured after each exposure (1,2). At various times after the jet fuel exposures the animals were sacrificed and examined for changes in immune system composition

and function. The major immune system organ systems (i.e., spleen, thymus, lymph nodes, blood and bone marrow) were recovered and examined for changes in organ weight, total cell numbers, immune cell components (by differential histochemical staining), and lymphocyte subpopulations by flow cytometric analyses. Assays were also performed to assess any changes in immune function in these organs. In some experiments the animals were administered an aerosolized concentration of the neuropeptide substance P (SP) in an effort to protect from or reverse the effects of JP-8 exposure.
DTIC
Armed Forces (United States); Diseases; Exposure; Immunology; Infectious Diseases; Jet Engine Fuels; Jp-8 Jet Fuel; Military Personnel; Personnel

20040170750 Ohio State Univ., Columbus, OH
The Effect of Cox-2 Inhibitors on the Aromatase Gene (CYP19) Expression in Human Breast Cancer
Shapiro, Charles L.; Burak, William; Brueggemeier, Robert; Jun. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0589
Report No.(s): AD-A426818; No Copyright; Avail: CASI; A02, Hardcopy

Aromatase (CYP-l9) is responsible for estrogen biosynthesis within breast tumor tissue. Aromatase and cyclooxygenase-2 (COX-2) are both overexpressed in human breast cancer, and increased levels of prostaglandin (PG) activates the CYP19 promotor and increases gene expression. We hypothesize that celecoxib, a selective COX-2 inhibitor, will decrease PG, decrease the expression of CYPl9, and reduce estrogen biosynthesis within tumor tissue. To test this hypothesis, in DOD grant # DAMD17-C-01-0589, tumor tissue will be collected from breast cancer patients at the initial diagnosis, and again at the definitive surgery (lumpectomy or mastectomy) for breast cancer. In the 10-14 day interval before the definitive surgery, patients will receive celecoxib and tissue samples collected before and after treatment with celecoxib will be evaluated for gene expression of COX-2 and CYPl9. If our hypothesis is correct, then expression of the CYPl9 gene will decrease in response to celecoxib. This study will provide preliminary data to a) support a mechanism whereby COX-2 inhibitors decrease estrogen production within breast tumors by decreasing CYP19 expression; and b) provide the rationale for initiating larger chemoprevention and therapeutic trials of COX-2 inhibitors in high risk and breast cancer patients.
DTIC
Breast; Cancer; Gene Expression; Genes; Inhibitors; Mammary Glands

20040170751 University Health Network, Toronto, Ontario
Novel Recombinant Fab Fragments of the Tag-72 Monoclonal Antibody CC49 Containing an Integrated Radiometal Binding Site for Radioimmunoguided Surgery for DCIS
Teng, Ying; May 2004; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0372
Report No.(s): AD-A426819; No Copyright; Avail: CASI; A03, Hardcopy

Ductal carcinoma in situ (DCIS) is an early form of breast cancer. Surgical treatment of DCIS is currently inadequate due to the inability to define accurately the extent of the disease. Radioimmunoguided surgery (RIGS) employing radionuclide-conjugated monoclonal antibodies against breast cancer antigens and a sensitive gamma-detecting probe may improve the surgical management of DCIS by more clearly identifying malignant tissue. TAG-72 antigen is overexpressed in 81% of NCIS by immunohistochemical staining with monoclonal antibody CC49. Our objective was to construct a novel recombinant Fab (rFab) of CC49 containing an integrated radiometal-binding site that can be directly labeled with (9mm)Tc through the C-terminal hexahistidine (His6) for RIGS of DCIS. In the first year of the project, I have cloned the genes of Fab (L and Fd) from CC49 hybridoma cells, constructed a co-expression plasmid to express rFab of CC49 in Pichia pastoris, and purified the rFab to homogeneity. This rFab was immunoreactive to TAG-72 in vitro; rFab labeled with 1231 localized specifically in TAG-72 positive s.c. LS174T cancer xenografts in athymic mice. In the second year, rFab will be labeled with (99m)Tc through its incorporated His6. The tumor targeting properties of (9mm)Tc-rFab will also be evaluated in the xenograft model.
DTIC
Antibodies; Breast; Cancer; Fragments; Mammary Glands; Surgery

20040170752 Texas Univ. Health Science Center, San Antonio, TX
Functions of Human Rad51 and Other Recombination Factors in DNA Double-Strand Break Repair
Sigurdsson, Stefan; Jun. 2004; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0412
Report No.(s): AD-A426820; No Copyright; Avail: CASI; A03, Hardcopy

Gene of RAD52 epistasis group mediate homologous recombination and recombination repair of. DNA double strand breaks. Genetic and biochemical studies have suggested that the function of genes of the RAD52 group is highly conserved from yeast to humans and interestingly the efficiency of DNA double strand break repair in mammalian cells is dependent on the tumor suppressors BRCA1 and BRCA2. This underscores the importance of studying the mechanistic basis of protein factors involved in the repair pathway. Rad51 is the key protein in the process and can catalyze homologous DNA pairing and strand exchange reaction. The reaction is stimulated by RPA but interestingly RPA can also suppress the strand exchange reaction by competing with Rad51 for binding sites on the DNA. Proteins called recombination mediators can overcome the suppressive effect of RPA and few are known from prokarvotes and yeast cells. Five Rad5l like proteins, called Rad51 paralogs have been identified in vertebrate cells. In this study, we show that two of these paralogs can promote the Rad51 homologous DNA pairing and strand exchange when Rad5l must compete with RPA for DNA binding sites. This represents the first recombination mediator described for human cells.
DTIC
Breast; Cancer; Deoxyribonucleic Acid; Mammary Glands; Strands

20040170753 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD
A Simple Assay for Determining Antiviral Activity Against Crimean-Congo Hemorrhagic Fever Virus
Paragas, Jason; Whitehouse, Chris A.; Endy, Timothy P.; Bray, Mike; Jan. 2004; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426821; No Copyright; Avail: Defense Technical Information Center (DTIC)
Crimean-Congo hemorrhagic fever virus (CCHFV) is a tick-borne virus that is emerging as a significant human pathogen in many regions of the world, including Africa, Asia, and Europe. In this report, we describe a simple screening method for discovering new antiviral compounds directed against CCHFV. Antiviral activity was determined by assaying infected SW-13 cells (human adrenal gland carcinoma) for protection from cytopathic effect (CPE). By using an in vitro neutral red uptake assay, we were able to quantitatively measure CPE induced by CCHFV. As a proof of concept, we used this method to evaluate the antiviral activity of ribavirin and a series of structural analogs (ribamidine, 6-azauridine, selenazofurin, and tiazofurin) against four geographically diverse strains of CCHFV. Ribavirin inhibited the replication of CCHFV as reported previously using plaque reduction assays. One drug, ribamidine, showed antiviral activity that was 4.5- to 8-fold less than that of ribavirin, and the other three drugs (6-azauridine, selenazofurin, and tiazofurin) did not show significant antiviral activity. There were no significant differences in drug sensitivities among the CCHFV strains. Development of this simple and reliable assay will potentially allow high-throughput screening for discovering additional antiviral drugs to combat this important public health threat.
DTIC
Africa; Assaying; Fever; Hemorrhages; Viruses

20040170762 Brookhaven National Lab., Upton, NY
Structural Studies on Toxins and Virulence Factors of Yersinia pestis
Swaminathan, Subramanyam; Jul. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0491
Report No.(s): AD-A426839; No Copyright; Avail: CASI; A02, Hardcopy
In this first annual report we present our progress on two different areas, protein production and crystallization. We are working on expression and purification of Yop proteins and their complexes. In the first year we learnt reasons why some of the Yop proteins are not crystallizing. We are using a novel approach of making complexes with synthetic peptides or partner proteins to overcome this problem. In the case of LcrV, we are using the inherent property of LcrV forming a coiled coil complex with LcrG to crystallize the complex.
DTIC
Toxins and Antitoxins; Virulence

20040170763 Texas Univ., Houston, TX
Role of GCN5 in Estrogen Responses, Tumor Suppression, and Breast Development in Mice
Dent, Sharon Y.; Jun. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0462
Report No.(s): AD-A426840; No Copyright; Avail: CASI; A02, Hardcopy
Nucleosomes are folded together into chromatin structures that inhibit transcription. Studies here tested the idea that a

histone acetyltransferase, Gcn5, that regulates chromatin folding is important for p53 functions and for estrogen responses. Experiments were proposed to 1) determine whether Gcn5 serves as a coactivator for activation of gene expression by the estrogen receptor 2) examine biochemical, molecular, and genetic connections between Gcn5 and p53 and 3) to generate a mammary gland specific knock out' of Gcn5 in mice to create a mouse model for Gcn5 functions in breast development and tumor formation. We made progress towards all three aims. We examined Gcn5-dependence of estrogen responses in ER+ cell lines. We generated mice that carry null alleles for both Gcn5 and p53 in cis on chromosome 11. We generated mice that carry a conditional disruption allele for Gcn5 that will allow us to do a breast-specific knock out. Our studies will allow us to determine whether histone acetyltransferases provide targets for development of new drug therapies or diagnostic agents, furthering our advancement towards eradication of breast cancer.
DTIC
Breast; Cancer; Estrogens; Mammary Glands; Mice; Neoplasms; Tumors

20040170764 Baylor Coll. of Medicine, Houston, TX
A Fusogenic Oncolytic Herpes Simplex Virus for Therapy of Advanced Ovarian Cancer
Zhang, Xiaoliu; Jun. 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0434
Report No.(s): AD-A426841; No Copyright; Avail: CASI; A02, Hardcopy

The tasks that were originally planned for the first year of this 3 year project are to demonstrate that the fusogenic oncolytic herpes simplex viruses are potent anti- tumor agents for advanced ovarian cancer. Specifically we planned to: 1) produce a large quantity of high grade and high titer viral stocks for the in vivo animal experiments: 2) establish advanced ovarian cancer in the animal model: 3) to therapeutically administer virus, and to evaluate the therapeutic results. We have now successfully finished these tasks. We initially prepared a large stock of the doubly fusogenic oncolytic HSV Synco-2D. We then characterized Synco- 2D in vitro and the result showed that its infection produced a distinctive syncytial phenotype, leading to a significantly increased tumor cell killing ability, compared with that of a nonfusogenic virus (Baco-1). Next we directly injected both Synco-2D and Baco-1 (as control) into the abdominal cavity of mice bearing human ovarian cancer xenografts, Synco-2D eradicated all tumor masses in 75% of the animals, whereas no animals in Baco-1-treated group was tumor-free. These results demonstrate that the doubly fusogenic Synco-2D is indeed an effective therapeutic agent against advanced ovarian cancer. We are now planning to execute the tasks planned for year 2.
DTIC
Cancer; Ovaries; Therapy; Viruses

20040170766 Princeton Univ., NJ
Molecular Computation With Automated Microfluidic Sensors (MCAMS)
Landweber, Laura; Sohn, Lydia; Alivasatos, Paul; Aug. 2004; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-2-0560; Proj-BIOC
Report No.(s): AD-A426843; AFRL-IF-RS-TR-2004-233; No Copyright; Avail: CASI; A03, Hardcopy

We combined microfluidic technology with recently developed algorithms of nucleic acid-based computing to demonstrate a compact, automated nucleotide-based computational device capable of rapid detection of computational output. We explored both experimental and theoretical aspects of the construction of microfluidic nucleic acid computing. Microreactors implementing Boolean operators lent themselves to a relatively simple implementation of DNA computing. On the theoretical side, we simulated the performance of individual reactors and designed small reactor systems (sorters) mimicking AND and OR gates and systems capable of solving complex Boolean expressions. We compared positive vs. negative selection and parallel vs. series arrangements of reactors, considering both the accuracy of and disproportionate representation (bias) within the final pool of solutions. We also developed O(P2) software that designs operating instructions for an O(NL) system capable of solving any Boolean expression. We developed software for automated data collection and signal analysis of electronic detection of labeled DNA and explored novel nanocrystal probes that enable detection of DNA for readout in on-chip electrical assays. We focused in the areas of methods to produce nanocrystals bearing precise numbers of oligonucleotides, and development of nanocrystal precise groupings that bear a collective signature.
DTIC
Computation

20040170772 Naval Health Research Center, Wright-Patterson AFB, OH
Impact of 30-Day Oral Dosing With N-Acetyl-L- Cysteine on Sprague-Dawley Rat Physiology
Arfsten, Darryl P.; Johnson, Eric W.; Thitoff, Angie R.; Jung, Anne; Wilfong, Erin R.; Jul. 2004; 21 pp.; In English
Report No.(s): AD-A426852; No Copyright; Avail: CASI; A03, Hardcopy

A number of studies have demonstrated a protective effect associated with N-acetyl-L-cysteine (NAC) against toxic chemical exposure. However, the impact of long-term oral dosing on tssue pathology has not been determined. In this study, we assessed the impact of long-term oral NAC administration on organ histopathology and tissue glutathione (GSH) and total glutathione-S-transferase (GST) activity levels in Sprague-Dawley (SD) rats. Groups of 20 SD rats (10 male, 10 female), 8 weeks of age, were dosed daily by oral gavage with deionized H2O (negative controls) or NAC solution at a rate of 600 or 1,200 mglkgld for 30 days. Animals were euthanized 6 hours after treatment on study Day 30. There were no significant differences in final body weights or weekly average weight gain between treatment groups. Serum alanine aminotransferase (ALT) activities were significantly elevated (p less than or equal to 0.05) in NAC-treated animals compared to controls when measured on study Day 30. Histopathologic evaluation of the liver, stomach, small intestine, liver, kidneys, spleen, thymus, and lungs revealed no lesions associated with NAC administration. When measured on study Day 30, total GST acUvity for kidney and skin from NAC-treated animals were increased 39-131% as compared to controls. Tissue GSH concentrations from NAC-treated animals were increased 24- 81% as compared with negative controls. Further studies are needed to determine if the observed increase in tissue GSH concentraion and GST activity provide a degree of chemoprotection against dermal and systemic chemical toxicants.
DTIC
Acetic Acid; Cysteine; Dosage; Glutathione; Rats

20040170778 Wyle Labs Life Science and Services, Inc., San Antonio, TX
Altitude Decompression Sickness at 7,620 m Following Prebreathe Enhanced With Exercise Periods
Webb, James T.; Pilmanis, Andrew A.; Balldin, Ulf I.; Oct. 2004; 10 pp.; In English
Contract(s)/Grant(s): F41624-97-D-6004; FA8650-04-D-6472; Proj-7184
Report No.(s): AD-A426859; AFRL-HE-BR-JA-2004-0008; No Copyright; Avail: CASI; A02, Hardcopy

Over 80% altitude decompression sickness (DCS) was reported during a 4-h exposure with mild exercise to 7620 m (25,000 ft) without prebreathe. Prebreathe for more than 1 h would be necessary to reduce the DOS risk below 40%. Use of a single period of exercise to enhance prebreathe effectiveness has been successfully tested and used during some U-2 operations. The current tests used multiple exercise sessions to enhance prebreathe (MEEP) as a means of improving denitrogenation efficiency. Methods. Two MEEP profiles, 30 or 60 min, preceded 4-h exposures to 7620 m with mild, upper-body exercise while breathing 100% oxygen. Resting prebreathe controls were from published studies at the same laboratory. Both MEEP profiles involved 10 min of strenuous dual-cycle ergometry (75% of maximal oxygen uptake) at the beginning of prebreathe. After a I 5-min rest period during the 60-min prebreathe an additional 5 min of strenuous ergometry was performed. Mild exercise was performed during 15 of the last 20 min of both prebreathe profiles. Results. The 60-min MEEP resulted in 25% DOS and the 30-min MEEP 40% DOS (N.S.). The 25% incidence of DOS following the 60-min MEEP profile was significantly less than the 63% DOS following an equal-time, resting prebreathe control. Following the 30-min MEEP, DOS incidence was not greater than the incidence following a 60- min, resting prebreathe control. There was a lower incidence of venous gas emboli during the MEEP exposures than during resting control exposures. Conclusion. Denitrogenation with multiple periods of exercise provides a shorter alternative to resting prebreathe for reducing DOS risk during exposure to 7620 m.
DTIC
Altitude Sickness; Decompression Sickness; Exercise Physiology; Physical Exercise

20040170782 American Inst. for Research, Silver Spring, MD
Detection of Antibodies to Squalene III. Naturally Occurring Antibodies to Squalene in Humans and Mice
Matyas, Gary R.; Rao, Mangala; Pittman, Phillip R.; Burge, Robert; Robbins, Iris E.; Jan. 2004; 24 pp.; In English
Report No.(s): AD-A426871; No Copyright; Avail: Defense Technical Information Center (DTIC)

An ELISA-based assay is described for the measurement of antibodies to squalene (SQE) in human serum and plasma. The assay was adapted from the previously described assay for murine antibodies to SQE (J. Immunol. Methods 267 (2002) 119). Like the murine SQE antibody assay, the human antibody assay used sterile cell culture 96-well plates coated with SQE (20 nmol/well). Phosphate-buffered saline (PBS)-0.5% casein was used as both a blocking agent and dilution buffer. The assay has a high through-put capacity and is reproducible and quantitative. This assay was used to evaluate samples from three different human cohorts. The first cohort was retired employees of the USA Army Medical Research Institute of Infectious Diseases (USAMRIID alumni). The mean age was 68 (N=40; range 58-82). Most were vaccinated with the U.S. licensed anthrax vaccine (AVA) and most had received several other vaccines through a USAMRIID special immunization program. The second cohort was of similar age (N=372; mean age 67; range 54-97) from the normal population of Frederick, MD and were not vaccinated with AVA. The third cohort (N=299) was from Camp Memorial Blood Center, USA Army Medical

Department Activities, Fort Knox, KY. (No additional volunteer information is available.) Using this new ELISA method, antibodies to SQE were detected in all three of the cohorts. IgG antibodies to SQE were detected in 7.5% and 15.1% of the samples from the USAMRIID alumni and Frederick cohorts, respectively. These differences were not significantly different (chi((1))(2)=1.69, p=0.19). In contrast, no IgG antibodies to SQE were detected in the Fort Knox cohort which is significantly different than the Frederick cohort (chi((1))(2)=49.25, p\h0.0001). IgM antibodies to SQE were detected in 37.5% and 32.3% of the samples from the USAMRIID and Frederick cohorts, respectively, but there was no significant difference between cohorts.
DTIC
Antibodies; Infectious Diseases; Mice

20040170785 Texas Univ., Austin, TX
Structure-Based Design of Inhibitors to the Cytotoxin Ricin
Robertus, Jon D.; Jul. 2004; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-03-C-0088
Report No.(s): AD-A426876; No Copyright; Avail: CASI; A03, Hardcopy

Ricin is a cytotoxin and a known bioterrorist weapon. The Army is pursuing anti-ricin vaccines, but plans to develop an efficacious antidote to the toxin, for cases where vaccination is not appropriate. The goal of this project is use the X-ray structure of ricin A chain (RTA) as a template for inhibitor design. Computer modeling and X-ray screening aid in the design process. Inhibitors which bind to the RTA substrate specificity site have been identified. A previous platform, 9-oxoguanine, has been shown to be of limited synthetic utility, however, 9-deaguanine appears to be a more versatile specificity site platform and should allow a range of pendant additions. A search has been initiated to screen for pendants which can be attached to the platform and which make strong and specific interactions at other sites. These groups can aid inhibitor uptake, binding specificity, and binding strength. A new compound, based on aminimide synthesis, was tested just as this report was being prepared. It has an IC50 more than 1000 times as potent as any past inhibitors we have tested; this finding will cause us to modify our research direction to some extent.
DTIC
Antidotes; Inhibitors; Toxins and Antitoxins

20040170786 Nebraska Univ., Omaha, NE
Estrogen-Induced Depurination of DNA: A Novel Target for Breast Cancer Prevention
Cavalieri, Ercole; May 2004; 33 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0229
Report No.(s): AD-A426878; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis that depurinating estrogen-DNA adducts initiate breast cancer by generating mutations is at the center of the research in this BCCOE. Inhibition of this adduct formation is anticipated to reduce estrogen-induced mutagenesis, neoplastic transformation and development of tumors. The research includes: (1) Testing the ability of two preventative agents to inhibit the induction of mammary tumors in female ACI rats implanted with estradiol. The profile of estrogen metabolites, conjugates, and depurinating DNA adducts and the expression of estrogen-metabolizing enzymes will be analyzed. (2) Determining the effects of estrogen metabolites on neoplastic transformation of human breast epithelial cells and the ability of the preventive agents to block transformation. (3) Preventing estradiol-induced mutations in mammary tissue of Big Blue rats and in cultured cells. (4) Determining the profile of estrogen metabolites, conjugates and DNA adducts in aromatase-transfected mouse mammary tissue and the ability of an aromatase inhibitor to prevent tumors. (5) Studying the role of estrogen in the induction of mammary tumors in female castrate ERKO/ Wnt-1 mice with and without administered estradiol. (6) Studying the profile of metabolites, conjugates, DNA adducts and estrogen-metabolizing enzymes in human breast ductal lavage samples to determine whether analysis of breast fluid might be noninvasive bioassay for risk of breast cancer. (7) Designing a clinical trial of breast cancer prevention in women based on the results of the above studies. The synergism in these studies rests on the complementary, collaborative scientific approaches. Consumer advocates will support this research and disseminate the findings. The results from this Center are expected to provide strategies for preventing human breast cancer and assessing risk of disease.
DTIC
Breast; Cancer; Deoxyribonucleic Acid; Epithelium; Estrogens; Health; Mammary Glands; Prevention; Targets

20040170787 Nebraska Univ., Omaha, NE

Regulation of Estrogen-Responsive Gene Expression and Tumor Suppression by Transcriptional Cofactors

Xiao, Hua; May 2004; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0507

Report No.(s): AD-A426879; No Copyright; Avail: CASI; A03, Hardcopy

The growth and metastatic potential of breast cancer cells are regulated by estrogen, a ligand of the estrogen receptors (ERs) (1, 2). The ERs facilitate major effects of estrogen in cells through interactions with transcriptional cofactors to regulate transcription of ER- targeting genes. We previously identified two human cofactors TIP30 and CIA (Coativator Independent of AF2) that can specifically regulate ERalpha-mediated transcription. TIP3O, also called CC3 or Htatip2, is a tumor suppressor that can promote apoptosis and inhibits angiogensis, through the regulation of transcription (3-5). TIP3O interacts with an ERalpha-interacting coactivator CIA (6,7). Therefore, we hypothesized that overexpression of both TIP3O and CIA will inhibit transcription of ER-target genes such as c-Myc and Cyclin D1 and overexpression of TIP3O and CIA in ER-negative MDA-MB-231 breast cancer cells suppresses cell growth. We proposed to determine the effects of TIP3O and CIA on expression of ERalpha-responsive genes, such as c-Myc and Cyclin Dl in the first year. Now, we show that TIP3O overexpression represses ERalpha-mediated c-myc transcription, whereas TIP3O deficiency enhances c-myc transcription in the absence and presence of estrogen. Ectopic CIA cooperates with TIP3O to repress ERalpha-mediated c-myc transcription. Using chromatin immunoprecipitation (ChIP) assays (8), we demonstrate that TIP3O and CIA are distinct cofactors that are dynamically associated with transcription initiation and elongation complexes in response to estrogen. Both TIP3O and CIA are recruited to the C-myc gene promoter by liganded ERalpha in the second transcription cycle. Overexpression of TIP30 and CIA in ER-negative MDA-MB-231 breast cancer cells suppresses cell growth.

DTIC

Breast; Cancer; Estrogens; Gene Expression; Genes; Mammary Glands; Tumors

20040170788 Stanford Univ., Stanford, CA

Genomic and Expression Profiling of Benign and Malignant Nerve Sheath Tumors in Neurofibromatosis Patients

VAN De Rijin, Matt; Nielsen, Torsten; Rubin, Brian; May 2004; 66 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0297

Report No.(s): AD-A426880; No Copyright; Avail: CASI; A04, Hardcopy

The goal of this project is to identify genes involved in the malignant transformation of neurofibromas to malignant peripheral nerve sheath tumors using expression profiling and array-based comparative genomic hybridization. The significance of the genes will be validated on much larger numbers of cases using antibodies and in situ hybridization probes on tissue microarrays (TMAs). Genes will be further studied in in vitro experiments using cell lines from nerve sheath tumors. While the grant starting date was on Nay 1, 2003 authorization to work with human subjects was not obtained until April 1, 2004. Therefore this 'annual report' will only describe the actual work performed in April 2004. Nevertheless the following progress has been made in the past year: 1. The number of cases of nerve sheath tumors available will be more than sufficient to perform the first aim of this study. 2. We have started to run expression profiling and gene microarrays on a number of nerve sheath tumors and since April 1, 2004 have analyzed six malignant peripheral nerve sheath tumors and five schwannomas. 3. We have gained much experience with in situ hybridization on TMAs. This experience will enormously benefit this project.

DTIC

Cancer; Genetics; Genome; In Vitro Methods and Tests; Nerves; Patients; Sheaths; Tumors

20040170789 Mayo Clinic, Scottsdale, AZ

The Role of MUC1 Cytoplasmic Domain in Tumorigenesis

Al-Masri, Azzah; Gendler, Sandra J.; May 2004; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0476

Report No.(s): AD-A426881; No Copyright; Avail: CASI; A03, Hardcopy

The overall aim of the research is to develop a better understanding of the role of MUCl in breast cancer. Loss of Muc1 (mouse homologue of MUCl) significantly reduces tumor progression in polyomavirus middle. T antigen (PyV MT) - induced mammary tumors. The high transforming activity of the PyV MT antigen depends on c-Src which has been shown to phosphorylate the cytoplasmic tail of MUC1. Our aim is to identify specific proteins that associate with MUCl and induce signaling that potentiates tumorigenesis, specifically the modulation of c-Src activity and signaling in MMTV-PyV MT tumorigenesis. We have found that MUCl and c-Src interact in pYV MT-induced mammary tumors. Our data provide insights into the possible mechanism for the significant delay in tumor progression that is observed in the absence of Mucl. We suggest that the interaction of Mucl with c-Src, a key player in PyV MT transformation, promotes the binding of c-Src to its

downstream targets and influences its intracellular localization. Other studies in the lab have shown that overexpressed MUCl induces mammary gland tumors. We found that overexpressed MUCl also inhibits mammary gland involution. These results suggest that MUCl functions as a weak oncogene in the mammary gland.
DTIC
Breast; Cancer; Cytoplasm; Mammary Glands; Proteins

20040170790 Northwestern Univ., Evanston, IL
Inhibition of PKR Activity is Required for Survival of Breast Cancer
Haines, George K.; Jan. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0585
Report No.(s): AD-A426882; No Copyright; Avail: CASI; A03, Hardcopy

PKR is an interferon-inducible protein kinase, which has recently been discovered to have pleiotropic effects on the growth and differentiation of normal and neoplastic cells. We reported a direct correlation between PKR expression and differentiation in a variety of human tumors and in normal squamous epithelial, and an inverse association between%PKR expression and proliferation in head and neck cancer. The mechanisms by which PKR produced such effects are being intensively studied. Phosphorylation of its major substrate, eIF-2alpha, leads to a selective inhibition of protein synthesis. PKR also phosphorylates IkB, freeing NFkB to tranlocate to the nucleus and induce transcription of a number of gene products. PKR-induced apoptosis has recently been reported to be co-dependent on both the eIF2alpha and NFKB pathways in HeLa cells. Breast cancer was utilized as a model system to determine the role of PKR in loss of hormone and growth factor dependence in human cancers, as it appears inactive or hypoactive, as determined by eIF-2alpha phosphyorylation in this system. We hypothesized that hormone deprivation induces apoptosis in dependent cell lines through a PKR: NFKB mediated process, but this pathway is abrogated in hormone-independent cell lines.
DTIC
Apoptosis; Breast; Cancer; Cells (Biology); Estrogens; Hormones; Mammary Glands; Neoplasms; Phosphorylation; Survival

20040170791 Duke Univ., Durham, NC
Definition of the Molecular Mechanisms Which Distinguish Between Selective Estrogen Receptor Modulators (SERMs) and Full Antiestrogens
Huang, Huey-Jing; May 2004; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0371
Report No.(s): AD-A426883; No Copyright; Avail: CASI; A03, Hardcopy

The antiestrogen tamoxifen is the most commonly used endocrine treatment for all stages of breast cancer. Tamoxifen is a SERM (Selective Estrogen Receptor Modulator) which can act as an estrogen or an antiestrogen depending on the tissues in which it operates. Initially, tamoxifen may have profound effects on the survival and proliferation of breast cancer cells, but progressively, resistance emerges through mechanisms that are only partially understood. Some pure antiestrogens lack cross-resistance with tamoxifen, thus makes them good candidates as second-line therapy for patients who develop tamoxifen resistance and also suggests that the mechanisms underlying the actions of SERMs and pure antagonists are very different. This proposal investigates the possible involvement of different corepressor proteins in mediating the actions of different classes of antiestrogens. To probe the changes in the structure of the estrogen receptor (ER) upon binding of different antiestrogens, a focused phage displayed peptide library which expresses peptides containing a 'CoRNR box' motif, important for corepressor to bind nuclear receptor, was made. Peptides that differentially interact with ER occupied by different antiestrogens were obtained. These peptides had provided a better understanding of actions of different antiestrogens and the assay which detects the peptide-ER interaction can be used as a sensitive and efficient system to screen for novel antiestrogens. During the course of the project in the last year, we have also used the technology we developed in studying estrogen receptor to examine the interaction of corepressor and retinoic acid receptor (RAR) and have brought forward more fundamental questions regarding nuclear receptor-corepressor interaction and its implication in breast cancer treatment.
DTIC
Breast; Cancer; Estrogens; Mammary Glands; Modulators

20040170793 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD
Mutational Effects on Protein Folding Stability and Antigenicity: The Case of Streptococcal Pyrogenic Exotoxin A
Carra, John H.; Welcher, Brent C.; Schokman, Rowene D.; David, Chella S.; Bavari, Sina; Jan. 2003; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426888; No Copyright; Avail: Defense Technical Information Center (DTIC)

The influence of mutationally induced changes in protein folding on development of effective neutralizing antibodies during vaccination remains largely unexplored. In this study, we probed how mutational substitutions of streptococcal pyrogenic exotoxin A (SPEA), a model bacterial superantigen, affect native conformational stability and antigenicity. Stability changes for the toxin variants were determined using circular dichroism and fluorescence measurements, and scanning calorimetry. Self-association was assayed by dynamic light scattering. Inactivated SPEA proteins containing particular combinations of mutations elicited antibodies in HLA-DQ8 transgenic mice that neutralized SPEA superantigenicity in vitro, and protected animals from lethal toxin challenge. However, a highly destabilized cysteine-free mutant of SPEA did not provide effective immunity, nor did an irreversibly denatured version of an otherwise effective mutant protein. These results suggest that protein conformation plays a significant role in generating effective neutralizing antibodies to this toxin, and may be an important factor to consider in vaccine design.
DTIC
Antibodies; Dichroism; Folding; Mutations; Proteins; Stability; Streptococcus

20040170796 New Orleans Univ., LA
Bio-Magnetics Interfacing Concepts: A Microfluidic System Using Magnetic Nanoparticles for Quantitative Detection of Biological Species
O'Connor, Charles J.; Hormes, Josef; Bazan, Nicolas G.; Sep. 30, 2004; 78 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MDA972-03-C-0100; ARPA ORDER-Q472/00/01
Report No.(s): AD-A426891; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report describes a research project in the area of bio-magnetics interfacing concepts aimed at developing a microfluidic system based on the use of magnetic nanoparticles for the quantitative detection of biological species in various media. Novel bio-compatible ferrofluids of functionalized magnetic nanoparticles suitable for bioconjugation of antibodies or other active biomolecules are developed, prepared, and tested for us in biomedical research, and various biological and clinical diagnostic applications.
DTIC
Biomagnetism; Detection; Magnetic Materials; Nanoparticles

20040170809
Biomolecular Computing by In Vitro Transcriptional Networks
Winfree, Erik; Kim, Jongmin; Lee, Shaun; Mohanty, Sarina; Shantz, Kristin; Apr. 30, 2004; 4 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0813
Report No.(s): AD-A426916; No Copyright; Avail: CASI; A01, Hardcopy
This grant supported the initial development of a novel biochemical system, in vitro transcriptional networks, that can be programmed to construct arbitrary circuits. These systems are a simplification of genetic regulatory networks. The foundational theory is completed; design, implementation, and characterization, and optimization of individual switches has been performed; and construction of non-trivial biochemical test circuits is still in progress.
DTIC
Biochemistry; Computer Networks; In Vitro Methods and Tests; Transcription (Genetics)

20040170811 Duke Univ., Durham, NC
Functional Characterization of TPF (Tumor Promoting Factor), A Novel Angiogenic Factor in Breast Cancer Pathogenesis
Shao, Rong; Wang, Xiao-Fan; Jun. 2004; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0228
Report No.(s): AD-A426921; No Copyright; Avail: CASI; A03, Hardcopy
The later stages of human cancer development are poorly understood complex processes associated with the expression of genes by cancers that promote specific tumorigenic activities, such as angiogenesis and metastasis. In the present study, we identified periostin whose acquired expression by human cancers leads to a significant enhancement in tumor angiogenesis and metastasis. Undetectable in normal human breast tissues, periostin was found to be overexpressed by human primary breast cancers examined. Tumor cell lines engineered to overexpress periostin showed accelerated angiogenesis and metastasis as xenografts in immune- compromised animals. The underlying mechanism of angiogenesis was found to derive in part from the up-regulation of the VEGF receptor Flk-1/KDR by endothelial cells through an integrin alpha(v)beta(3)-FAK mediated

signaling pathway. These findings demonstrate the presence of a novel mechanism by which tumor angiogenesis is acquired with the expression of periostin as a crucial step in later stages of tumorigenesis.
DTIC
Breast; Cancer; Genes; Mammary Glands; Pathogenesis; Tumors

20040170812 Alabama Univ., Birmingham, AL
UAB - Community Breast Cancer Network
LoBuglio, Albert F.; Saleh, Mansoor; Jul. 2004; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0120
Report No.(s): AD-A426925; No Copyright; Avail: CASI; A03, Hardcopy

The University of Alabama at Birmingham (UAB) Clinical Trial Network was formed with the aim of establishing a clinical research consortium between the UAB Comprehensive Cancer Center (UAB CCC), community-based oncology practices, and pharmaceutical sponsors, which would provide access to high priority breast cancer clinical trials to women in the community. The Department of Defense (DoD) grant provided funding to establish the network infrastructure followed by the activation of breast cancer clinical trials in the community. This was the first time ever implementation of this funding mechanism. Year 2001 was primarily dedicated to establishment of the network infrastructure and development of a working relationship between the network and funding organization as well as the Human Subjects Research Review Board (HSRRB) in regards to protocol approval and activation. Six clinical trials were activated in Year 2002 and accrued a total of 69 patients. Clinical trials at the network sites were put on hold in Year 2003 following an Food and Drug Administration (FDA) audit of a non-network trial revealed deficiency in protocol compliance and Good Clinical Practice (GCP). A non-funded extension was approved for Year 04. A total of 121 patients were accrued at the network sites during the landing period and currently three protocols are actively accruing patients. The major accomplishments during the granting period included establishment of a successful clinical trials network that provided access to women in the community to cutting edge clinical trials. While the FDA- mandated clinical hold resulted in a substantial setback to the momentum of the network activity and a disruption of the proposed clinical research efforts, with the assistance of the academic partner retraining and reorientation, the network sites successfully established a self-sustaining clinical research program and recently successfully passed an FDA audit.
DTIC
Breast; Cancer; Mammary Glands

20040170818 California Univ., Irvine, CA
Differential Gene Expression in Mammalian Liver During Hibernation
Martin, Sandra L.; Epperson, Elaine; Sep. 13, 2004; 4 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0550
Report No.(s): AD-A426942; ARO-41960.5-LS; No Copyright; Avail: CASI; A01, Hardcopy

The long-range goal of this project is to understand what molecular changes allow some mammals to achieve and survive hibernation so that these molecular mechanisms may be engineered to evoke similar hypometabolic states in humans. Earlier results supported the hypothesis that differential gene expression is significant for determining the hibernating phenotype. Thus, one objective of this work has been to identify gene products that are differentially expressed during hibernation in ground squirrels. This question was addressed at both the mRNA and protein levels, and led to the identification of numerous gene products with significantly altered expression between summer and hibernating ground squirrels. These proteins provide targets for future work with a goal of improving outcomes after ischemic or hypothermic insults. Our second objective was to determine the control mechanism(s) used to suppress protein synthesis in the liver during hibernation; this aspect of our study defined a novel regulatory mechanism acting through eIF4E as the likely cause of reduced translation in the liver during torpor. Furthermore, this mechanism provides an elegant solution to the need for a reversible process that permits the reactivation, or even hyperactivation, of translation observed
DTIC
Gene Expression; Genes; Hibernation; Liver; Mammals

20040170826 Texas Univ. Health Science Center, Houston, TX
An Evaluation of a Bacteriostatic Heat and Moisture Exchanger vs a Nonbacteriostatic Heat and Moisture Exchanger in Preventing the Transmission of Bacteria Colony- Forming Units from the Endotracheal Tube to the Anesthesia Breathing Circuit
Goodman, Jerri R.; Hlavnicka, John P.; Neft, Michael W.; Aug. 1997; 81 pp.; In English
Contract(s)/Grant(s): HSC-SN-97-001
Report No.(s): AD-A426952; No Copyright; Avail: CASI; A05, Hardcopy

Heat and Moisture Exchangers (HMEs) have been used for over 30 years for heat and moisture retention. Studies about bacteriostatic HMEs (BHMEs/NHMEs) have been conducted to assess their role in preventing bacterial transmission to the anesthesia breathing circuit (ABC); none have been done on anesthetized OR patients. This study adds to existing knowledge about the effect of HMEs in preventing transmission of bacteria with implications for cost reduction resulting from reuse of ABCs between patients. This quasi-experimental study involved adults (n=99) undergoing general endotracheal anesthesia for elective procedures. Subjects were randomly assigned to BHME or NHME groups. The appropriate HME was placed between the endotracheal tube (ETT) and ABC. At the conclusion of the case, the ETT and ABC were washed in a clinical laboratory. The wash was cultured to determine presence of bacteria. Cultures were described as positive or negative for Bacteria Colony-Forming Units (BCFUs); alpha level was p \h .05, with a power of .80. The Chi square test revealed no statistically significant differences between groups in transmission of bacteria from ETT to Y-connector (p = .485). However, both groups showed statistically significant differences between presence of bacteria in ETTs and ABCs: BHME (p \h.005) and NHME (p \h.005). Neither MHE prevented contamination of the machine side of the circuit. These results support not reusing breathing circuits. Of 53 subjects in the NHME group, 28 had positive Eli cultures with 7 showing transmission to ABC. Of 46 subjects in the BHME group, 28 had positive ETT cultures with 9 showing transmission to ABC.
DTIC
Anesthesia; Bacteria; Circuits; Contamination; Health; Heat Exchangers; Moisture; Respiration

20040170831 Johns Hopkins Univ., Baltimore, MD
Identification of Breast Cancer Specific Proteolytic Activities for Targeted Prodrug Activation
Denmeade, Samuel R.; May 2004; 42 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0304
Report No.(s): AD-A426967; No Copyright; Avail: CASI; A03, Hardcopy

The underlying hypothesis of this proposal is that a breast tissue/cancer proteolytic activity can be identified by screening the extracellular fluid from human breast cancers with a fluorescence quenched random peptide library. The peptide substrate(s) identified from this screening could be used to produce prodrugs that are targeted for specific activation by proteolytic activity present in extracellular fluid of breast cancers while avoiding systemic toxicity. In the first year we developed methods to synthesize large fluorescently quenched peptide libraries as outlined in task 1. In preliminary studies, we incubated these libraries with a purified serine protease, human glandular kallikrein 2, and identified a series of putative substrates. These substrates were resynthesized as soluble peptides and peptides were then identified that were excellent hK2 substrates but unstable to non-specific hydrolysis in human plasma. Coupling these peptides to the thapsigargin analog, Ll2ADT, however, produced a prodrug that was readily hydrolyzed by hK2, stable in human plasma in vitro and mouse plasma both in vitro and in vivo, and was selectively cytotoxic to cancer cells in the presence of enzymatically active HK2. These studies demonstrated the feasibility of the approach to identification of protease substrates outlined in tasks 1-3 of the proposal. However, incubation of breast cancer homogenates or concentrated media from breast cancer cell lines did not yield any hydrolyzed peptides. This lack of hydrolys is most likely is due to a combination of ng/ml concentrations of protease in the extracellular fluid and the need to dilute samples to cover entire bead library (i.e. 10-40 mls). A new approach for combinatorial screening is required that would yield libraries of small physical volume to screen small volume of extracellular fluid from breast cancers without requiring substantial dilution.
DTIC
Breast; Cancer; Enzymes; Mammary Glands; Peptides

20040170834 Veridian Engineering, Inc., Dayton, OH
Enhanced Recovery of Aircrew from G Acceleration Induced Loss of Consciousness (G-LOC): A Centrifuge Study
Tripp, Lloyd D., Jr.; Oct. 2001; 41 pp.; In English
Contract(s)/Grant(s): F41624-97-D-6004; Proj-7184
Report No.(s): AD-A426973; AFRL-HE-WP-TR-2004-0117; No Copyright; Avail: CASI; A03, Hardcopy

G-LOC is one of the main physiological threats to aircrew of high-performance aircraft. The primary focus on this study was to measure recovery latency periods for both the absolute and relative incapacitation period following a G- LOC event and what effect the G-LOC event may have on pre- and post-G-LOC performance of fine motor control and cognitive function tasks (simulated flying tasks). G-LOC events were produced using the Dynamic Environment Simulator (DES) centrifuge at Wright-Patterson AFB OH and the Air Force Research Laboratory centrifuge at Brooks AFB TX. At each facility, an identical compensatory tracking task was used to tap the motor skill required by a pilot. In addition to the tracking task, participants were also required to perform a computation task (addition and subtraction problems) to tap the cognitive skills required by fighter pilots. Following the collection of baseline data the participant experienced his/her first G exposure, which was used

to establish his/her relaxed (tolerance. Following a rest period, the subject experienced G-LOC. Recovery time data were analyzed and they suggest that it would take a pilot approximately 64 sec to regain the same degree of decision making cognitive ability as he/she had prior to the G-LOC episode. This result has tremendous implications for pilot performance in fighter aircraft.
DTIC
Acceleration Tolerance; Centrifuges; Consciousness; Flight Crews; Losses

20040171077 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD
The Case for Pre-Enlistment Physical Fitness Testing: Research and Recommendations
Knapik, Joseph J.; Jones, Bruce H.; Sharp, Marilyn A.; Darakjy, Salima; Jones, Sarah; Aug. 2004; 100 pp.; In English
Report No.(s): AD-A426848; USACHPPM-12-HF-01Q9D-04; No Copyright; Avail: CASI; A05, Hardcopy

This paper reviewed the concept of physical fitness and outlined suggestions for a pre-enlistment physical fitness test. The components of physical fitness were identified by reference to factor analysis studies and to physiological concepts related to the components of physical fitness. The physiological validity and reliability of relatively simple tests of physical fitness were considered. Criteria against which physical fitness tests have been validated include a) performance on military tasks, b) injuries and c) attrition. The review resulted in three suggested courses of action. Course of Action 1 (COA1) was to keep the current Reception Station Physical Fitness Test consisting of push-ups (PU), sit-ups and a i-mile run. Course of Action 2 (COA2) involved a physical fitness test battery based on 1) findings in the literature, 2) the assumptions that the major components of physical fitness should be measured and 3) the assumption that fitness tests should be related to some criterion measure. The COA2 test consisted of an incremental dynamic lift (IDL), PUs and a 1-mile run. Course of Action 3 (COA3) recommended a research project that involves 6 major steps: 1) determining a set of critical military criteria, 2) determining a battery of physical fitness tests that are assumed to measure the fitness components associated with these criteria, 3) obtaining performance data on a representative sample of soldiers 4) validating and cross-validating the fitness measures against the military criteria, 5) selection of fitness test score that represent acceptable performance on the criterion tasks, 6) periodic re-evaluation of the fitness tests. The current entry- level physical fitness test (COA1) possesses some validity since individuals who do not pass the test are more likely to be injured or to attrite from service but the relationship with job performance is weaker and muscle strength is not measured by the test battery.
DTIC
Human Performance; Physical Fitness

20040171078 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD
Secular Trends in the Physical Fitness of American Youth, Young Adults and Army Recruits
Knapik, Joseph J.; Sharp, Marilyn A.; Jones, Bruce H.; Darakjy, Salima; Jones, Sarah; Aug. 2004; 88 pp.; In English
Report No.(s): AD-A426849; USACHPPM-12-HF-01Q9B-04; No Copyright; Avail: CASI; A05, Hardcopy

This paper reviews the literature and existing databases for information on secular trends in the physical fitness of young Americans and describes changes in fitness during Basic Combat Training (BCT). The VO2max of male youth and new Army recruits has not changed while that of female youth and new recruits has improved slightly from at least 1975 to 1998. Performance has declined on endurance running tasks in a similar time period. It may be that youth and recruits are not as proficient at applying their physiological capability to performance tasks like timed runs, possibly because of factors such as reduced experience with ruining, lower motivation, and/or environmental factors. Limited data on Army recruits demonstrate an increase in strength from 1978 to 1998 that is consistent with an increase in the frequency of self-reported youth strength training and an estimated increase in fat-free body mass over the same time period. Data on muscular endurance is not consistent. Among young Americans there is strong evidence that body weight and body mass index (BMI) have progressively increased since about 1980 and this increase continues into the 2000s. Available evidence suggests that the increases in BMI and body weight are associated with an increase in caloric intake. Most physical fitness trends can be modeled using linear regression and there is little reason to think the trends cited above will not continue into the future. During BCT, men improved their push-up, sit-up, and 2-mile run performance by an average of 56%, 47%, and 17%, respectively; women improved an average of 189%, 77% and 18%, respectively. To track future trends in BMI, cardiorespiratory endurance, and muscular endurance in the Army, appropriate surveillance systems should be developed to systematically collect Army Physical Fitness Test data.
DTIC
Adults; Exercise Physiology; Physical Fitness; Trends; Youth

20040171539 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Simulation of Avifauna Distributions Using Remote Sensing

Smith, James A.; [2004]; 1 pp.; In English; International Geoscience and Remote Sensing Symposium (IGARSS'04), 19-25 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

Remote sensing has proved a fruitful tool for understanding the distribution and functioning of plant communities at multiple scales and to understand their coupling to bioclimatic and anthropogenic factors. But a similar approach to understanding the distribution and abundance of bird species as well as many other animal organisms is lacking. The increasing need for such understanding is evident with the recent examples of threats to human health via avian vector transmission and the increasing emphasis on global conservation biology. From experimental observations we know that species richness tends to track biological or environmental gradients. In this paper, we explore the fundamental idea that thermal and water-relation environments of birds, as estimated from satellite data and biophysical models, can define the constraints on their Occurrences and richness. We develop individual bird energy budget models and use these models to define the climate space niche of birds. Using satellite data assimilation products to drive our models, we disperse a distribution of virtual or actual bird species across the landscape in accordance to the limits expressed by their climate space niche. Here, we focus on the North American summer breeding season and give two examples to illustrate our approach. The first is a tundra loving bird, e.g. corresponding to the Culidris genus, and a second genus example, Myiurchus, that corresponds to arid or semi-arid regions. We define these birds in terms of their basic physiology and morphological characteristics, construct avian energetic simulations to predict their allowable metabolic ranges and climate space limits.

Author

Birds; Remote Sensing; Simulation; Habitats; Satellite Observation

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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*.

20040170777 Wyle Labs Life Science and Services, Inc., San Antonio, TX

Enhancement of Preoxygenation for Decompression Sickness Protection: Effect of Exercise Duration

Webb, James T.; Pilmanis, Andrew A.; Fischer, Michele D.; Kannan, Nandini; Dec. 2002; 7 pp.; In English

Contract(s)/Grant(s): F33615-92-C-0018; F41624-97-D-6004; Proj-7184

Report No.(s): AD-A426858; AFRL-HE-BR-JA-2002-0005; No Copyright; Avail: CASI; A02, Hardcopy

Since strenuous exercise for 10 during preoxygenation was shown to provide better protection from decompression sickness (DCS) incidence than resting preoxygenation, a logical question was: would a longer period of strenuous exercise improve protection even further. Increased strenuous exercise duration during preoxygenation increases DCS protection. There were y0 subjects, 30 men and 30 women, who were exposed to 9,144 m (4.3 psia) for 4-h while performing mild, upper body exercise. Before the exposures, each subject performed 3 preoxygenation profiles on different days in balanced order: a 90-min resting preoxygenation control; a 240-min resting preoxygenation control; and a 90- min preoxygenation including exercise during the first 15 min. The subjects were monitored at altitude for venous gas emboli (VGE) with an echo-imaging system and observed for signs and symptoms of DCS. There were no significant differences in occurrence of DCS following any of the 3 preoxygenation procedures. Results were also comparable to an earlier report of 42% DCS with a 60-min preoxygenation including a 10-min exercise. There was no difference between VGE incidence in the comparison of protection offered by a 90-min preoxygenation with or without 15 min of strenuous exercise. The DCS incidence following a 240-min resting preoxygenation, 40%, was higher than observed during NASA studies and nearly identical with the earlier 42% DCS after a 60-min preoxygenation including exercise during the first 10 min. Conclusion: The protection offered by a 10 min exercise in a 60-min preoxygenation was not increased with extension of the preoxygenation exercise period to 15 min in a 90-min reoxygenation, indicating an upper time limit to the beneficial effects of strenuous exercise.

DTIC

Augmentation; Decompression Sickness; Exercise Physiology; Physical Exercise

20040170779 Wyle Labs Life Science and Services, Inc., San Antonio, TX

The Effect of Exposure to 35,000 ft on Incidence of Altitude Decompression Sickness

Webb, James T.; Pilmanis, Andrew A.; Fischer, Michele D.; Kannan, Nandini; Jun. 2001; 5 pp.; In English

Contract(s)/Grant(s): F33615-92-C-0018; F41624-97-D-6004; Proj-7184

Report No.(s): AD-A426860; AFRL-HE-BR-JA-2000-0001; No Copyright; Avail: CASI; A01, Hardcopy

Exposure to 35,000 ft without preoxygenation, breathing 100% oxygen prior to decompression, can result in severe decompression sickness (DCS). Exercise while decompressed increases the incidence and severity of symptoms. Clarification of the level of activity versus time to symptom onset is needed to refine recommendations for current operations requiring 35,000-ft exposures. Currently, the USAF limits these operations to 30 min following 75 min of preoxygenation. The objective of this study was to determine the effect of exercise intensity on DCS incidence and severity at 35,000 ft. Following 75 or 90 min of ground-level preoxygenation, 54 male and 38 female subjects were exposed to 35,000 ft for 3 hours while performing strenuous exercise, mild exercise, or seated rest. The subjects were monitored for venous gas emboli (VGE) with an echo-imaging system and observed for signs and symptoms of DCS. Results. Exposures involving strenuous and mild exercise resulted in higher incidence (P \h.05) and earlier onset of symptoms (P \h.05) of DCS than exposure at rest. Mild and strenuous exercise during exposure did not differ in incidence or rate of onset. Incidence at 30 min of exposure was 8% at rest and 23% while exercising. The results showed that current guidelines for 35, 000-ft exposures keep DCS risk below 10% at rest. Exercise, even at mild levels, greatly increases the incidence and rate of onset of DCS.
DTIC
Altitude Sickness; Decompression Sickness; Exercise Physiology; Exposure

20040170781 Wyle Labs Life Science and Services, Inc., San Antonio, TX
Moderate Exercise After Altitude Exposure Fails to Induce Decompression Sickness
Webb, James T.; Pilmanis, Andrew A.; Fischer, Michele D.; Sep. 2002; 5 pp.; In English
Contract(s)/Grant(s): F41624-97-D-6004; Proj-7184
Report No.(s): AD-A426862; AFRL-HE-BR-JA-2001-0006; No Copyright; Avail: CASI; A01, Hardcopy

The objective of this study was to determine the effect of exercise after altitude exposure (post-exposure exercise) on subsequent altitude decompression sickness (DCS) incidence. Existing USAF prohibition of exercise following altitude chamber training exposures and interest from operational personnel prompted our evaluation of post-exposure exercise as a DCS-inducing stressor. Methods: After a 1-h resting preoxygenation, 67 subjects were exposed to 30,000 ft for 2-h while performing mild, upper body exercise. The subjects were monitored for venous gas emboli (VGE) with an echo-imaging system and observed for signs and symptoms of DCS. Subjects without DCS (N=31) or with DOS which resolved during recompression (N=29) were randomly assigned to post-exposure rest (control, N=29) or moderate exercise (50% of peak oxygen uptake, dual-cycle ergometry; N=31) and both groups were monitored for delayed or recurring DOS. Results. The altitude exposure resulted in 48.3% DOS in the 60 volunteers serving as test or control subjects. Of 31 subjects assigned to the post- exposure exercise group, 15 had developed DOS which resolved during descent. No cases of DOS were observed or reported during or following post-exposure exercise. The results show that moderate exercise after exposure did not result in either delayed-onset or recurring DOS.
DTIC
Altitude Sickness; Decompression Sickness; Exercise Physiology; Exposure; Physical Exercise

20040171314 Wyle Labs Life Science and Services, Inc., San Antonio, TX
An Abrupt Zero-Preoxygenation Altitude Threshold for Decompression Sickness Symptoms
Webb, James T.; Pilmanis, Andrew A.; OConnor, Robert B.; Apr. 1998; 7 pp.; In English
Contract(s)/Grant(s): F33615-89-C-0603; F33615-92-C-0018; Proj-7184
Report No.(s): AD-A426912; AL/CF-JA-1997-0006; No Copyright; Avail: CASI; A02, Hardcopy

The altitude threshold for decompression sickness (DCS) symptoms has been variously described as being 18,000 ft (5,487 m) to above 25,000 ft (7,620 m). Safety and efficiency of aerospace operations require more precise determination of the DCS threshold. One hundred fifteen male human-subjects were exposed to simulated altitude (11 at 11,500 ft; 10 at 15, 000 ft; 8 at 16,500 ft; 10 at 18, 100 ft; 10 at 19,800 ft; 20 at 21,200 ft; 20 at 22,500 ft; 10 at 23,800 ft, and 16 at 25, 000 ft) for up to 4 h. All breathed 100% oxygen beginning with ascent. Subjects were monitored for precordial venous gas emboli (VGE) and DOS symptoms. Probit curves representing altitude versus incidence of DCS symptoms and VGE allowed estimation of respective risk. VGE were first observed at 15, 000 ft with increasing incidence at higher altitudes; over 50% at 21,200 ft and at least 70% at 22,500 ft and above. DCS symptoms were first reported at 21,200 ft with an incidence of 5%. At 22,500 ft, the DOS incidence climbed to 60%. The 5% threshold for zero-preoxygenation altitude DCS symptoms is at 21,000 ft and an abrupt increase in DCS symptom incidence with increased altitude.
DTIC
Decompression Sickness; High Altitude; Signs and Symptoms

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20040170494 Instituto Politecnico de Setubal, Setubal, Portugal
Implementation And Application Of Fuzzy Case-Based Expert System
Du, Jian-Feng; Song, Jun-De; ICEIS 2001; [2001], pp. 24; In English; See also 20040170490; Copyright; Avail: Other Sources

Simulating the thought and inference of human being is an important methodology to develop the knowledge-based intelligent system. This paper researches on the implementation techniques of fuzzy casebased expert system (FC-ES). The emphasis is put on the design and implementation of fuzzy case inference engine (FC-IE). This paper creates the structure of frame-based classified fuzzy case representation, gives the definition of one case searching principle, puts forward two kinds practical fuzzy case matching algorithm. Taking the mobile communication network optimization as one application of FC-ES, one example is presented to prove the feasibility and efficiency of FC-IE.
Author
Communication Networks; Human Behavior; Fuzzy Systems

20040170546 Instituto Politecnico de Setubal, Setubal, Portugal
Quantification Of The Emotional Quotient Of The Intelligence Using The Classic And Fuzzy Logic
deCarvalho, Lucimar F.; Rabello, Roberto; deMorais, Rosane R.; Nassar, Silvia M.; Koehler, Cristiane; ICEIS 2001; [2001], pp. 23-24; In English; See also 20040170490; Copyright; Avail: Other Sources

The objective of this paper is to integrate and compare the results of several tests of Intelligence Quotient (IQ). To Integrate through the use of a software that works the classic logic in the identification of the Emotional Intelligence (El) and compare the tests of IQ, after the identification of El through the quantification of three scales: Wechsler of Adult Intelligence Scale (Wais), Stanford Binet and Progressive Matrices using the modeling of the fuzzy logic. The software can be used to quantify the people's emotional capacity - an important factor in the development of IQ, however it should not be used for the definitive diagnosis, but for aid to the taking of decision.
Author
Quantitative Analysis; Intelligence; Quotients

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*.

20040170824 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD
Test Results of ChemiCover Dress Level B Suit to Challenge by Chemical and Biological Warfare Agents and Simulants
Lindsay, Robert S.; Procell, Suzanne A.; Harrison, Elaina H.; Pappas, Alex G.; Sep. 2004; 36 pp.; In English
Report No.(s): AD-A426949; ECBC-TR-365; No Copyright; Avail: CASI; A03, Hardcopy

Swatches from one ChemiCover Level B protective suit were challenged with-liquid droplets of sarin (OB) and mustard (HD) using modifications of the static diffusion procedure described in Test Operations Procedure (TOP) 8-2-501. The cumulative mass of each agent that permeated each swatch was determined over time, and the results for all swatches were used to determine a weighted-average cumulative mass for the suit. From these data, a physiologically derived breakthrough time was calculated for the suit for the purposes of comparison. In addition, intact suits were challenged with corn-oil aerosol to simulate a biological or chemical aerosol. Protection factors were determined for the suit.
DTIC
Biological Weapons; Chemical Warfare

20040171149 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Applying a Wearable Voice-Activated Computer to Instructional Applications in Clean Room Environments
Graves, Corey A.; Lupisella, Mark L.; [2004]; 6 pp.; In English; IASTED International Conference, 22-24 Nov. 2004, Saint Thomas, Virgin Islands (U.S.); No Copyright; Avail: CASI; A02, Hardcopy

The use of wearable computing technology in restrictive environments related to space applications offers promise in a

number of domains. The clean room environment is one such domain in which hands-free, heads-up, wearable computing is particularly attractive for education and training because of the nature of clean room work We have developed and tested a Wearable Voice-Activated Computing (WEVAC) system based on clean room applications. Results of this initial proof-of-concept work indicate that there is a strong potential for WEVAC to enhance clean room activities.
Author
Clean Rooms; Personal Computers; Voice Communication; Wireless Communication; Vests

20040171335 Fire Administration, Emmitsburg, MD, USA
Fire and Emergency Medical Services Ergonomics. A Guide for Understanding and Implementing an Ergonomics Program in Your Department
Mar. 1996; 214 pp.; In English
Report No.(s): PB2005-101009; No Copyright; Avail: CASI; A10, Hardcopy

This guide is intended to offer both small and large, career and volunteer departments, specific recommendations and examples for applying ergonomics. The guides contents include: Chapter 1 provides an introduction to ergonomics in general and how it can be considered in the fire and emergency medical services; Chapter 2 lists a number of medical disorders commonly associated with ergonomic hazards; Chapter 3 gives the basic steps for establishing a stand-alone ergonomics program or implementing it as part of an on-going department safety program; Chapter 4 provides guidance on how to identify ergonomic hazards within your department; Chapter 5 offers guidelines for preventing and controlling ergonomic hazards, addressing a number of specific areas relevant to the fire and emergency medical services; Chapter 6 discusses the role of training in an ergonomics program and provides an outline of training information; Chapter 7 describes aspects of a medical management system including both preventative measures and post-injury treatment protocols; Chapter 8 specifically deals with methods for reporting injuries and evaluating injury data; Chapter 9 gives recommendations for how to specific implement an ergonomics program in your department; Chapter 10 furnishes techniques to evaluate the effectiveness of the ergonomics program.
NTIS
Fire Fighting; Musculoskeletal System; Human Factors Engineering; Injuries

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*.

20040171208 NASA Goddard Space Flight Center, Greenbelt, MD, USA
From Surface Chlorophyll a to Phytoplankton Community Composition in Oceanic Waters
Uitz, Julia; Claustre, Herve; Morel, Andre; Hooker, Stanford B.; [2004]; 70 pp.; In English; Copyright; Avail: CASI; A04, Hardcopy

The objective of the present study is to examine the potential of using the near-surface total chlorophyll a concentration (C(sub surf)), as it can be derived from ocean color observation, to infer the column-integrated and the vertical distribution of the phytoplanktonic biomass, both in a quantitative way and in a qualitative way (z.e., in terms of community structure). Within this context, a large HPLC (High Performance Liquid Chromatography) pigment database has been analyzed. It includes 2419 vertical pigment profiles, all sampled in Case-1 waters with various trophic states. The relationshps between C(sub surf) and the total chlorophyll alpha vertical distribution, as previously derived by Morel and Berthon, are fully confirmed, as the present results coincide with the previous ones. This agreement allows to go further, namely to examine the possibility of extracting relationships between C(sub surf) and the vertical composition of the algal assemblages. Thanks to the detailed pigment composition available from HPLC measurements, the contribution of three size classes (micro-, nano-, and pico-phytoplankton) to the local total chlorophyll a concentration can be assessed. Corroborating previous findings (e.g., large species dominate in eutrophc environments, whereas tiny phytoplankton prevail in oligotrophic zones), the results lead to a statistically based parameterization. The predictive skill of this parameterization is successfully tested on a separate data set. With such a tool, the vertical total chlorophyll a profiles associated with each size class can be inferred from the sole knowledge of C(sub surf). By combining this tool with satellite ocean color data, it becomes conceivable to quantify on a

global scale the phytoplankton biomass associated with each of the three size classes.
Author
Algae; Chlorophylls; Extraterrestrial Oceans; Phytoplankton; Water Color; Oceans

20040171603 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Global Patterns in Human Consumption of Net Primary Production
Imhoff, Marc L.; Bounoua, Lahouari; Ricketts, Taylor; Loucks, Colby; Harriss, Robert; Lawrence William T.; [2004]; 10 pp.; In English; Copyright; Avail: Other Sources

The human population and its consumption profoundly affect the Earth's ecosystems. A particularly compelling measure of humanity's cumulative impact is the fraction of the planet's net primary production that we appropriate for our Net primary production-the net amount of solar energy converted to plant organic matter through photosynthesis-can be measured in units of elemental carbon and represents the primary food energy source for the world's ecosystems. Human appropriation of net primary production, apart from leaving less for other species to use, alters the composition of the atmosphere, levels of biodiversity, flows within food webs and the provision of important primary production required by humans and compare it to the total amount generated on the landscape. We then derive a spatial ba!mce sheet of net primary production supply and demand for the world. We show that human appropriation of net primary production varies spatially from almost zero to many times the local primary production. These analyses reveal the uneven footprint of human consumption and related environmental impacts, indicate the degree to which human populations depend on net primary production 'imports' and suggest policy options for slowing future growth of human appropriation of net primary production.
Author
Biological Diversity; Demand (Economics); Ecosystems; Organic Materials; Populations

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*.

20040170419 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, California Univ., Berkeley, CA
Efficient Algorithms for Multi-File Caching
Otoo, E. J.; Rotem, D.; Seshadri, S.; 2004; In English
Report No.(s): DE2004-824285; No Copyright; Avail: National Technical Information Service (NTIS)

Multi-File Caching issues arise in applications where a set of jobs are processed and each job requests one or more input files. A given job can only be started if all its input files are preloaded into a disk cache. Examples of applications where Multi-File caching may be required are scientific data mining, bit-sliced indexes, and analysis of sets of vertically partitioned files. The difference between this type of caching and traditional file caching systems is that in this environment, caching and replacement decisions are made based on 'combinations of files (file bundles),' rather than single files. In this work we propose new algorithms for Multi-File caching and analyze their performance. Extensive simulations are presented to establish the effectiveness of the Multi-File caching algorithm in terms of job response time and job queue length.
NTIS
Algorithms; Computers; Data Mining

20040170423 National Energy Research Supercomputer Center, Berkley, CA, USA
Performance Variability of Highly Parallel Architectures
Kramer, W. T. C.; Ryan, C.; 2004; In English
Report No.(s): DE2004-822834; No Copyright; Avail: National Technical Information Service (NTIS)

The design and evaluation of high performance computers has concentrated on increasing computational speed for applications. This performance is often measured on a well configured dedicated system to show the best case. In the real environment, resources are not always dedicated to a single task, and systems run tasks that may influence each other, so run times vary, sometimes to an unreasonably large extent. This paper explores the amount of variation seen across four large distributed memory systems in a systematic manner. It then analyzes the causes for the variations seen and discusses what can be done to decrease the variation without impacting performance.
NTIS
Computers; Distributed Memory; Memory (Computers); Variability

20040170431 Administration for Children and Families, Washington, DC, USA
Automated Systems for Child Support Enforcement: A Guide for Automating Case Closure
Jun. 2004; 76 pp.; In English
Report No.(s): PB2005-100912; No Copyright; Avail: CASI; A05, Hardcopy

Contents: Introduction (Level of Automation Technical Assistance, Office of the Inspector General (OIG) Report on Use of Case Closure Criteria, OCSE Technical Assistance for Case Closure Automation, Benefits of Case Closure Automation); Case Closure Automation Starter Kit (Business and System Requirements, Helpful information, Tips from OIG Reports, Generic Template for Case Closure intent notice, Excerpts from the Federal Case Registry Technical Assistance Guide, Release 3.0 , Perform Routine Monitor/Supervisory Review , Case Study - State of Virginia); Case Closure Automation Technical Assistance (Introduction, Case Closure Automation Discussion Guide).
NTIS
Automatic Control; Commerce

20040170545 Instituto Politecnico de Setubal, Setubal, Portugal
Multivariate Distribution Generation
Podvalny, Symon; Kalinin, Alexander; Chernikova, Irina; ICEIS 2001; [2001], pp. 32; In English; See also 20040170490; Copyright; Avail: Other Sources

There is wide variety of the classification methods in decision support systems. Multivariate test distributions with given correlation matrix allows to determine a quality of the classification algorithms by their exactness, speed, noise-rigidity and other appears. In order to generate such distributions we need to generate the initial random vector with independent components and given distribution law, to define covariance matrix for desired distribution and to find the matrix of linear transformation from initial vector to desired. The first problem is wide known in literature and the solutions are presented in various mathematical libraries. But the last (creation matrix of linear transformation) is more complex. In order to solve it we need to implement the Cholesky decomposition for initial correlation matrix. These theoretical calculations are verifying by experiments of comparative calculations 2D/3D distribution. For the task of generation one-dimension distributions and execution of Cholesky decomposition we use Java language and 'Colt' scientific library.
Author
Classifications; Decision Support Systems; Multivariate Statistical Analysis; Covariance

20040170548 Instituto Politecnico de Setubal, Setubal, Portugal
Relying On The Organizational Structure To Model Workflow Processes
Iochpe, Cirano; Thom, Lucineia Heloisa; ICEIS 2001; [2001], pp. 44; In English; See also 20040170490; Copyright; Avail: Other Sources

According to the business literature, one can classify a social organization relying on a set of well-known structural features. Depending on the values taken by each of these features, one can conclude whether the type of a specific organization is functional, divisional, hybrid, matrix-like, or process-oriented. The organization type has strong influence upon the way business processes are executed. The workflow technology, on the other hand, aims at supporting the automation of the organization processes. However, most of today's workflow modeling techniques does not consider those structural features in order to assist designers during the modeling process. The present paper discusses the possibility of using the knowledge of the organizational structure to support the workflow modeling process.
Author
Commerce; Functionals; Matrices (Mathematics)

20040171093 California Energy Commission, Sacramento, CA, USA
Review of Current Southern California Edison Load Management Programs and Proposal for a New Market-Driven, Mass-Market, Demand-Response Program
Weller, G. H.; Jan. 2002; 68 pp.; In English
Report No.(s): DE2004-822264; LBNL-52866; No Copyright; Avail: Department of Energy Information Bridge

Utility load management programs, including direct load control and interruptible load programs, constitute a large installed base of controllable loads that are employed by utilities as system reliability resources. In response to energy supply shortfalls expected during the summer of 2001, the California Public Utilities Commission in spring 2001 authorized new utility load management programs as well as revisions to existing programs. This report provides an independent review of the designs of these new programs for a large utility (Southern California Edison) and suggests possible improvements to

enhance the 'price responsiveness' of the customer actions influenced by these programs. The report also proposes a new program to elicit a mass-market demand response to utility price signals.
NTIS
Loads (Forces); Project Management; Utilities

20040171226 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Computation of Symmetric Discrete Cosine Transform Using Bakhvalov's Algorithm
Aburdene, Maurice F.; Strojny, Brian C.; Dorband, John E.; [2005]; 2 pp.; In English; 2005 IEEE International Conference, 19-23 Mar. 2005, Philadelphia, PA, USA; Copyright; Avail: CASI; A01, Hardcopy

A number of algorithms for recursive computation of the discrete cosine transform (DCT) have been developed recently. This paper presents a new method for computing the discrete cosine transform and its inverse using Bakhvalov's algorithm, a method developed for evaluation of a polynomial at a point. In this paper, we will focus on both the application of the algorithm to the computation of the DCT-I and its complexity. In addition, Bakhvalov s algorithm is compared with Clenshaw s algorithm for the computation of the DCT.
Author
Algorithms; Discrete Cosine Transform; Polynomials; Symmetry; Computation

20040171233 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Discussion of Using a Reconfigurable Processor to Implement the Discrete Fourier Transform
White, Michael J.; [2004]; 9 pp.; In English; 2004 National Technical Conference, 16-17 Sep. 2004, Tuskegee, AL, USA; No Copyright; Avail: CASI; A02, Hardcopy

This paper presents the design and implementation of the Discrete Fourier Transform (DFT) algorithm on a reconfigurable processor system. While highly applicable to many engineering problems, the DFT is an extremely computationally intensive algorithm. Consequently, the eventual goal of this work is to enhance the execution of a floating-point precision DFT algorithm by off loading the algorithm from the computing system. This computing system, within the context of this research, is a typical high performance desktop computer with an may of field programmable gate arrays (FPGAs). FPGAs are hardware devices that are configured by software to execute an algorithm. If it is desired to change the algorithm, the software is changed to reflect the modification, then download to the FPGA, which is then itself modified. This paper will discuss methodology for developing the DFT algorithm to be implemented on the FPGA. We will discuss the algorithm, the FPGA code effort, and the results to date.
Author
Discrete Functions; Fourier Transformation; Reconfigurable Hardware; Algorithms; Data Processing

20040171328 Swedish Defence Research Establishment, Linkoeping, Sweden
Requirements Analysis of the SitSyst-Builder. A Methodlogy Report to Support the Subsequent Development of Service Management Tools
Alfredson, J.; Lindoff, J.; Rencrantz, C.; May 2004; 56 pp.; In Swedish
Report No.(s): PB2005-100092; FOI-R-1231-SE; No Copyright; Avail: CASI; A04, Hardcopy

In order to meet future demands of situation adaptable systems a Network Based Defense tool is being developed (SitSyst-builder). The SitSyst-builder can be used to create systems that are service-based, flexible and distributed. This report scrutinizes the SitSyst-builder from a user perspective to support the subsequent development of the tool. The report focuses on a number of basic issues regarding who should use the SitSyst-builder and what it should be used for. Furthermore, why, when, where and how it should be used is touched upon. The report is based upon literary survey, meetings, seminars and interviews with potential users. The results show that the SitSyst-builder could be useful for many people in a variety of different situations. However, one should bear in mind that it is not sufficient to adapt the tool only to the situation: it must also be adapted to the user's capabilities and skills. This is illustrated by exemplifying how different people require different design and functionality of the SitSyst-builder. The tool has both strengths and weaknesses, however, in order to get an efficient and effective tool it is important to conduct a more comprehensive analysis of the issues previously mentioned.
NTIS
Computer Programs; Systems Management

20040171329 National Defence Research Establishment, Stockholm, Sweden
Tracing From IT Security Vulnerabilities to Underlying Reasons
Vidstroem, A.; Westerdahl, L.; Hunstad, A.; Hallberg, J.; Dec. 2003; 74 pp.; In Swedish
Report No.(s): PB2005-100095; FOI-R-1215-SE; No Copyright; Avail: CASI; A04, Hardcopy

This report describes a framework intended to be an aid when investigating how decisions on a management level in an organization have consequences in the form of IT security vulnerabilities. This work is done by so called tracing, which consists of investigating backwards from a discovered vulnerability to its underlying reason(s).
NTIS
Security; Data Processing

20040171342 Kentucky Univ., Lexington, KY
Developing an Intelligent Transportation System (ITS) Architecture for the KIPDA Region
Crabtree, J. D.; Walton, J. R.; Aug. 2004; In English
Report No.(s): PB2005-100976; KTC-04-23/KIPDA-02-1F; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the development of a regional Intelligent Transportation Systems (ITS) Architecture for the five-county urban area under the auspices of the Kentuckiana Regional Planning and Development Agency (KIPDA).
NTIS
Transportation; Architecture (Computers); Regional Planning

20040171572 Winzen Engineering, Inc., San Antonio, TX, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Constitutive Equation for Stratospheric Balloon Materials
Rand, J. L.; Sterling, W. J.; [2004]; 7 pp.; In English; 35th COSPAR Scientific Assembly International Committee on Space Research, 18-25 Jul. 2004, Paris, France; Copyright; Avail: CASI; A02, Hardcopy

The selection of a suitable material for use as a reliable stratospheric balloon gas barrier and structural component is based on a variety of properties. Due to a more desirable combination of properties, the low density polyethylene that has been used for the last half century has been replaced during the last decade by linear low density polyethylene (LLDPE). This paper describes the effort to characterize the time dependent properties of a 38 micron coextrusion of LLDPE. The nonlinear viscoelastic constitutive equation presented may be used to accurately describe the creep and/or relaxation of this film when subjected to a biaxial state of stress, such as might be required for an extended balloon flight. Recent laboratory data have been used to mod@ an existing model of LLDPE to account for differences caused by the coextrusion process. The new model will facilitate structural design optimization and reliability assessment, and may be further utilized as a predictive tool to benefit in-flight operations. Current structural analysis tech&ques based on linear elastic properties have predicted stresses in excess of those which would actually exist.
Author
Creep Properties; Materials Selection; Polyethylenes; Meteorological Balloons; Constitutive Equations

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20040170505 Instituto Politecnico de Setubal, Setubal, Portugal
Promoting Component-Based Software Development Through Design Reuse
Hornsby, Peter; Newman, Ian; ICEIS 2001; [2001], pp. 52; In English; See also 20040170490; Copyright; Avail: Other Sources

Although component-based development holds great promise, very little support is available to manage the complexity inherent in an effective development process based around the reuse of components. One area that is currently being explored is the use of design materials as a stimulus for reusing components within the design process. This approach uses the design materials to provide a rich source of descriptive information about the components used. As components are used in different contexts, more information about their range of uses is built up, enabling components to be reused based on the problem areas to which they may be applied, as well as the solution they are initially created to provide. This approach has been implemented in the DesignMatcher tool, which operates as a background process during development, notifying the developer of opportunities for reuse based on the changing state of the design.
Author
Computer Programming; Components

20040170567 Instituto Politecnico de Setubal, Setubal, Portugal

Machine Learning Approaches For Image Analysis: Recognition Of Hand Orders By A Mobile Robot

Sierra, Basillio; Rano, Inaki; Lazkano, Elena; Gisasola, Unai; ICEIS 2001; [2001], pp. 22; In English; See also 20040170490; Copyright; Avail: Other Sources

The work described in this paper is part of a project in which the aim is to deliver hand signals to a mobile B21 robot equipped with a color digital camera that captures these signals in order to be interpreted as robotic instructions. To carry out this objective, we first need to distinguish the hand and its position in order to achieve the semantics of the order given to the robot. To identify the hand from the background, we search for the skin colored pixels in the picture. In this paper the task is presented as a machine learning classification problem in which the goal is to determine, given a general picture, which of the pixels corresponds to the hand and which of them compose the background. Results of the classification algorithms used are converted to black and white images, where the white pixels indicate the hand and the black pixels indicate the background. We have used different Machine Learning algorithms and compared the accuracy of different approaches used by the Machine Learning community.

Author

Machine Learning; Images; Robots; Semantics; Computer Programs

20040170583 Instituto Politecnico de Setubal, Setubal, Portugal

Optimising The Grouping of E-mail Users to Servers Using Intelligent Data Analysis

Counsell, Steve; Liu, Xiao-Hui; Swift, Stephen; Tucker, Allan; McFall, Janet; ICEIS 2001; [2001], pp. 30; In English; See also 20040170490; Copyright; Avail: Other Sources

For a large commercial business employing as many as twelve thousand staff, an efficient email service is of paramount importance. This is particularly true when large volumes of data are being sent by users to other users located on different servers in the same site, or between users located on servers in different sites. Choice of how to allocate users to servers is equally important. A rule-of-thumb approach used to allocate users to servers, based on the likelihood of one user (or group of users) e-mailing other users (or groups), will rarely produce an optimal solution in terms of minimising internal network traffic. In this paper, intelligent data analysis is used to optimize the configuration of users to servers in order to minimise internal traffic flow across the network. A hill-climbing algorithm is used to identify the optimal arrangement of users to servers within one site of a large accountancy organization, based on data from the log files of all emails sent between users in the same site over a two month period. A metric is introduced by which each potential configuration provided by the hill-climbing algorithm can be measured for its fitness. Results show that for a single site with over two thousand employees, a 42% reduction in interserver traffic between users within that site was achievable over that two month period; this represented approximately 17% of all messages sent between users in that period.

Author

Electronic Mail; Information Resources Management; Client Server Systems

20040170728 Universitaet der Bundeswehr Muenchen, Neubiberg

Tests of the Use of a Standard PC for the Control of Three-Phase Pulse-Width Modulated (PWM) Converters (Untersuchungen zum Einsatz eines Standard-PC fuer die Steuerung von dreiphasigen, gepulsten Stromrichtern)

Frank, Wolfgang; Jan. 2000; 153 pp.; In German

Report No.(s): AD-A426782; No Copyright; Avail: CASI; A08, Hardcopy

This dissertation explores the use of the standard PC as an alternative to the micro controller for controlling three-phase pulse-width modulated (PWM) converters. The PC- based approach has advantages in the areas of software, hardware, organization/management, and development potential. Taking into account that the micro controller-based approach requires a host PC, the costs associated with both options are comparable. One disadvantage of the PC-based approach is that almost all system-relevant functions (for example, interrupt management) are handled outside the processor and, therefore, cannot be as effectively integrated as they can be with highly integrated micro controllers.

DTIC

Computers; Pulse Duration

20040170747 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Estimating the Effects of Radio Frequency Identification (RFID) Tagging Technologies on the Army's War- Time Logistics Network

O'Brien, Kristina M.; Jul. 2004; 114 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426811; AFIT/MLM/ENS/04-09; No Copyright; Avail: CASI; A06, Hardcopy

Some civilian business practices, such as radio frequency identification (RFID) tags, were used for the first time by the Army in a major conflict during Operation Iraqi Freedom (OIF). RFID tags were attached to every container and pallet in all sustainment shipments entering and exiting the area of operations (AOR). Although RFID tagging was somewhat successful during OIF, the logistics network still suffered significant problems, to include lack of asset visibility and ineffective theater distribution. Implementing business practices on the battlefield seems like an easy answer to these problems, but the implementation of RFID tags mayor may not easily transition to a military of combat environment. The purpose of this research was to discover if the business practice of using RFID tags to track equipment and supplies could be effectively used in a war-time environment by the Army's logistics network. Using grounded theory and content analysis methodologies, this research sought to understand the similarities and differences between how RFID tags are being used by civilian industry and the Army, and if RFID tags can apply to a war-time scenario. Data collection included interviewing industry subject matter experts regarding RFID tag use and implementation, and an extensive analysis of OIF lessons learned. Data was tabulated and compared, and similarities and differences were identified. The research then highlighted how RFID tags could improve asset visibility and theater distribution during war, and the limitations associated with transitioning RFID tags from a civilian supply chain to the Army's war-time logistics network.
DTIC
Estimating; Logistics; Logistics Management; Marking; Radio Frequencies; Warfare

20040171283 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Printed Circuit Board Design (PCB) with HDL Designer
Winkert, Thomas K.; LaFourcade, Teresa; [2004]; 10 pp.; In English; MARLUG, 5 October 2004, Laurel, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy

Contents include the following: PCB design with HDL designer, design process and schematic capture - symbols and diagrams: 1. Motivation: time savings, money savings, simplicity. 2. Approach: use single tool PCB for FPGA design, more FPGA designs than PCB designers. 3. Use HDL designer for schematic capture.
CASI
Printed Circuits; Circuit Boards; Design Analysis

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20040170449 NASA Langley Research Center, Hampton, VA, USA
NASA-Langley Research Center's Aircraft Condition Analysis and Management System Implementation
Frye, Mark W.; Bailey, Roger M.; Jessup, Artie D.; October 2004; 15 pp.; In English
Contract(s)/Grant(s): 728-30-85
Report No.(s): NASA/TM-2004-213276; L-18388; No Copyright; Avail: CASI; A03, Hardcopy

This document describes the hardware implementation design and architecture of Aeronautical Radio Incorporated (ARINC)'s Aircraft Condition Analysis and Management System (ACAMS), which was developed at NASA-Langley Research Center (LaRC) for use in its Airborne Research Integrated Experiments System (ARIES) Laboratory. This activity is part of NASA's Aviation Safety Program (AvSP), the Single Aircraft Accident Prevention (SAAP) project to develop safety-enabling technologies for aircraft and airborne systems. The fundamental intent of these technologies is to allow timely intervention or remediation to improve unsafe conditions before they become life threatening.
Author
Accident Prevention; Management Systems; Architecture (Computers); Hardware

20040170492 Instituto Politecnico de Setubal, Setubal, Portugal
Ontology-Drive Virtual Production Network Configuration: A Concept And Constraint-Object-Oriented Knowledge Management
Smirnov, Alexander V.; ICEIS 2001; [2001], pp. 23; In English; See also 20040170490; Copyright; Avail: Other Sources

Interest in global businesses and such a new form of co-operation as Virtual Production Network (VPNet) is growing along with increasing use of Internet-based engineering and management technologies, and the trend towards VPNet data & knowledge management. Ontology-drive approach for VPNet configuration is a new approach to configuration of global

production network in order to improve knowledge efficiency for decision making over total VPNet facility life-time. A kernel of this approach is a distributed multi-level constraint satisfaction technology based on a shared constraint-object-oriented knowledge domain model 'product - process - resources'. This paper discusses a generic methodology of VPNet configuration management and ontology-drive information support based on Knowledge Management Technology for distributed decision making,
Author
Knowledge Based Systems; Engineering Management

20040170493 Instituto Politecnico de Setubal, Setubal, Portugal
Model Management Facilities For Cyber DSS
Jais, Jamilin; Selamat, H.; Ghani, M. Azim A.; Mamat, A.; Rahman, Zarina A.; Hussein, H.; ICEIS 2001; [2001], pp. 24-25; In English; See also 20040170490; Copyright; Avail: Other Sources

Model management in cyber decision support systems (Cyber DSS) is a new approach to problem-solving. This is because professional judgement and insight are critical in decision-making. DSS is designed to support a manager's skill at all sta_les of decisionmaking such as problem identification, choosing relevant data to work with, picking an appropriate approach to be used in making the decision and evaluating the alternative course of action. In complex decision situations, it will often be necessary to coordinate the application of multiple decision models for solving a problem. DSS need a model management component that handles the tasks of identifying appropriate models from a problem description, sequencing their application, and in substantiating them with the necessary data.
Author
Management Systems; Decision Support Systems; Mathematical Models

20040170499 Instituto Politecnico de Setubal, Setubal, Portugal
RSHP: A Scheme To Classify Information In A Domain Analysis Environment
Llorens, Juan; Fuentes, Jose Miguel; Diaz, Irene; ICEIS 2001; [2001], pp. 41; In English; See also 20040170490; Copyright; Avail: Other Sources

This work presents the theoretic aspects of a new domain analysis technique. That technique tries to improve the fundamental aspects in domain analysis; it joins knowledge acquisition and knowledge classification in only one automatic step. Also this acquisition organization knowledge process is made automatically. This property is so important in two aspects: First, the process was semi-automatic until now, with human help in key steps. Secondly, most domain analysis methods are manual, implying huge costs. The repository used in this technique is adapted to Unified Modeling Language (UML). That characteristic allows reusing all the information used in previous coding steps in an easily way.
Author
Numerical Analysis; Information Analysis; Computer Programs

20040170500 Instituto Politecnico de Setubal, Setubal, Portugal
A Framework For Evaluating Wis Design Methodologies
Luca, Cernuzzi; Magali, Gonzalez; ICEIS 2001; [2001], pp. 42; In English; See also 20040170490; Copyright; Avail: Other Sources

Actually, a waste range of methodologies is available for Web-based Information Systems (WlS) designers. So, may be very interesting for WIS designers to analyze or evaluate the existing methodology looking for the appropriate to use in each case. This study presents a proposal of a framework for the evaluation process of WIS design methodologies. The proposal, based on previous works, takes into consideration qualitative evaluation criteria employing quantitative methods. In order to clarify the proposal, this framework is also applied to a case study and some interesting aspects are analyzed from both a qualitative and a quantitative perspective.
Author
Information Systems; World Wide Web; Systems Engineering; Design Analysis

20040170501 Instituto Politecnico de Setubal, Setubal, Portugal
The First Tax Return Assessment Expert System In Switzerland
Bettoni, Marco; Fuhrer, Georges; ICEIS 2001; [2001], pp. 25; In English; See also 20040170490; Copyright; Avail: Other Sources

In realising the first Tax Return Assessment Expert System in Switzerland we had first to make a convincing business case

for an AI innovation in a traditional governmental environment, secondly to show in the daily business environment that what can be demonstrated to be viable in theory does also work in practice, thirdly to minimize the gap between the tacit knowledge in the head of assessment experts and the explicit model of expertise that specifies the domain knowledge and finally to minimize the gap between the specified expert knowledge and the system knowledge formalized in the knowledge base. We present the project, our approach to meeting these challenges, the current state of the productive system and a sketch of the final system under development.
Author
Expert Systems; Systems Engineering; Computer Programs

20040170503 Instituto Politecnico de Setubal, Setubal, Portugal
Business Process Modeling With UML
Castela, Nuno; Tribolet, Jose; Silva, Alberto; Guerra, Arminda; ICEIS 2001; [2001], pp. 41; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper focuses the reasons and advantages of the application of the Unified Modeling Language (UML) in organizational architecture modeling. A presentation and description of the methodology to apply business modeling is made, namely, the organization of the modeling in views and the application of those views. A case study is presented, as an illustration.
Author
Mathematical Models; Computer Programs

20040170504 Instituto Politecnico de Setubal, Setubal, Portugal
Designing Intelligent Tutoring Systems: A Bayesian Approach
Gamboa, Hugo; Fred, Ana; ICEIS 2001; [2001], pp. 28; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper proposes a model and an architecture for designing intelligent tutoring system using Bayesian Networks. The design model of an intelligent tutoring system is directed towards the separation between the domain knowledge and the tutor shell. The architecture is composed by a user model, a knowledge base, an adaptation module, a pedagogical module and a presentation module. Bayesian Networks are used to assess user's state of knowledge and preferences, in order to suggest pedagogical options and recommend future steps in the tutor. The proposed architecture is implemented in the Internet, enabling its use as an e-learning tool. An example of an intelligent tutoring system is shown for illustration purposes.
Author
Computer Programs; Architecture (Computers); Intelligence; Learning

20040170511 Instituto Politecnico de Setubal, Setubal, Portugal
Using XML and Frameworks to Develop Information Systems
deOliveira, Toacy C.; Filho, Ivan Mathias; deLucena, Carlos J. P.; ICEIS 2001; [2001], pp. 35; In English; See also 20040170490; Copyright; Avail: Other Sources

To accomplish the software development time and cost constraints this development should take place in an environment that helps the designer to deal with the large amount of concepts obtained during the domain analysis phase and the semantic gap between those concepts and the object oriented design model due to their different levels of abstraction. This paper describes the main features of an environment designed to support the development of IS software based on framework reuse and XML specifications.
Author
Software Engineering; Software Development Tools; Computer Systems Programs; Document Markup Languages; Information Systems

20040170512 Instituto Politecnico de Setubal, Setubal, Portugal
Flow Composition Modeling with MOF
Litoiu, Marin; Starkey, Mike; Schmidt, Marc-Thomas; ICEIS 2001; [2001], pp. 36; In English; See also 20040170490; Copyright; Avail: Other Sources

With the current unprecedented e-business explosion, business analysts and enterprise software architects alike are faced with developing increasingly complex business processes or applications, while time to market gets shorter and shorter. Separating the application domain concerns (such as the flow of data and control) from implementation issues reduces the complexity and allows different roles to coexist in the life cycle of a software system. This paper describes a meta-model that

allows the problem domain architect to define flows of data and control at any granularity level. To allow easier interchangeability among the tools or run times, flows are based on OMG's Meta Object Facility and use XMI as an interchange format.
Author
Software Engineering; Data Management

20040170516 Instituto Politecnico de Setubal, Setubal, Portugal
A Logic Programming Approach To Negotiation For Conflict Resolution In BDI Agents System
Lee, Myung-Jin; Kim, Jin-Sang; ICEIS 2001; [2001], pp. 31-32; In English; See also 20040170490; Copyright; Avail: Other Sources

In most Multi-Agent Systems (MAS), each agent needs to be designed to negotiate with other agents and to reach a mutual acceptable state where agents can avoid any goal conflicts due to theirs interdependencies upon others such as some price conflicts in electronic commerce systems. Many problematic situations, however, may arise such that an agent can meet goal conflicts among agents and cannot possess a complete set of knowledge about others. Negotiation provides a solution to these problems even though agents' knowledge is not complete, and it is also used to allocate tasks or resources in goal inconsistency states. We present a logic programming framework for negotiation in which agents are represented on the basis of three major components: Belief, Desire, and Intention (BDI). Further, we suggest a negotiation mechanism to resolve goal conflicts accompanied with each agent's problem solving activities in cooperative MAS. We implement the proposed negotiation mechanism and test it using a simple example in InterProlog, a Java front-end and functional enhancement for Prolog, based on a variant of FIPA Agent Communication Language (ACL) specification and its interaction protocols.
Author
Logic Programming; Problem Solving; Electronic Commerce

20040170518 Instituto Politecnico de Setubal, Setubal, Portugal
An Agent-Based Architecture of Future Integrated Operational Decision Support Systems
Iordanova, Blaga N.; ICEIS 2001; [2001], pp. 31; In English; See also 20040170490; Copyright; Avail: Other Sources

Conflict-free planning for air traffic is a new Integrated Operational Decision Support (IODS) policy for airlines and air traffic control and management both in Oceanic Airspace and in Domestic Airspace. It can be accomplished by an agent-based architecture of a global network of new generation IODS Systems for air traffic management. It puts forward an advanced air space-time management supported by an agent-based monitoring of flights and planning of their conflict-resolutions off-line. It aims at securing the efficiency of airspace use and of air traffic control operations supported by an IODS for pilots and controllers through satellite communications.
Author
Architecture (Computers); Decision Support Systems; Airline Operations; Air Traffic Control; Airspace; Systems Integration; Systems Management

20040170521 Instituto Politecnico de Setubal, Setubal, Portugal
Object Models for Model Based Applications
Bruno, Giorgio; Torchiano, Marco; ICEIS 2001; [2001], pp. 4-5; In English; See also 20040170490; Copyright; Avail: Other Sources

Web based systems in general, and e-commerce applications in particular, are required to face a very high pace of change. The evolution of such systems is caused both by adaptation to the customer needs and enterprise continuous improvement strategies. Such rapid change can be: achieved adopting a model-based approach in which the application is customized according to a model. The concept of model proposed in this paper is more wide that the one adopted in most modeling languages such as UML. We propose an object model that allows an application access the model according to different perspectives and abstraction levels.
Author
Electronic Commerce; Applications Programs (Computers); Mathematical Models

20040170524 Instituto Politecnico de Setubal, Setubal, Portugal
An Approach For Totally Dynamic Forms Processing In Web-Based Applications
Helm, Daniel J.; Thompson, Bruce W.; ICEIS 2001; [2001], pp. 58; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents an approach for dynamically generating and processing user input form variants from metadata stored in a database. Many web-based applications utilize a series of similar looking input forms as a basis for capturing information from users, such as for surveys, cataloging, etc. Typical approaches for form generation utilize static HTML pages or dynamic pages generated programmatically via scripts. Our approach generates totally dynamic forms (including page controls, presentation layout, etc.) using only metadata that has been previously defined in relational tables. This significantly reduces the amount of custom software that typically needs to be developed to generate and process form variants.
Author
Metadata; Document Markup Languages; Data Bases

20040170527 Instituto Politecnico de Setubal, Setubal, Portugal
Domain Oriented Framework Construction
Filho, Ivan Mathias; CavalcantedeOliveira, Toacy; deLucena, Carlos J. P.; ICEIS 2001; [2001], pp. 36; In English; See also 20040170490; Copyright; Avail: Other Sources

Object-oriented Application Frameworks is a powerful reuse technique that allows the sharing of requirements, design and code among a set of application systems instantiated from an original framework. Nevertheless, little attention has been given to the role of an explicit Domain Analysis phase in the framework construction process. This paper describes an approach where the requirements capture for an entire application family takes a central role in the framework development, thus facilitating verification
Author
Object-Oriented Programming; Software Reuse

20040170528 Instituto Politecnico de Setubal, Setubal, Portugal
Conflict And Negotiation Among Intentional Agents
Lopes, Fernando; Mamede, Nuno; Novais, A. Q.; Coelho, Helder; ICEIS 2001; [2001], pp. 23; In English; See also 20040170490; Copyright; Avail: Other Sources

Negotiation has been extensively discussed in management science, economic, and social psychology. Recent growing interest in artificial agents and their potential application in areas such as electronic commerce has given increased importance to automated negotiation. This paper defines the social concept of conflict of interests, presents a formal prenegotiation model that acknowledges the role of conflict as a driving force for negotiation, and introduces a generic negotiation mechanism that handles multiparty, multi-issue and single or repeated rounds.
Author
Electronic Commerce; Management Methods; Computer Programs

20040170530 Instituto Politecnico de Setubal, Setubal, Portugal
A Contract-Based Theory Of Information Systems
Toffolon, Claudine; Dakhli, Salem; ICEIS 2001; [2001], pp. 38-39; In English; See also 20040170490; Copyright; Avail: Other Sources

Heavy investments in IT made by organizations have to be questioned regarding their effectiveness notably in terms of productivity growth. In that way, the term 'software crisis' has been frequently coined since the 60's to allude to a set of problems encountered in IS development activities. Since the hardware aspects of computers and networks are well mastered within almost all organizations, the problems with IT are in great part related to information systems (IS) and in particular to their computerized part called software systems. Well-known models of IS present some weaknesses related on the one hand, to the gap separating theories and frameworks of IS and their computerization process and on the other hand, to the development tools and languages which generally do not rely on theoretical foundations. In this paper, we propose a framework which analyze IS as contracts linking organizational actors involved in operational and decision-making processes. Such contracts are related to goods and services and information flows exchanged. This framework provides instruments which may be used to define a software development process which eliminate at least partly many important causes of the 'software crisis'
Author
Information Systems; Software Engineering; Software Development Tools; Computer Programming; Information Flow; Decision Making

20040170531 Instituto Politecnico de Setubal, Setubal, Portugal

A Knowledge Creation Strategy To Enrich Enterprise Information Systems With Enterprise-Specific Tacit Knowledge

Abidi, Syed Sibte Raza; Cheah, Yu-N.; ICEIS 2001; [2001], pp. 38; In English; See also 20040170490; Copyright; Avail: Other Sources

Enterprise information systems need to leverage enterprise knowledge management methodologies and tools to formally manage and capitalize on enterprise-wide knowledge resources. In this paper, we propose a novel knowledge creation strategy, together with its computational implementation, to (a) capture tacit knowledge possessed by domain experts in an enterprise; and (b) crystallize the captured tacit knowledge so that it can be added to the enterprise's existing knowledge info-structures for usage by front-end enterprise information or knowledge systems. The formulation of the strategy purports a synergy between artificial intelligence techniques for representation, reasoning and learning purposes, with existing concepts and practices in knowledge management.

Author

Enrichment; Computer Programs; Knowledge Bases (Artificial Intelligence)

20040170532 Instituto Politecnico de Setubal, Setubal, Portugal

Business Processes Extensions To UML Profile For Business Modeling

Sinogas, Pedro; Vasconcelos, Andre; Caetano, Artur; Neves, Joao; Mendes, Ricardo; Tribolet, Jose; ICEIS 2001; [2001], pp. 40-41; In English; See also 20040170490; Copyright; Avail: Other Sources

In today's highly competitive global economy, the demand for high quality products manufactured at low costs with shorter cycle times has forced various industries to consider new product design, manufacturing and management strategies. To fulfill these requirements organizations have to become process-centered so they can maximize the efficiency of their value chain. The concept of business process is a key issue in the process-centered paradigm. In order to take the most out of the reengineering efforts and from the information technology, business processes must be documented, understood and managed. One way to do that is by efficiently modeling business processes. This paper proposes an extension to Unified Modeling Language (UML) Profile for Business Modeling to include the concepts of business process.

Author

Information Systems; Computer Programs; Mathematical Models

20040170538 Instituto Politecnico de Setubal, Setubal, Portugal

A Case Tool Approach For Software Process Evolution

Ahmed-Nacer, Mohamed; ICEIS 2001; [2001], pp. 45; In English; See also 20040170490; Copyright; Avail: Other Sources

Software processes not only have a very long life, but they are incomplete and no deterministic. This explains that, all along a project, one is brought to modify the process during execution to redefine it or to complete it. This paper discusses evolution, an important feature in software processes. We present an evolution model that allows adapting software process dynamically to the new needs in order to correct inconsistencies found during execution, to modify some constraints or to act directly on the process execution. This approach is complementary to the modification of software process models that we have developed and which supports different evolution strategies.

Author

Software Development Tools; Computer Programs

20040170544 Instituto Politecnico de Setubal, Setubal, Portugal

A Corba And Web Technology Based Framework For The Analysis And Optimal Design Of Complex Systems In The Oil Industry

Arevalo, Carlos; Colmenares, Juan; Queipo, Neestor; Arape, Nelson; Villalobos, Jorge; ICEIS 2001; [2001], pp. 57; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents a new approach on the problem of the estimation and planning in the software development projects (SDP). Therefore, a qualitative simulation of a part of the dynamic system of Abdel- Hamid, (subsystem of human resources) will be carried out. We will model this subsystem like a CSP (Constrains satisfaction problem), that is, it will be modelled as a set of restrictions that should be full satisfied. Next, the associated program will be generated under the constraint-programming paradigm. This will simulate the dynamic subsystem and will give as result all its possible behaviours. This way we achieve to improve and to concrete the qualitative information that we can get to obtain of such a subsystem.

Author

Software Engineering; Computer Programming; Complex Systems; Human Resources

20040170547 Instituto Politecnico de Setubal, Setubal, Portugal

GEODA: A Geographical Object Digitising Application

Garcia-Consuegra, Jesus D.; Orozco, Luis; Cisneros, Guillermo; Martinez, Angel; Castillo, Antonio; ICEIS 2001; [2001], pp. 43; In English; See also 20040170490; Copyright; Avail: Other Sources

In recent years, software developers have focused their efforts in adapting, or designing, novel applications able to take full advantage of the wide range facilities offered by the World Wide Web. Geographical Information System (GIS) applications are not exception to this trend. By using the World-Wide Web as underlying communications infrastructure, GIS applications can gain access to the large number of facilities provided by distributed heterogeneous GIS. In this paper we describe GEODA (GEographical Object Digitising Application) a prototype system to be deployed over the Internet. The design of GEODA follows a groupware approach allowing multiple users to jointly participate in the visualisation and processing of geographical data distributed across the Internet. The structure of GEODA has been based on the Object Oriented Programming paradigm. The use of Java technology ensures portability across platforms. The paper also summarizes related concepts of CSCW and Geographic Information Science, in order to understand similar experiences and justify the design criteria adopted in GEODA.

Author

Object-Oriented Programming; Geography; World Wide Web; Internets; Information Systems; Design Analysis

20040170551 Instituto Politecnico de Setubal, Setubal, Portugal

Qualitative Reasoning For Software Development Project By Constraint Programming

Suarez, Antonio J.; Abad, Pedro J.; Gasca, Rafael M.; Ortega, J. A.; ICEIS 2001; [2001], pp. 30; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents a new approach on the problem of the estimation and planning in the software development projects (SDP). Therefore, a qualitative simulation of a part of the dynamic system of Abdel-Hamid, (subsystem of human resources) will be carried out. We will model this subsystem like a CSP (Constrains satisfaction problem), that is, it will be modelled as a set of restrictions that should be full satisfied. Next, the associated program will be generated under the constraint-programming paradigm. This will simulate the dynamic subsystem and will give as result all its possible behaviours. This way we achieve to improve and to concrete the qualitative information that we can get to obtain of such a subsystem.

Author

Computer Programming; Software Engineering; Human Resources; Behavior

20040170552 Instituto Politecnico de Setubal, Setubal, Portugal

An XML-Based Multimedia Middleware For Mobile Online Auctions

Wagner, Matthias; Balke, Wolf-Tilo; Kiessling, Werner; ICEIS 2001; [2001], pp. 56; In English; See also 20040170490; Copyright; Avail: Other Sources

Pervasive Internet services today promise to provide users with a quick and convenient access to a variety of commercial applications. However, due to unsuitable architectures and poor performance user acceptance is still low. To be a major success mobile services have to provide device-adapted content and advanced value-added Web services. Innovative enabling technologies like XML and wireless communication may for the first time provide a facility to interact with online applications anytime anywhere. We present a prototype implementing an efficient multimedia middleware approach towards ubiquitous value-added services using an auction house as a sample application. Advanced multi-feature retrieval technologies are combined with enhanced content delivery to show the impact of modern enterprise information systems on today's e-commerce applications.

Author

Applications Programs (Computers); Information Systems; Electronic Commerce; Document Markup Languages

20040170553 Instituto Politecnico de Setubal, Setubal, Portugal

A CORBA/XML-Based Architecture For Distributed Network Planning Tools

Riedl, Anton; ICEIS 2001; [2001], pp. 55-56; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents a novel architecture for network planning tools where functionality of the tools is distributed over the network and algorithms can be contributed by various providers. The concept is based on a client/server architecture with CORBA as the middleware and XML as common information exchange language. The framework breaks up the functionalities, which are commonly implemented in one tool, into several independent modules, which then can run on different machines in an IP network. This type of realization allows for easy extendibility and administration of the tool and

offers possibilities to implement features like load sharing, accounting, or authentication, Furthermore, the platform could be used to provide planning services and algorithm implementations over the Internet. We describe a first prototype, which implements the concept of this distributed architecture and discuss implementation issues. In this context a very generic and versatile Java client is introduced, which establishes the front end of the network planning platform. To allow this client to adapt to the dynamic environment and to integrate different algorithms within one graphical user interface, we specify a data exchange format, which is based on XML.
Author
Applications Programs (Computers); Architecture (Computers); Document Markup Languages; Client Server Systems

20040170555 Instituto Politecnico de Setubal, Setubal, Portugal
OC: A New Concept For Modelling And Information Integration
Petit, Claude; Dussart, Claude; ICEIS 2001; [2001], pp. 53; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper describes an object-oriented language. A new concept object, the cellular objects, is associated with the concept of class of objects. The other types of representation of the knowledge can be also associated easily. Basic object is a matrix of cells objects. It is not a spreadsheet. Each cell object is located by its Cartesian coordinates in its matrix object. The cell object is composed of a data and a method. The data of a matrix object are private data. There are not public data. Some matrices are specialized: matrix algebra, data acquisition, decision table, interface data bases,...Each developer can create its tools objects. This language has original orders of navigation inside a matrix object or between matrices. The problems of heritage are simplified. A new capacity of heritage is proposed: reflexive heritage and conditional heritage. The integration of the treatments is simplified. The modeling of complex systems multi-formalisms is intuitive. The developer sees its application in three dimensions. A variable in-depth reasoning is easy to set up. Thirty applications validated this tool.
Author
Object-Oriented Programming; Data Acquisition; Cartesian Coordinates; Matrices (Mathematics)

20040170557 Instituto Politecnico de Setubal, Setubal, Portugal
Business Process Modeling Based On The Ontology And First-Order Logic
Hikita, Toshiya; Matsumoto, Masao J.; ICEIS 2001; [2001], pp. 42-43; In English; See also 20040170490; Copyright; Avail: Other Sources

The current social, economic, and technical environments surrounding enterprises are undergoing a period of rapid change. Such changes produce permanent alterations to the information systems within enterprises. This paper proposes a framework for developing an adaptable system that anyone can change immediately when a new requirement arises from those changes. The adaptable system consists of a business process model, a requirement navigator, and a systems synthesizer. The business process model is constructed for clear and rigorous specifications of business processes in an enterprise. The model is structured by the Ontology, which is a framework to define concepts clearly, and formalized by First-Order Logic (FOL) to give rigorous syntax and semantics on the model. One of the important reasons to select FOL for expression of the model is that FOL has equivalency between probability and validity. This equivalency allowed verifying consistency of the model with theorem proving, which is a syntactic operation.
Author
Information Systems; Commerce; Synthesizers; Logic Programming

20040170559 Instituto Politecnico de Setubal, Setubal, Portugal
Managing Processes Through A Base Of Reusable Components
Coulette, Bernard; Cregut, Xavier; Thuy, Dong Thi Bich; Thu, Tran Dan; ICEIS 2001; [2001], pp. 36-37; In English; See also 20040170490; Copyright; Avail: Other Sources

RHODES is a Process centered Software Engineering Environment (PSEE) that allows to describe software development processes and to control their enactment. To make process reuse efficient in such PSEE, we think that it is necessary to go towards an engineering of reusable process components. To efficiently store and retrieve such components, we have defined a Process Component Base offering classical database functionalities, especially consistency properties. In this paper, we first describe the RHODES PSEE principle, then we define reusable process components (patterns), and we focus on the definition of component consistency, particularly the topological consistency based on relationships among constituents of a component.

The Process Component Base is implemented over the Jasmine object-oriented database.
Author
Computer Programming; Software Engineering; Programming Environments; Product Development

20040170562 Instituto Politecnico de Setubal, Setubal, Portugal
Designing Usable Software Products
Nunes, Nuno Jardim; FalcaoeCunha, Joao; ICEIS 2001; [2001], pp. 39; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper describes an UML-based lightweight software development method that provides integration between usability engineering and conventional object-oriented development. Here we briefly introduce the Wisdom method and the different techniques used to improve the usability of software products developed by small software companies (SSDs). We present two UML based architectural models to leverage the usability aspects of software products and discuss the importance of participatory techniques to improve requirements gathering, taking advantage of the increased communication and access to end-users that we observed in SSDs. Finally, we provide several Wisdom artifacts based on a real-world web-application, illustrating the different UML notational extensions to support interactive system design.
Author
Software Development Tools; Computer Programs; Software Engineering; Product Development; Object-Oriented Programming

20040170563 Instituto Politecnico de Setubal, Setubal, Portugal
WinWin Decision Support Framework: A Case Study On Students' In-course-Assessment In A Software Engineering Module
Oriogun, Peter K.; Mikusauskas, R.; ICEIS 2001; [2001], pp. 24; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper investigated how a particular group of students implemented the WinWin decision support framework in the resolution of conflicts through negotiation after the stakeholders have had the opportunity to raise issues, select options and finally arriving at a negotiated agreements satisfying all the parties involved. A statistical analysis of students' In-course-Assessment (ICA) for the module Software Engineering for Computer Science (IM283) is presented, and, the paper is proposing the studens' Negotiated Incremental Model (NIM) as a software process model for developing software in a semester framework.
Author
Statistical Analysis; Computer Programs

20040170564 Instituto Politecnico de Setubal, Setubal, Portugal
The Effects Of Different Feature Sets On The Web Page Categorization Problem Using The Iterative Cross-Training Algorithm
Soonthornphisaj, Nuanwan; Kijsirkul, Boonserm; ICEIS 2001; [2001], pp. 26; In English; See also 20040170490; Copyright; Avail: Other Sources

The paper presents the effects of different feature sets on the Web page categorization problem. These features are words appearing in the content of a Web page, words appearing on the hyperlinks, which link to the page and words appearing on every headings in the page. The experiments are conducted using a new algorithm called the Iterative Cross-Training algorithm (ICT) which was successfully applied to Thai Web page identification. The main concept of ICT is to iteratively train two sub-classifiers by using unlabeled examples in crossing manner. We compare ICT against supervised naive Bayes classifier and Co-Training classifier. The experimental results show that ICT obtains the highest performance and the heading feature is considerably succeed in helping classifiers to build the correct model used in the Web page categorization task.
Author
Words (Language); Information Retrieval; Training Simulators

20040170565 Instituto Politecnico de Setubal, Setubal, Portugal
Computer Augmented Communication In Cooperative Groups
Kotowicz, Jean-Philippe; ICEIS 2001; [2001], pp. 26; In English; See also 20040170490; Copyright; Avail: Other Sources

Companies are plunged into an unstable and internationalized environment. This environment evolves very fast technologically and the companies have to adapt themselves to it. The methods and tools of work organization can benefit from

new technologies of communication to return these more effective adaptations. We think that information and cooperation mechanisms are going to move massively from a structured information system towards a communication system without any a priori structure. A new type of software will be then necessary to disambiguate, to facilitate, to structure and to allow complex searches in the exchanges arising among the actors (human beings and software agents) of a cooperative sociotechnical system. We thus propose a system of communication mediation and of memories companies management, based on a multiagent architecture. This architecture allows a use adapted to the 'professional' activities of tool users associated to the various levels of language treatment.
Author
Interprocessor Communication; Computer Networks; Augmentation

20040170568 Instituto Politecnico de Setubal, Setubal, Portugal
Handling Mutual Exclusion in UML Class Diagrams
Araujo, Joao; Moreira, Ana; ICEIS 2001; [2001], pp. 39-40; In English; See also 20040170490; Copyright; Avail: Other Sources

UML is a standard modelling language that is able to specify a wide range of object-oriented concepts. However, there are some aspects that UML does not fully discuss. For example, UML has no mechanism to prevent the specification, for semantic reasons, of undesirable relationships. With the fast evolution of the requirements of our nowadays applications we cannot simply rely on omitting what we do not want to happen. We explicitly have to specify unwanted concepts. We are referring to the concept of mutually excluding classes. Moreover, the lack of formalization compromises the precision of the specification of the concepts. By using formal description techniques, such as Object-Z, we can reason about the requirements and identify ambiguities and inconsistencies earlier in the development process. Particularly, the formal specification can be used through the software evolution. In general, we can say that formalizing helps obtaining a more reliable system. Our aim is to specify precisely mutually excluding classes.
Author
Object-Oriented Programming; Programming Languages; Exclusion

20040170571 Instituto Politecnico de Setubal, Setubal, Portugal
Template-Based Requirements Specification: A Case Study
Dawson, Linda; ICEIS 2001; [2001], pp. 51; In English; See also 20040170490; Copyright; Avail: Other Sources

A requirements specification describes the system which will be built in a software development project independently of design or implementation detail. In this paper the process of developing a requirements specification as a stand-alone activity is illustrated by describing the requirements specification process undertaken for a government department by a small software development organization. This case used a commercial requirements-only semi object-oriented template method which involved producing a set of requirements cards on which the specification document was based. A major consideration for the consulting organization was convincing the client that completing the requirements engineering process is vital to a successful working product. The case study illustrates the process from the individual system developer/consultant's point of view based on transcripts of semi-structured interviews.
Author
Computer Programming; Specifications; Requirements

20040170572 Instituto Politecnico de Setubal, Setubal, Portugal
An Integrated Architecture For Web-Based Enterprise Document Management Systems
Zhang, Wei-Dong; Badil, Atta; ICEIS 2001; [2001], pp. 58-59; In English; See also 20040170490; Copyright; Avail: Other Sources

The critical challenge facing information technologists today is to develop integrated computer systems capable of effective and efficient management of the increasing amount of information and knowledge that is available to our Information Society. This paper explores system solutions for enterprise document management systems within distributed and heterogeneous computing environments. An integrated framework is presented, which makes use of various emerging technologies of object-orientation, internet, databases, and expert systems, to incorporate different components of document management functions, such as document retrieval and workflow automation.
Author
Architecture (Computers); Management Information Systems; Systems Integration

20040170575 Instituto Politecnico de Setubal, Setubal, Portugal

Improvements In The Decision Making In Software Projects

Roman, I. Ramos; Santos, J. Riquelme; Paez, J. Aroba; ICEIS 2001; [2001], pp. 27; In English; See also 20040170490; Copyright; Avail: Other Sources

The Simulators of Software Development Projects based on dynamic models have supposed a significant advance in front of the traditional techniques of estimate. These simulators enable to know the evolution of a project before, during and after the execution of the same one. But its use in the estimate of the project before beginning the execution, has been braked by the great number of attributes of the project that it is necessary to know previously. In this paper are presented the improvements that have been added to the simulator developed in our department to facilitate the use of them, and a new improvement obtained when using machine learning and fuzzy logic techniques with the databases generated by the simulator. In this last case, the project manager can know, in function of the decisions that he takes, the level of execution of the project objectives.

Author

Decision Making; Computer Programming; Simulators; Dynamic Models

20040170581 Instituto Politecnico de Setubal, Setubal, Portugal

Modeling Extensions For Object-Oriented Web Application Design

Giachetti, Ronald E.; Patel, Mayankkumar; Rodriguez-Medina, Maneli; ICEIS 2001; [2001], pp. 49; In English; See also 20040170490; Copyright; Avail: Other Sources

The incorporation of greater functionality into web applications requires use of technologies beyond HTML that integrate interfaces, application servers, database servers, and increasingly back-office applications. Design of these web applications has more in common with software engineering than with what has evolved as a highly graphical web site design approach. This paper describes the extension of the unified modeling language (UML) for modeling web applications during the analysis and design phases of a project. The target implementation of the design is done with a new framework called CFObjects, which combines the benefits of object orientation, Cold Fusion which a tag-based language, and the utilization of a rapid application development environment. The UML modeling extensions, web application design methodology, and application of CFObjects is illustrated through a case study of building a commercial web application. The modeling extensions provide a sorely needed tool for web application designers to communicate, design, and reuse objects to rapidly develop enterprise web applications.

Author

Computer Programming; Data Bases; Software Development Tools; Object-Oriented Programming

20040170582 Instituto Politecnico de Setubal, Setubal, Portugal

From Client's Dreams to Achievable Projects

Escribano, Juan Jose; Murciano, Raul; Gervas, Pablo; ICEIS 2001; [2001], pp. 49; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents a web based expert system application that carries out an initial assessment of the feasibility of a web project. The system allows detection of inconsistency problems before design starts, and suggests correcting actions to solve them. The developed system presents important advantages not only for determining the feasibility of a web project but also by acting as a means of communication between the client company and the web development team, making the requirements specification clearer.

Author

Expert Systems; Feasibility; World Wide Web

20040170584 Instituto Politecnico de Setubal, Setubal, Portugal

Towards Scalable Multi-Agent Systems

Deters, Ralph; ICEIS 2001; [2001], pp. 30-31; In English; See also 20040170490; Copyright; Avail: Other Sources

The multi-agent research community is currently faced with a paradox. While promoting the use of agents as the silver bullet for various software engineering problems, it faces difficulties in presenting successful deployments. Despite the countless multi-agent prototypes that have been developed, the number of actually deployed and in use MAS is at best very small. And as long as multi-agent frameworks continue to encounter difficulties in scaling up, it seems unlikely that this will change. This paper has two aims. First, it is an attempt to relate the scalability problem of multi-agent systems with that of executing large numbers of concurrent threads. Second, it evaluates a CORBA/Java middle-ware layer for transparent access

to distributed resources. Using such a layer, it is possible, to build multi-agent systems that require large numbers of concurrent threads and significant memory resources.
Author
Software Engineering; Computer Systems Design; Scaling

20040170588 Instituto Politecnico de Setubal, Setubal, Portugal
Enterprise Modelling For An Educational Information Infrastructure
Widya, Ing; Volman, Cees; Pokraev, Stanislav; DeDiana, Italo; Michiels, Eddie; ICEIS 2001; [2001], pp. 47; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper reports the modelling exercise of an educational information infrastructure that aims to support the organization of teaching and learning activities suitable for a wide range of didactic policies. The modelling trajectory focuses on capturing invariant structures of relations between entities in educational organization into Enterprise object models. An Educational Model Space has been introduced to define the problem domain context for the modelling. In this space, educational requirements have been elaborated towards the Open Distributed Processing Enterprise Viewpoint object models expressed in terms of the Unified Modelling Language. Recursive structures, which are uniform for the planning, performance and evaluation activities of education, have been used to capture the dynamic needs of education.
Author
Information Systems; Educational Resources; Computer Programming

20040170590 Instituto Politecnico de Setubal, Setubal, Portugal
Supporting Decentralized Software-Intensive Processes Using Zeta Component-Based Architecture Description Language
Alloui, Ilham; Oquendo, Flavio; ICEIS 2001; [2001], pp. 17; In English; See also 20040170490; Copyright; Avail: Other Sources

In order to provide a large variety of software products and to reduce time to market, software engineering is nowadays moving towards an architecture-based development where systems are built by composing or assembling existing components that are often developed independently. In this paper we advocate that a similar approach can be adopted to build software-intensive processes that are characterized by their complexity, heterogeneity and decentralization. Indeed considering a software-intensive process as monolithic is no longer true since parts of it may exist and run separately from the others. Therefore those parts referred to as processlets must be considered as the building blocks for larger software processes. The paper presents ZETA, an interaction-based architecture description language for building software-intensive processes starting from existing processlets. ZETA is intended to be used by process engineers in order to design the 'software glue' that connects processlets so that their interactions can be managed and/or controlled at runtime. ZETA addresses the contents of interactions through an intentional approach where interactions are guided by intentions that are revoked/maintained given some defined conditions. The underlying theory of the proposed approach is logic-based. The industrial relevance of the proposed approach, in a decentralized and heterogeneous context, is currently being demonstrated based on case studies from the automotive industry within the framework of an ESPRIT IV LTR Project.
Author
Software Engineering; Architecture (Computers); Language Programming; Computer Components

20040170591 Instituto Politecnico de Setubal, Setubal, Portugal
Data Reduction To Improve Knowledge Extraction
deFatimaRodrigues, Maria; Henriques, Pedro R.; ICEIS 2001; [2001], pp. 28; In English; See also 20040170490; Copyright; Avail: Other Sources

Knowledge Discovery in Databases (KDD) is a challenging machine learning application because it must be a very efficient process with yet high understandability and reliability requirements. First, the learning task shall find all valid and non-redundant rules (rule learning). Second, the datasets for learning are very large. When learning from very large databases, the reduction of complexity is of highest importance. We highlight the advantages of combining attribute value discretization with rough set theory to find a subset of attributes that let the KDD process discover more useful patterns. We present the evaluation of such approach by providing results from the application of a classification algorithm to various public domain datasets.
Author
Data Reduction; Data Mining; Machine Learning; Applications Programs (Computers)

20040170593 Instituto Politecnico de Setubal, Setubal, Portugal
Integrating Legacy Applications within a Java/Cobra Environment
Fatoohi, Rod; Smith, Lance; ICEIS 2001; [2001], pp. 18-19; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper examines the design and implementation process of applying a Java/CORBA solution to legacy code support environments. A support environment is defined as a collection of programs and scripts that support a monolithic application. The goal in developing an object oriented support environment is to allow monolithic legacy codes to accept inputs from and provide outputs to highly distributed applications and databases. The monolithic codes for this research are Computational Fluid Dynamics (CFD) applications. Batches of CFD jobs are currently run via a collection of C shell scripts. As production demands have grown, the scripts have become more complex. A Java/CORBA solution has been developed in order to replace the scripting system with a flexible, extensible production system. The implementation of four technologies is explored here: Java, CORBA, UML, and software design patterns. The architecture, implementation and design issues are presented. Finally, concluding remarks are provided.
Author
Computational Fluid Dynamics; Java (Programming Language); Programming Environments; Applications Programs (Computers); Architecture (Computers)

20040170594 Instituto Politecnico de Setubal, Setubal, Portugal
Optimizing User Preferences While Scheduling Meetings
Wong, Rebecca Y. M.; Chun, Hon Wai; ICEIS 2001; [2001], pp. 28-29; In English; See also 20040170490; Copyright; Avail: Other Sources

Meeting scheduling is a routine office task, which is highly time-consuming and tedious. During the scheduling process, we need to consider timing and the participant preferences (such as preference on meeting time, date or day of the week). Being able to model and make use of individual user preferences during scheduling is probably one of the key decisive factors in the acceptance of these automated systems. This paper describes the user preference model we have created and the results of simulating our meeting scheduling algorithms in a set of experiments. Based on software agent architecture, the meeting scheduling is performed through negotiation among a set of software agents. From our experiments, we found that higher quality schedules were generated when knowledge of user preferences are passed to a coordinator and used during the negotiation. The results had higher average preference levels, less deviation from expected schedule and a more even distribution of these deviations among participants.
Author
Scheduling; Conferences; Computer Programs

20040170595 Instituto Politecnico de Setubal, Setubal, Portugal
Developing The Infrastructure For Knowledge Based Enterprises
Hawryszkiewycz, Igor T.; ICEIS 2001; [2001], pp. 27-28; In English; See also 20040170490; Copyright; Avail: Other Sources

Knowledge management is now emerging as an important area of interest in most business systems. It is particularly important in distributed organizations where knowledge must be shared across distance. Knowledge management goes beyond simply keeping explicit documents and providing data mining and search facilities. It must also provide the infrastructure where people can readily collaborate and combine explicit knowledge with their tacit knowledge to create new knowledge or to carry out their work more effectively. Furthermore such collaboration must be an intrinsic part of any business process rather than a process on its own. This paper defines the general environment of knowledge management within distributed business processes and the kinds of computer systems to support it. It then describes a way of analyzing knowledge needs followed by an implementation.
Author
Knowledge Based Systems; Data Mining; Computer Programs; Management Systems

20040170596 Instituto Politecnico de Setubal, Setubal, Portugal
CEM: Collaborative Enterprises Modeling
Ilzuka, Kayo; Matsumoto, M. J.; ICEIS 2001; [2001], pp. 38; In English; See also 20040170490; Copyright; Avail: Other Sources

Collaborative enterprises modeling (CEM) is defined as enterprise modeling for multiple and collaborative enterprises. In this paper, we propose a framework for collaborative business process modeling. The model emphasis the supply chain

relationship connection among firms. This framework will suggest analyzing an effective method of information exchange between enterprises in a supply chain, because this method must be different for inter enterprise relationships under the given conditions. To develop the model, we will discuss already conducted survey studies about enterprise relationships in Japan. The trends shown in the main findings of the survey are that trust and accountability affect the quality and precision of the information. That means that those factors will affect supply chain performance. CEM with supply chain relationship connection will result in the ability to build effective supply chain business processes and information systems in the real world.
Author
Commerce; Computer Programs; Mathematical Models

20040170597 Instituto Politecnico de Setubal, Setubal, Portugal
Coordinates: A Language For Enterprise Modeling
Mannarino, G.; Leone, H.; Henning, G.; ICEIS 2001; [2001], pp. 37-38; In English; See also 20040170490; Copyright; Avail: Other Sources

Information requirements identification and specification are among the most important phases of the software development process. Both, the context in which the information system will be implemented and the impact it will have on the domain have to be evaluated, if the right system is to be constructed. Models are common tools for abstracting a domain. In particular, the complexity of production organizations turns enterprise models a prerequisite for deriving the organization information requirements. This paper presents a language for enterprise modeling. The language integrates the Task, Domain and Dynamic views of an organization. The Task view abstracts business and production processes in terms of a set of tasks that transform different resources in order to achieve their goals. The Domain view describes the static relationships among the organization entities and the Dynamic view puts emphasis on the interaction and evolution of resources when they participate in different tasks, assuming specific roles.
Author
Computer Programming; User Requirements; Information Systems; Mathematical Models; Industrial Management

20040170598 Instituto Politecnico de Setubal, Setubal, Portugal
An Insight Into the Australian the ERP Market
Hawking, Paul; Stein, Andrew; ICEIS 2001; [2001], pp. 4; In English; See also 20040170490; Copyright; Avail: Other Sources

The global ERP industry blossomed in the 1990's automating back office operations. Research up to date has been limited especially in the relation to market penetration of these products around the: world. This paper presents an analysis of the Australasian ERP market place. It looks at the market movement and demographics of companies that have implemented SAP software, the dominant ERP vendor within the Australasian marketplace. The 387 SAP customers are classified by industry sector, size, and software implemented to establish metrics for ERP implementation pertaining to the region.
Author
Australia; Automation; Market Research

20040170600 Instituto Politecnico de Setubal, Setubal, Portugal
An Architecture for Incorporating Business Rules in an Object-Oriented System
Mohan, Permanand; Yussuff, Sheik; ICEIS 2001; [2001], pp. 15; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper discusses the design of an object-oriented system with business rules where the rules are treated as objects in their own right. The paper argues that an architecture-centric approach is essential in developing any software system and puts forward a multi-tiered architecture for incorporating business rules in an object-oriented environment. In the architecture, rule objects are completely separate from the domain objects, promoting rule maintenance. No assumption is made about other layers such as the persistence layer, allowing domain objects to be stored in any manner such as in an object database, a relational database, a flat file, or some other format. The architecture also lends itself to object distribution of both domain and rule objects using standards such as the Common Object Request Broker Architecture.
Author
Object-Oriented Programming; Architecture (Computers); Software Engineering

20040170602 Instituto Politecnico de Setubal, Setubal, Portugal

IODBCON: A Integrated Object-Oriented Database System for Integrating Information About Architecture Design and Construction Processes

Marir, Farhi; Yip, Yau Jim; ICEIS 2001; [2001], pp. 7-8; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents IODBCON (Integrated Object Database for Construction), an interactive system for integrating CAD and construction related applications to address the problems of design fragmentation and the gap that exists between construction and design processes. It provides a vehicle for storing architectural design information in an integrated construction object-oriented database that can be shared by a range of computer applications. The IODBCON model is characterised by several new features. It uses the object-oriented modelling approach to establish standard models for architectural design l:hat comply with Industry Foundation Classes (IFC) for common interpretation of construction design objects and with CORBA (Common Object Request Broker Architecture) for distribution of the objects amongst the construction applications. It aims to achieve independence from the display environment by providing a set of Abstract Factory and Abstract Design Classes, which provide abstractions that the design model classes can use to draw and render themselves in any display environments. More importantly, graphical and textual information about the building design components is directly saved as instances in an object-oriented database without passing through the existing CAD databases. 1‘o demonstrate the independence from the display environment, two applications using IODBCON models are implemented. The first is an interactive AutoCAD application, which creates instances of the IODBCON design model and stores them directly in the distributed object database. The second A web-based application using VRML (Virtual Reality Modelling Language) for remotely interrogating information stored within the integrated database, visualising and manipulating the design components in 3D environment. Also, to demonstrate the feasibility and practicability of the OSCON (Open Systerns for Construction) object-oriented product model, three OSCON construction applications that access and share the IODBCON building design instances are presented.

Author

Computer Aided Design; Object-Oriented Programming; Data Bases; Systems Integration; Computer Techniques

20040170604 Instituto Politecnico de Setubal, Setubal, Portugal

MIDEA: A Multidimensional Data Warehouse Methodology

Cavero, Jose Maria; Piattii, Mario; Marcos, Esperanza; ICEIS 2001; [2001], pp. 13; In English; See also 20040170490; Copyright; Avail: Other Sources

Developing a Data Warehouse has become a critical factor for many companies. Specific issues, such as conceptual modeling, schemes translation from operational systems, physical design, etc.., have been widely treated. Unfortunately, there is not a general accepted complete methodology for data warehouse design. In this work we present MIDEA, a multidimensional data warehouse development methodology based on a multidimensional data model. The methodology is integrated within a general software development methodology.

Author

Computer Programming; Software Engineering; Systems Engineering

20040170609 Instituto Politecnico de Setubal, Setubal, Portugal

Agent-Based Application Engineering

Girardi, Rosario; ICEIS 2001; [2001], pp. 20; In English; See also 20040170490; Copyright; Avail: Other Sources

Main difficulties in the practice of reuse techniques are due to the lack of reusable software abstractions for the development of specific applications in various and rapidly changing domains. Therefore, current research has been centered on problems related to building reusable software artifacts in a high level of abstraction - like language and domain languages, reusable software architectures and software patterns. Application Engineering is the main discipline addressing solutions to these problems. This work proposes a model for developing reusable software using the agent paradigm. Reusable software abstractions generated through Agent-based Application Engineering are analyzed considering both their abstraction level and domain dependence.

Author

Computer Programs; Software Engineering; Computer Programming; Applications Programs (Computers)

20040170610 Instituto Politecnico de Setubal, Setubal, Portugal

Moving code (Servlet Strategy) vs. Inviting Code (Applet Strategy)

Maamar, Zakaria; ICEIS 2001; [2001], pp. 19-20; In English; See also 20040170490; Copyright; Avail: Other Sources

In this position paper, we aim at describing two strategies that could enhance the functioning of software agents. Servlet and applet denote respectively these strategies. In the servlet strategy, the flow takes place from the client to the server. The applet strategy performs differently; the flow takes place from the server to the client. Applying both strategies to workflows, as a potential application domain, is also discussed.
Author
Computer Programs; Software Engineering; Domains

20040170612 Instituto Politecnico de Setubal, Setubal, Portugal
Exploiting Temporal GIS And Spatio-Temporal Data To Enhance Telecom Network Planning And Development
Stojanovic, Dragan; Djordjevic-Kajan, Siobodanka; Stojanovic, Zoran; ICEIS 2001; [2001], pp. 10; In English; See also 20040170490; Copyright; Avail: Other Sources

In this paper, modeling and management of spatio-temporal-thematic data within an object-oriented GIS application framework, are presented. The object-oriented modeling concepts have been applied in integration of spatial, thematic and temporal geographic information in spatio-temporal object model. Based on model implementation and development of appropriate components for temporal GIS application functionality, a temporal GIS application framework has been developed. Description of its architecture and functional components dedicated to management of temporal aspect of geographic information is given. Planning and development of telecommunication networks using temporal GIS application, developed around application framework are presented. Great performance and qualitative improvements and benefits enabled by such GIS developments are described.
Author
Computer Networks; Object-Oriented Programming; Telecommunication; Geographic Information Systems; Spatial Distribution; Temporal Distribution

20040170616 Instituto Politecnico de Setubal, Setubal, Portugal
Spino: A Distributed Architecture For Massive Text Storage
Guimaraes, Jose; Trezentos, Paulo; ICEIS 2001; [2001], pp. 15-16; In English; See also 20040170490; Copyright; Avail: Other Sources

In this paper we introduce a framework for text data storage and retrieval. As an alternative for proprietary solutions is used a distributed architecture based on a Linux Beowulf Cluster and open source tools. In order to validate the proposed solution an prototype (Spino-Servico de Pesquisa INteligente ou Orientada) had been builded. The prototype is oriented for retrieving USENET articles through a Web interface, Most of the points described can be applied for scenarios not related with Internet. The framework proposed is within Databases and Information Systems Integration area and describes simultaneously the conceptual and practical aspects of its implementation. Suggested solution is presented in three different perspectives: web serving, off-line processing and database querying.
Author
Computer Networks; Data Storage; Architecture (Computers); Texts

20040170621 Instituto Politecnico de Setubal, Setubal, Portugal
A Decision Support System Model For Subjective Decisions
Malhotra, Vishv; ICEIS 2001; [2001], pp. 2-3; In English; See also 20040170490; Copyright; Avail: Other Sources

Modern government and business units routinely collect and store structured data of general interest to them. In the course of their operations, these organisations often need to take decisions that do not directly follow from the available data. Specialized managerial skills are needed to interpret the data and derive useful conclusions. Subjective assumptions and judgments are made by the managers to interpret the data. Where the data volume is large, it may be difficult to sift the data, as the managerial skills may not be available for the repeated evaluation of every entity in the database. A decision support system is needed that can be easily reprogrammed to cater for the subjective judgments and biases of the decision-makers. In this paper, we develop a model for a decision support system to identify promising entities based on the subjective preferences. The model can easily be integrated with a relational database system/tool such as Microsoft Access to examine entities in the database and to highlight those that have superior potential based on the decision-makers subjective judgments.
Author
Mathematical Models; Decision Support Systems; Relational Data Bases

20040170627 Instituto Politecnico de Setubal, Setubal, Portugal

Architecture for Reengineering Legacy Databases

Sivalanka, Prasad N.; Subrahmanya, S. V.; Agarwal, Rakesh; ICEIS 2001; [2001], pp. 5; In English; See also 20040170490; Copyright; Avail: Other Sources

There exist different methods to facilitate database design recovery under the framework of software engineering and reengineering. These tools and methods are usually limited to a particular scenario and requirement, and thus, not generic. In most cases, new tools and methods need to be redeveloped to suit these scenarios. This can result in a significant waste of effort and increased costs. In this paper we describe a generic architecture for reengineering legacy databases, which is an outcome of working on a real software project for one of our customers 1. The goal of this research is to formalize a process that is applicable to different database reengineering scenarios and requirements. We elaborate the steps that were actually done for implementing the project.

Author

Data Bases; Architecture (Computers); Software Engineering

20040170632 Instituto Politecnico de Setubal, Setubal, Portugal

An Object-Oriented Framework for the Development of Distributed Industrial Process Measurement and Control Systems

Thramboulidis, Kleanthis; Tranoris, Chris; Koulamas, Chris; ICEIS 2001; [2001], pp. 35-36; In English; See also 20040170490; Copyright; Avail: Other Sources

Software industry increasingly faces today the challenge of creating complex custommade Industrial Process Measurement and Control System (IPMCS) applications within time and budget, while high competition forces prices down. A lot of proprietary solutions address the engineering process, and evolving standards exploit the function block construct as the main building block for the development of IPMCSs. However existing approaches are procedural-like and they do not exploit the maximum benefits introduced by the object technology. In the context of this paper, new technologies in Software Engineering that assist in improving the efficiency of software development process are considered. An Object-oriented framework is defined, to improve the engineering process of IPMCSs in terms of reliability, development time and degree of automation, This framework embodies an abstract design capable to provide solutions for the family of distributed IPMCSs. It will attempt to increase reusability in both architecture and functionality by addressing issues such as interoperability and integrated development of distributed IPMCSs.

Author

Object-Oriented Programming; Software Engineering

20040170634 Instituto Politecnico de Setubal, Setubal, Portugal

From System to Text

Clarke, Rodney J.; ICEIS 2001; [2001], pp. 46; In English; See also 20040170490; Copyright; Avail: Other Sources

Using a semiotic model of language called Systemic Functional Linguistics, this paper identifies and describes the function, structure and features of two text patterns or genres, the Taxonomic Report and the Instructional Procedure, that are commonly employed in computer application and tool documentation. A familiarity with these and other relevant genres constitutes a significant aspect of computer literacy for documentation users and producers. These specific genres can be used in isolation to organize the overall structure of small texts, or they can be used in combination to form a composite structure called a macrogenre. The structure of the so-called Computer Training or CT macrogenre is identified, described and exemplified. Genre theory suggests that readers who are familiar with particular kinds of texts expect the specific staging of the appropriate genre or set of genres. Conforming to an appropriate genre or combinations of genres increases the likelihood of the computer documentation being judged as useful by the community for which it is written. The identification of specific genres can be useful for writers as well who would then have templates that could assist then in the process of creating useful documentation.

Author

Computer Programming; Linguistics; Applications Programs (Computers); Texts

20040170637 Instituto Politecnico de Setubal, Setubal, Portugal

MySDI: A Generic Architecture to Develop SDI Personalized Services

Ferreira, Joao; Silva, Alberto; ICEIS 2001; [2001], pp. 6-7; In English; See also 20040170490; Copyright; Avail: Other Sources

We introduce in this paper a generic architecture to deal with the general problem: 'How to Deliver the Right Information to the Right User?'. We discuss this issue through the proposal of our SDI (,Selective Dissemination of Information) Personalised Architecture, called MySDI, which is based on the software agent paradigm as well as on information retrieval techniques. In order to clarify and validate this proposal we also introduce in this paper a prototype service, called MyGlobalNews, which should be a public service to provide personalised news.
Author
Architecture (Computers); Information Retrieval; Selective Dissemination of Information

20040170639 Instituto Politecnico de Setubal, Setubal, Portugal
Presentation Of An Information Systems Architecture Model For Public Sector
Tait, Tania Fatima Calvi; Pacheco, Roberto C. S.; ICEIS 2001; [2001], pp. 10-11; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents an information systems architecture (ISA) model that comprises the integration of information systems, technology, business processes and users in public sector environment. The ISA model presented considers specific aspects of the public sector as well characteristics of information systems development and use in this sector found in the literature and in the studies realized in informatic services Brazilian State public enterprises. The model proposed is based in the business, information technology (IT) and information systems integration and it was structured with five components: (a) Government structure (mission and organizational culture, Planning and government platform); (b) Public services (considered the' business' of public structure, with the information for citizens, for top level and government administrative technical); (c) Information systems (by including the legacy systems and executives systems information); (d) Information technology (centered in investment policies and the government computational platforms - as micro-computer and mainframe relationship) and (e) Users (centered in the necessities for public - training, adaptation and use of the SI). The model proposed was submitted to validation from informatic services Brazilian State public enterprises. The results point out the relevance of the integrated vision of their components and they permit to establish strategies for implantation of ISA model, in order to observing public sector specificity.
Author
Information Systems; Architecture (Computers); Computer Programs; Systems Integration

20040170661 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Visual Debugging of Object-Oriented Systems With the Unified Modeling Language
Fox, Wendell E.; Mar. 2004; 142 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426572; AFIT/GCS/ENG/04-07; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) is developing a Joint Battlespace Infosphere, linking a large number of data sources and user applications. Debugging and analysis tools are required to aid in this process. Debugging of large object- oriented systems is a difficult cognitive process that requires understanding of both the overall and detailed behavior of the application. In addition, many such applications linked through a distributed system add to this complexity. Standard debuggers do not utilize visualization techniques, focusing mainly on information extracted directly from the source code. To overcome this deficiency, this research designs and implements a methodology that enables developers to analyze, troubleshoot and evaluate object- oriented systems using visualization techniques. It uses the standard UML class diagram coupled with visualization features such as focus+context, animation, graph layout, color encoding and filtering techniques to organize and present information in a manner that facilitates greater program and system comprehension. Multiple levels of abstraction, from low-level details such as source code and variable information to high- level structural detail in the form of a UML class diagram are accessible along with views of the program s control flow. The methods applied provide a considerable improvement (up to 1110%) in the number of classes that can be displayed in a set display area while still preserving user context and the semantics of UML, thus maintaining system understanding. Usability tests validated the application in terms of three criteria software visualization, debugging, and general system usability.
DTIC
Computer Programming; Object-Oriented Programming; Program Verification (Computers); Software Engineering

20040170668 Army Research Lab., Aberdeen Proving Ground, MD
A VRML Door Prototype
Neiderer, Andrew M.; Aug. 2004; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426583; ARL-TR-3277; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this research was to develop software that would contribute to military operations on urban terrain (MOUT) simulation. In particular, a virtual reality modeling language (VRML) 2.0 prototype for defining a door was completed. This VRML 2.0 node was also translated to the extensible 3D (X3D) language. An effort is now underway for describing apertures in general.
DTIC
Doors; Programming Languages; Prototypes; Virtual Reality

20040170697 Army Research Lab., Adelphi, MD
Parametric Study of Heating in Ferrite Core Using Solid Works Simulation Tools
Ovrebo, Gregory K.; Sep. 2004; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426694; ARL-MR-595; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report shows a comparison of simulation of steady-state heating in a ferrite core using two different analysis tools, a wide range of different heating and convection parameters. The tools, CosmosWorks and FloWorks, are associated with the SolidWorks solid modeling software. It is shown that FlowWorks is the better tool for heat-transfer problems with convection.
DTIC
Computer Programs; Computerized Simulation; Ferrites; Heating; Simulation

20040170707 National Defense Univ., Washington, DC
JLASS: Educating Future Leaders in Strategic and Operational Art
Hyde, James C.; Everett, Michael W.; Jan. 1996; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426731; No Copyright; Avail: CASI; A02, Hardcopy
The joint land, aerospace, and sea simulation (JLASS) is the preeminent joint educational exercise structured to support wargaming at the senior colleges. It generally concludes advanced studies electives on strategic and operational art. The exercise is unique in that both red and blue teams win. This can only be accomplished through cooperation among faculty and staff members. JLASS is also the only exercise that explores service capabilities in a learning environment, which not only allows but actually encourages risk-taking. Students thus think in a nonthreatening situation, learn to ask the right questions, explore military options in support of political objectives, and experiment by employing innovative teaching tools at a pivotal time in their careers. Warriors who fought in the Persian Gulf, regardless of component, attributed much of their success to training at Red Flag, Blue Flag, Twentynine Palms, and the National Training Center. But such training is costly because it requires deployment of a large number of personnel as well as considerable material over great distances. It also consumes sustainment and maintenance stocks. Congress is heeding the popular call to focus on domestic issues and balance the budget. Cuts have been made across the board, leaving much of the government to provide the same output with reduced resources. This has required the services to make hard decisions on weapon systems and readiness that are felt by unified commands: CINCs must train with fewer resources each day. It therefore becomes more vital for senior colleges to find ways to educate officers in strategic and operational art and science. Part of this need can be met through wargaming. (3 figures)
DTIC
Computerized Simulation; Education; Military Operations; Strategy; War Games

20040170730 Army Tank-Automotive and Armaments Command, Warren, MI
Graphic File Conversion: DADS 'g.mod' to '.geo' Format
Bylsma, Wesley; Apr. 2003; 15 pp.; In English
Report No.(s): AD-A426784; TR-13863; No Copyright; Avail: Defense Technical Information Center (DTIC)
The following report documents the details of converting the Dynamic Analysis and Design System (DADS) 'g. mod' graphics file format to the '.geo' graphics file format. The file format of each type is discussed and the process described. A C program is included that automates the conversion process.
DTIC
Computer Graphics; Computer Storage Devices; Graphs (Charts)

20040170739 Army Research Inst. of Environmental Medicine, Natick, MA
Pool Data Acquisition System Documentation
Robinson, Scott B.; Blanchard, Laurie A.; Soares, Robert; Aug. 2004; 35 pp.; In English
Report No.(s): AD-A426794; USARIEM-TN04-06; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report describes a data acquisition system developed to obtain body temperature measurements for human volunteers

during cold exposure. Since acceptable commercial systems are not available, this system was custom-built to acquire data using National Instruments hardware components and LabVIEW 6.0 Development Software. The system works by integrating signals collected by hardware devices, and the software processes/manipulates by using Virtual Instruments (VI's). This report provides detailed documentation for the construction and operation of the data acquisition system. This report is intended to allow a technician to duplicate or modify this system, given general background knowledge in National Instrument's LabVIEW graphical programming language.
DTIC
Data Acquisition; Data Processing Equipment

20040170795 Grammatech, Inc., Ithaca, NY
Programmable Interfaces for Advanced Static Analysis
Teitelbaum, Tim; Jun. 10, 2004; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-C-0188
Report No.(s): AD-A426890; No Copyright; Avail: CASI; A02, Hardcopy

Tools that analyze software are exorbitant to develop, yet different analysis applications have quite similar infrastructure requirements. An effective cost- reduction approach is to amortize the development costs of a common infrastructure across multiple subject programming languages, computer platforms, and analysis applications. This is the final report of a one-year project aimed at creating such a common program-analysis infrastructure.
DTIC
Application Programming Interface; Programming Languages

20040170816 Dayton Univ. Research Inst., OH
Core Automated Maintenance System (CAMS) at the Flightline: Nellis AFB structured Study Test Report
Gorman, Megan; Anders, Shilo; Donahoo, Carlton; Quill, Laurie; Jernigan, Johnnie; Jul. 2003; 43 pp.; In English
Contract(s)/Grant(s): F33615-99-D-6001; Proj-1710
Report No.(s): AD-A426939; AFRL-HE-WP-TR-2004-0105; No Copyright; Avail: CASI; A03, Hardcopy

One data collection system the US Air Force uses to capture all aircraft maintenance actions is the Core Automated Maintenance System (CAMS). Infrastructure and hardware are in place at Nellis AFB for CAMS to be used via a mobile device on the flightline. The mobile system at Nellis AFE is referred to as the Nellis AFE CAMS at the Flightline system. This document describes a usability test conducted by the Air Force Research Laboratory and the University of Dayton Research Institute at Nellis AFB: The test assessed the Nellis AFB CAMS at the Flightline system accessing CAMS via two different modes. These modes of maintenance documentation were: 1) a portable laptop accessing CAMS via wireless frequency and 2) the desktop device accessing CAMS via wired network. The conditions tested included: 1) opening work orders, 2) listing open work orders, and 3) closing work orders in both the stationary CAMS condition and in the mobile CAMS condition. This study focused on the differences and similarities between the stationary CAMS and mobile CAMS access methods, as well as the usability of each. Significant time savings are realized by use of the mobile system when required travel time is included as part of the overall task; however, when time required for the additional logon required in the mobile condition is included in the analysis, no significant time savings are observed for the mobile system as compared to the stationary method. The additional sign-on time is identified as the key factor precluding significant time savings when using the mobile system.
DTIC
Cams; Computer Programs; Graphical User Interface; Maintenance

20040170817 Centre National de la Recherche Scientifique, Toulouse
Effects of Imperfections and Residual Inter-Qubit Interaction on Quantum Computing
Shepelyansky, D. L.; Georgeot, B.; Sep. 15, 2004; 6 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0553
Report No.(s): AD-A426940; ARO-42377.25-PH-QC; No Copyright; Avail: CASI; A02, Hardcopy

We study the effects of static interqubit interactions on the accuracy of various quantum algorithms. Extensive numerical simulations show that their effect is stronger compared to external decoherence. Analytical approach based on Random Matrix Theory is developed. It gives universal law for fidelity decay induced by interqubit static interactions. This determines the time scale for reliable quantum computation in presence of realistic static imperfections and external decoherence. New polynomial algorithms are developed for simulation of complex dynamics in the regime of classical and quantum chaos, and Anderson metal- insulator transition. A generic quantum error correction method is developed; it allows to eliminate coherent effect of

static errors. The theoretical results are confirmed by numerical computations with up to 28 qubits.
DTIC
Defects; Matrix Theory; Numerical Analysis; Quantum Computation; Quantum Theory

20040170833 Naval Air Warfare Center, China Lake, CA
Data Visualization: Conversion of Data to Animation Files
Kimbler, Nate; Aug. 2004; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426972; NAWCWD-TP-8577; No Copyright; Avail: CASI; A03, Hardcopy

Details of data visualization tools are explored that were developed for the purpose of viewing time dependent data. Because visualization tools are vital to understanding complex physical phenomena, these visualization tools attempt to facilitate converting data into animations that can be saved and used in data analysis and presentation. A User's Guide for the tools is included. The software implementation and purpose are described as well as to how to obtain the software.
DTIC
Computer Programs; Data Conversion Routines; Data Processing; Visual Aids

20040171251 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Precision Formation Flying Integrated Analysis Tool (PFFIAT)
Stoneking, Eric; Lyon, Richard G.; Sears, Edie; Lu, Victor; [2004]; 12 pp.; In English; 2nd International Symposium on Formation Flying Missions and Technologies, 14-16 Sep. 2004, Washington, DC, USA; Copyright; Avail: CASI; A03, Hardcopy

Several space missions presently in the concept phase (e.g. Stellar Imager, Sub- millimeter Probe of Evolutionary Cosmic Structure, Terrestrial Planet Finder) plan to use multiple spacecraft flying in precise formation to synthesize unprecedently large aperture optical systems. These architectures present challenges to the attitude and position determination and control system; optical performance is directly coupled to spacecraft pointing with typical control requirements being on the scale of milliarcseconds and nanometers. To investigate control strategies, rejection of environmental disturbances, and sensor and actuator requirements, a capability is needed to model both the dynamical and optical behavior of such a distributed telescope system. This paper describes work ongoing at NASA Goddard Space Flight Center toward the integration of a set of optical analysis tools (Optical System Characterization and Analysis Research software, or OSCAR) with the Formation J?lying Test Bed (FFTB). The resulting system is called the Precision Formation Flying Integrated Analysis Tool (PFFIAT), and it provides the capability to simulate closed-loop control of optical systems composed of elements mounted on multiple spacecraft. The attitude and translation spacecraft dynamics are simulated in the FFTB, including effects of the space environment (e.g. solar radiation pressure, differential orbital motion). The resulting optical configuration is then processed by OSCAR to determine an optical image. From this image, wavefront sensing (e.g. phase retrieval) techniques are being developed to derive attitude and position errors. These error signals will be fed back to the spacecraft control systems, completing the control loop. A simple case study is presented to demonstrate the present capabilities of the tool.
Author
Computer Programs; Apertures; Attitude Control; Feedback Control; Solar Radiation

20040171315 Defence Science and Technology Organisation, Edinburgh, Australia
Lessons for the Construction of Military Simulators: A Comparison of Artificial Intelligence with Human-Controlled Actors
Sandercock, Jennifer; September 2004; 39 pp.; In English
Report No.(s): DSTO-TR-1614; DODA-AR-013-185; Copyright; Avail: Other Sources

Computer Generated Forces (CGF) are a significant component of military modelling and simulation. The creation of artificial agents with human-like decision-making is difficult. By using a Turing Test in a virtual environment that relates to military scenarios, areas in which CGF need to improve in order to help direct future studies are probed. The main areas determined for improvement are: environment awareness, human variance, persistence, vengeance, anticipation, learning and teaming. The CGF show consistent weakness in these areas across all virtual environments and should be considered in future studies. They present a technical challenge in adoption of CGF as surrogate players in computer supported simulation activity for training, mission rehersal, operations research and military experimentation.
Author
Artificial Intelligence; Computerized Simulation; Simulation; Human-Computer Interface

20040171399 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Properties of a Formal Method for Prediction of Emergent Behaviors in Swarm-based Systems

Rouff, Christopher; Vanderbilt, Amy; Hinchey, Mike; Truszkowski, Walt; Rash, James; [2004]; 10 pp.; In English; 2nd IEEE International Conference Software Engineering ad Formal Methods (IEEE SEFM 2004), 26-30 Sep. 2004, Beijing, China; No Copyright; Avail: CASI; A02, Hardcopy

Autonomous intelligent swarms of satellites are being proposed for NASA missions that have complex behaviors and interactions. The emergent properties of swarms make these missions powerful, but at the same time more difficult to design and assure that proper behaviors will emerge. This paper gives the results of research into formal methods techniques for verification and validation of NASA swarm-based missions. Multiple formal methods were evaluated to determine their effectiveness in modeling and assuring the behavior of swarms of spacecraft. The NASA ANTS mission was used as an example of swarm intelligence for which to apply the formal methods. This paper will give the evaluation of these formal methods and give partial specifications of the ANTS mission using four selected methods. We then give an evaluation of the methods and the needed properties of a formal method for effective specification and prediction of emergent behavior in swarm-based systems.

Author

Autonomy; Program Verification (Computers); Intelligence

20040171434 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Results of the Magnetometer Navigation (MAGNAV)lnflight Experiment

Thienel, Julie K.; Harman, Richard R.; Bar-Itzhack, Itzhack Y.; Lambertson, Mike; June 30, 2004; 24 pp.; In English; AIAA Conference, 15-19 Aug. 2004, Providence, RI, USA; Copyright; Avail: CASI; A03, Hardcopy

The Magnetometer Navigation (MAGNAV) algorithm is currently running as a flight experiment as part of the Wide Field Infrared Explorer (WIRE) Post-Science Engineering Testbed. Initialization of MAGNAV occurred on September 4, 2003. MAGNAV is designed to autonomously estimate the spacecraft orbit, attitude, and rate using magnetometer and sun sensor data. Since the Earth's magnetic field is a function of time and position, and since time is known quite precisely, the differences between the computed magnetic field and measured magnetic field components, as measured by the magnetometer throughout the entire spacecraft orbit, are a function of the spacecraft trajectory and attitude errors. Therefore, these errors are used to estimate both trajectory and attitude. In addition, the time rate of change of the magnetic field vector is used to estimate the spacecraft rotation rate. The estimation of the attitude and trajectory is augmented with the rate estimation into an Extended Kalman filter blended with a pseudo-linear Kalman filter. Sun sensor data is also used to improve the accuracy and observability of the attitude and rate estimates. This test serves to validate MAGNAV as a single low cost navigation system which utilizes reliable, flight qualified sensors. MAGNAV is intended as a backup algorithm, an initialization algorithm, or possibly a prime navigation algorithm for a mission with coarse requirements. Results from the first six months of operation are presented.

Author

Magnetometers; Spacecraft Orbits; Spacecraft Trajectories; Satellite Navigation Systems

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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.

20040170491 Instituto Politecnico de Setubal, Setubal, Portugal

Using Virtual Reality Data Mining for Network Management

Thornton, K. E.; Radix, C.; ICEIS 2001; [2001], pp. 22-23; In English; See also 20040170490; Copyright; Avail: Other Sources

In this paper a Virtual Reality Data Mining (VRDM) tool is described which has been developed over the past two years in order to provide network management of ATM networks. The tool enables network data capture, and visualization of this data. A demonstration of the tool may be found at http://www.durham.ac.uk/CompSci/research/dmg. In our work we have reduced the time costs of the use of VR environments by combining approaches taken in Functional Programming and Data Mining. This has led to the production of a VRDM tool which enables rapid, focused analysis of network information at a required layer, and element, of a network. The tool we describe is the first application of Virtual Reality for network

management via the use of embedded, distributed (parallelized), Data Mining algorithms.
Author
Virtual Reality; Data Mining

20040170496 Instituto Politecnico de Setubal, Setubal, Portugal
The MOMIS Approach to Information Integration
Beneventano, D.; Bergamaschi, S.; Guerra, F.; Vincini, M.; ICEIS 2001; [2001], pp. 19; In English; See also 20040170490; Copyright; Avail: Other Sources

The web explosion, both at internet and intranet level, has transformed the electronic information system from single isolated node to an entry points into a worldwide network of information exchange and business transactions.
Author
Computer Networks; Data Integration; Information Management

20040170498 Instituto Politecnico de Setubal, Setubal, Portugal
Planning Security Policy on e-Commerce
Martin, Maria; Carrasco, Alejandro; Luque, Joaquin; Gonzalo, Rosa; ICEIS 2001; [2001], pp. 55; In English; See also 20040170490; Copyright; Avail: Other Sources

This article intends to reflect the need for taking steps to ensure the right operation of any e-commerce platform. The final aim consists not only on describing the different technical options available to build up a secure commerce, but also, on transmitting the importance of giving a sense of security and confidence to our clients. We describe the different options we should take into account in order to implement the appropriate security policy. All this is based on the experience obtained on electronic bank and on a University's site.
Author
Electronic Commerce; Computer Information Security

20040170506 Instituto Politecnico de Setubal, Setubal, Portugal
Ontology Negotiation Using Jess
Bailin, Sidney C.; Truszkowski, Walt; ICEIS 2001; [2001], pp. 34-35; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper describes a framework for ontology negotiation between information agents. Ontologies are declarative (data driven) expressions of an agent's 'world': the objects, operations, facts, and rules that constitute the logical space within which an agent performs. Ontology negotiation enables agents to cooperate in performing a task, even if they are based on different ontologies. We have developed an Ontology Negotiation Protocol (ONP) and implemented it in the Java Expert System Shell (Jess). In this paper we describe the ONP and some of the issues that arise in its implementation in Jess.
Author
Expert Systems; Protocol (Computers); Java (Programming Language)

20040170507 Instituto Politecnico de Setubal, Setubal, Portugal
Modelling the Generation of Customized Poetry in Jess
Gervas, Pablo; Murciano, Raul; ICEIS 2001; [2001], pp. 34; In English; See also 20040170490; Copyright; Avail: Other Sources

The present paper presents an application that composes formal poetry in Spanish in a semiautomatic interactive fashion. JASPER is a forward reasoning rule-based system that obtains from the user an intended message, the desired metric, a choice of vocabulary, and a corpus of verses; and, by intelligent adaptation of selected examples from this corpus using the given words, carries out a prose-to-poetry translation of the given message. In the composition process, JASPER combines natural language generation and a set of construction heuristics obtained from formal literature on Spanish poetry.
Author
Mathematical Models; Expert Systems; Heuristic Methods

20040170508 Instituto Politecnico de Setubal, Setubal, Portugal
Metadata for the Semi-Structured Mono-Media Documents
Amous, Ikram; Jedidi, Anis; ICEIS 2001; [2001], pp. 3; In English; See also 20040170490; Copyright; Avail: Other Sources

One of the main information retrieval problems on the Web is related to the poverty of describing and cataloguing any

information type. One proposal to cope with this lack consists in introducing the metadata concept to enrich and structure information description and improve searching relevance. We propose here a contribution to extend the existing metadata by a set of metadata describing documents resulting from various media (text, image, audio and video). These metadata, structured with XML, makes it possible to model document indexing by their content and/or structure and to process them by query languages.
Author
Information Retrieval; Metadata; Documentation

20040170509 Instituto Politecnico de Setubal, Setubal, Portugal
XML Interface for Object Oriented Databases
VanLingen, Frank; ICEIS 2001; [2001], pp. 3; In English; See also 20040170490; Copyright; Avail: Other Sources

Within CERN (European Organization for Nuclear Research) there are different data sources (different in format, type and structure). Several of these sources will be flat files or data sources other than databases. To create a common interface to these sources, we decided to use XML (eXtended Markup Language). XML is becoming the de facto standard for data (exchange). Because of this there is a large number of developers of tools. This document describes a mechanism to access object-oriented databases as an XML document by using serialization on demand. Furthermore it discusses an extension of XML to achieve this.
Author
Object-Oriented Programming; Document Markup Languages; Data Bases; Information Management

20040170510 Instituto Politecnico de Setubal, Setubal, Portugal
Establishing the Importance of ERP Implementation Critical Success Factors Along ASAP Methodology Processes
Esteves, Jose; Pastor, Joan; ICEIS 2001; [2001], pp. 6; In English; See also 20040170490; Copyright; Avail: Other Sources

This research in progress paper seeks to establish the relationship between critical success factors of ERP implementations and the ASAP methodology processes. Applying the process quality management method and the grounded theory method we derived a matrix of critical success factors versus ASAP processes. This relationship will help managers to develop better strategies for supervising and controlling SAP implementation projects.
Author
Management Methods; Research and Development; Data Processing

20040170514 Instituto Politecnico de Setubal, Setubal, Portugal
Information Systems Integration
Ericsson, Fredrik; ICEIS 2001; [2001], pp. 13; In English; See also 20040170490; Copyright; Avail: Other Sources

In this paper we address organizational and technological issues on information systems integration and architectures when it comes to self-developed relational database management systems, and how these issues can be identified. Organizational and technological issues have been identified using a three level of analysis that incorporates organizational context, application, and data source. We introduce the concept of data source interface and application interface in order to analyze the relation between data sources and conformity in how systems appear and behave on user's command. The empirical research represented in this paper has been conducted through a case study. The unit of analysis is a Swedish small to medium-sized manufacturing company. The organizational and technological issues outlined in this paper are valid in a context where developers primary activity does not reside in the field of information systems development and where the organization does not have an IT function responsible for the organization's use o1:IT.
Author
Information Systems; Data Base Management Systems; Systems Integration; Systems Engineering; Relational Data Bases

20040170515 Instituto Politecnico de Setubal, Setubal, Portugal
Interactive Search In Web Catalogues
Ciocca, G.; Gagliardi, I.; Schettini, R.; Zuffi, S.; ICEIS 2001; [2001], pp. 16; In English; See also 20040170490; Copyright; Avail: Other Sources

E-commerce is one of the most challenging fields of application of the new Internet technologies. It is clear that the larger the number of items available to be presented, the more difficult it is to guide the user towards the product he is looking for. In this article we present a prototype for the interactive search of images in high-quality electronic catalogues. The system is

based on a visual information search engine, and integrates a Color Management System for the faithful display of images. Author
Electronic Commerce; Information Retrieval

20040170519 Instituto Politecnico de Setubal, Setubal, Portugal
Front-End Tools in Data Warehousing: Informix Metacube (ROLAP) vs. Cognos Powerplay (MOLAP)
Medina, Enrique; Trujillo, Juan C.; ICEIS 2001; [2001], pp. 14; In English; See also 20040170490; Copyright; Avail: Other Sources

A Data Warehouse (DW) is a subject oriented, integrated, nonvolatile, time variant collection of data in support of management decisions. On-Line Analytical Processing (OLAP) tools based on the Multidimensional (MD) model are the predominant front-end tools to analyze data in DW. Current OLAP servers can be either relational systems (ROLAP) or proprietary multidimensional systems (MOLAP). This paper presents the underlying semantics to the MD model and compares how current ROLAP and MOLAP front-end tools provide these semantics.
Author
Data Acquisition; On-Line Systems; Computer Programs

20040170520 Instituto Politecnico de Setubal, Setubal, Portugal
The Decor Toolbox for Workflow-Embedded Organizational Memory Access
Abecker, Andreas; Bernardi, Ansgar; Ntioudis, Spyridon; Mentzas, Gregory; Herterich, Rudi; Houy, Christian; Muller, Stephan; Legal, Maria; ICEIS 2001; [2001], pp. 18; In English; See also 20040170490; Copyright; Avail: Other Sources

We shortly motivate the idea of business-process oriented knowledge management (BPOKM) and sketch the basic approaches to achieve this goal. Then we describe the DECOR (Delivery of context-sensitive organizational knowledge) project which develops, tests, and consolidates new methods and tools for BPOKM. DECOR builds upon the KnowMore framework for organizational memories (OM), but tries to overcome some limitations of this approach. In the DECOR project, three end-user environments serve as test-beds for validation and iterative improvement of innovative approaches to build: - knowledge archives organized around formal representations of business processes to facilitate navigation and access, active information delivery services which - in collaboration with a workflow tool to support weakly-structured knowledge-intensive work - offer the user in a context-sensitive manner helpful information from the knowledge archive, and - methods for an organisation analysis from the knowledge perspective, required as supporting methods to design and introduce the former two systems. In this paper, we present the basic modules of the DECOR toolkit and elaborate on their current status of development.
Author
Organizations; Knowledge Representation; Commerce; Memory (Computers)

20040170522 Instituto Politecnico de Setubal, Setubal, Portugal
Knowledge-Powered Executive Information System Design
Nijbakker, Sander; Wielinga, Bob; ICEIS 2001; [2001], pp. 6; In English; See also 20040170490; Copyright; Avail: Other Sources

Why do we want an Enterprise Ontology (Architecture)? If we want to design an World Wide / Global Enterprise Information system, we need a rigid (ordered) structure at the top and adaptability at the bottom. Most ontologies stop at the level of best-practices or activities. To find the, root structure we have to abstract a little further to the most abstract (atomic) ontology. This generic ontology is filled with the elementary business concepts comprising the atomic intelligent enterprise architecture. Ideas, methodology and application thereof.
Author
Information Systems; Systems Engineering; Architecture (Computers); Knowledge Based Systems

20040170526 Instituto Politecnico de Setubal, Setubal, Portugal
Webmaster - An Internet Information Support System For Academic Services Using ASP Technology
Ferreira, Carlos; Teixeira, Leonor; Santiago, Rui; ICEIS 2001; [2001], pp. 58; In English; See also 20040170490; Copyright; Avail: Other Sources

Nowadays the management and publication of academic and administrative information should not ignore the new information technologies. This paper describes the WebMaster application, a Web Information System for computerizing the academic information concerning a Master degree within an academic department. It performs, as well, the automation of all

administrative jobs and the inherent procedures for the distribution of this information, increasing its accessibility, reliability, up-to-dateness and decreasing the bureaucratic burden. With this application it is possible to speed up some routine activities, decreasing the need for manual, exhaustive and repetitive tasks. The general goal of this work is to determine how and to what extent different groups of users within an academic department can interchange information using the Web; in order to attain this goal, we have developed a framework with three essential aspects, that will be briefly presented: contents, design and implementation.
Author
Human Performance; Management Information Systems; Reliability; Support Systems

20040170537 Instituto Politecnico de Setubal, Setubal, Portugal
Supporting Query Processing Across Application Systems
Hergula, Klaudia; Beck, Gunnar; Haerder, Theo; ICEIS 2001; [2001], pp. 11; In English; See also 20040170490; Copyright; Avail: Other Sources

With the emergence of so-called application systems which encapsulate data-bases and related application components, pure data integration using, for example, a federated database system is not possible anymore. Instead, access via predefined functions is the only way to get data from an application system. As a result, the combination of generic query as well as predefined function access is needed in order to integrate heterogeneous data sources. In this paper, we present a middleware approach supporting this novel and extended kind of integration. Starting with the overall architecture, we explain the functionality and cooperation of its core components: a federated database system (FDBS) and a workflow management system (WfMS) connected via a wrapper. Afterwards, we concentrate on essential aspects of query processing across these heterogeneous components. Motivated by optimization demands for such query processing, we describe the native functionality provided by the WfMS. Moreover, we discuss how this functionality can be extended within the wrapper in order to obtain salient features for query optimization.
Author
Data Bases; Data Systems; Applications Programs (Computers)

20040170539 Instituto Politecnico de Setubal, Setubal, Portugal
Voyeurism, Exhibitionism, And Privacy On The Internet
Gochenouer, John E.; Tyler, Michael L.; ICEIS 2001; [2001], pp. 55; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper contrasts the natural, genetically based tendency of people to display voyeuristic and exhibitionistic behaviors with issues pertaining to privacy on the Internet. Results of a survey provide evidence that suggests personal control of information, not personal privacy, is the issue and that a trusted Internet-based organization would be the ideal repository of a person's authorized and authenticated information.
Author
Computer Information Security; Privacy; Internets

20040170540 Instituto Politecnico de Setubal, Setubal, Portugal
C-ISCAP: Controlled-Internet Secure Connectivity Assurance Platform
Jeong, Ji-Hoon; Nah, Jae-Hoon; Sohn, Sung-Won; Lee, Jong-Tai; ICEIS 2001; [2001], pp. 55; In English; See also 20040170490; Copyright; Avail: Other Sources

IPsec is a standard protocol to offer Internet information security service. Recently IPsec is implemented throughout the world on the base of various operating systems. Through the interoperability test among multiple independent implemented devices, it is now the mandatory function of Internet equipment. IPsec adds two headers (i.e., AH and ESP) and protocol to the legacy IP packet so therefore, IPsec offers not only internet security service such as internet secure communication, and authentication service but also the safe key exchange and anti-replay attack mechanism. In this paper, we propose the design and implementation of C-ISCAP, which is IPsec based Internet information security system and also we will show the data of performance measurement.
Author
Computer Information Security; Protocol (Computers)

20040170541 Instituto Politecnico de Setubal, Setubal, Portugal
The Pattcar Approach To Capturing Patterns For Business Improvement
Seruca, Isabel; Loucopoulos, Pericles; ICEIS 2001; [2001], pp. 43-44; In English; See also 20040170490; Copyright; Avail: Other Sources

Patterns as a technology is in its infancy with few theoretical underpinnings. Most work published about patterns is based on practice. Indeed, the whole trust of patterns capturing and writing derives from experience. Realizing the difficulty associated with pattern development due to its empirical and knowledge-intensive nature, we propose a method to aid in the process of capturing and reusing patterns in a business domain. In this paper, we describe the first stage of the method dedicated to the capture of patterns. Our approach to pattern development is based on domain analysis principles and is process-oriented, so as to ensure a progressive and increasing understanding of the business domain and the awareness of new opportunities for improving business. We report our experiences in applying the pattern development approach within the Clothing Manufacturing domain in the context of a business process improvement project.
Author
Clothing; Commerce; Manufacturing; Domains

20040170543 Instituto Politecnico de Setubal, Setubal, Portugal
Expert Systems For Disorders Prediction
Edrees, Soliman A.; ICEIS 2001; [2001], pp. 29-30; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents an expert system that uses the climatic changes such as temperature, frost, hail, storms, wind, downpour and other hazardous conditions to predict infestation severity and populations of plant disorders. In addition to prediction process the expert systems gives a set of advice (i.e. chemical and/or agricultural operations) to the growers. The system advice should be applied during current season to control the predicted disorders or applied next season to avoid disorders infestation.
Author
Expert Systems; Climate Change; Infestation; Prediction Analysis Techniques

20040170550 Instituto Politecnico de Setubal, Setubal, Portugal
Affect-Sensitive Multi-Modal Monitoring In Ubiquitous Computing: Advances And Challenges
Pantic, Maja; Rothkrantz, Leon J. M.; ICEIS 2001; [2001], pp. 29; In English; See also 20040170490; Copyright; Avail: Other Sources

The topic of automatic interpretation of human communicative behaviour, that is, giving machines the ability to detect, identify, and understand human interactive cues, has become a central topic in machine vision research, natural language processing research and in AI research in general. The catalyst behind this recent 'human-centered computing hoopla' is the fact that automating monitoring and interpretation of human communicative behaviour is essential for the design of future smart environments, next generation perceptual user interfaces, and ubiquitous computing in general. The key technical goals concern determining of the context in which the user acts, that is, disclosing in an automatic way where is the user, what is he doing, and how is he feeling, so that the computer can act appropriately. This paper is pertained with the last of these issues, that is, with providing machines with the ability to detect and interpret user's affective states. It surveys the past work done in tackling this problem, provides taxonomy of the problem domain, and discusses the research challenges and opportunities.
Author
Natural Language Processing; Computer Vision; Human-Computer Interface; Sensory Feedback

20040170556 Instituto Politecnico de Setubal, Setubal, Portugal
The Web Server Using Dynamic Histograms
Teh, Ying Wah; Zaitun, Abu Bakar; ICEIS 2001; [2001], pp. 57-58; In English; See also 20040170490; Copyright; Avail: Other Sources

In a large computer networked system, and load balancing among these machines is usually done by a trial and error method which gives unsatisfied results when much data is fed into these machines. The increased data traffic volume can badly affect the networked system. To overcome this, we present a Web Server technique using dynamic histograms for load balancing. The classification of techniques is divided into static and dynamic histograms. Static histograms are usually defined by the users, and are plotted by dividing the useful data into different classes subjectively. However, dynamic histograms are done using improving query processing techniques. It is like an adaptive system that learns the patterns of the existing data input. The basic idea is that a client machine of the system will query data from the server machine. The server will produce dynamic histograms to Optimize the performance of these machines. Based on these histograms, a load-balancing pattern can be predicted and then further study to improve the load distribution; that means we can make the loads to be evenly distributed among the machines in the network.
Author
Computer Networks; Histograms; Balancing; Dynamic Loads

20040170560 Instituto Politecnico de Setubal, Setubal, Portugal

Enterprise Information Systems: Specifying the Links Among Project Data Models Using Category Theory

Johnson, Michael; Dampney, C. N. G.; ICEIS 2001; [2001], pp. 37; In English; See also 20040170490; Copyright; Avail: Other Sources

Major enterprise information systems are frequently specified by integrating information models which have been developed in separate divisions of the enterprise. These models, often called project data models, embody the information that needs to be modelled in the enterprise, but they can be difficult to link because when common information is stored in different divisions it is frequently stored in significantly different forms. This paper describes a new technique, based on category theory, that uses the specification of logically data independent views to link project data models. The link mechanism is powerful because the use of views permits data in radically different forms to be linked, and a new solution to the view update problem allows the linking mechanism to be embodied as code, thus allowing the linked data models to be implemented as interoperating information systems. The paper is somewhat theoretical since it describes the foundation for a new technique, but the methods described here are being tested in large consultancies including the enterprise models for a government department, an oil company, and a telecommunications carrier.

Author

Information Systems; Data Links

20040170569 Instituto Politecnico de Setubal, Setubal, Portugal

An Integrated Component-Based Approach To Enterprise System Specification and Development

Stojanovic, Zoran; Dahanayake, Ajantha; Sol, Henk; ICEIS 2001; [2001], pp. 40; In English; See also 20040170490; Copyright; Avail: Other Sources

Component-Based Development (CBD) represents an advanced system development approach, capable for managing complexity and ever-changing demands in the business and IT environment. While many of the component technology solutions have been already settled in practice, of equal importance to their success are the methods and techniques closely aligned with CBD principles. Current methods do not offer a systematic and complete support for component-based way of thinking. This paper presents a new approach to CBD, integrating the component concept consistently into all phases and aspects of the enterprise system development. The approach combines the CBD paradigm and ISO Reference Model for Open Distributed Processing (RM-ODP), providing a comprehensive component-based specification and development framework for building enterprise systems of nowadays.

Author

Computer Systems Design; Systems Integration

20040170573 Instituto Politecnico de Setubal, Setubal, Portugal

An Intelligent Agent-Based Order Planning For Dynamic Networked Enterprises

Azevedo, Americo; Toscano, Cesar; Bastos, Joao; ICEIS 2001; [2001], pp. 21-22; In English; See also 20040170490; Copyright; Avail: Other Sources

There is currently an increasing interest in exploring the opportunities for competitive advantage that can be gained by reinforcing core competencies and innovative capabilities through networks of industrial and business partners. This paper firstly identifies some of the gaps that exist within current information systems that claim to support e-Business and e-Work in networked enterprises and describes some of the general requirements of distributed and decentralized information systems for companies operating in networks. It goes on to cover some principles for the design of a distributed IS provid'[ng an advanced infrastructure to support general co-operation, particular methodologies for co-operative and collaborative planning and guidelines for network set-up and support. The present work is one of the areas currently being delivered as part of the European IST consortium called Co-OPERATE. A distributed and decentralized information system, based on an architecture of agents and extensively using the internet, is being designed and implemented as a means to provide new and more powerful decision support tools for networked enterprises.

Author

Architecture (Computers); Information Systems; Internets

20040170576 Instituto Politecnico de Setubal, Setubal, Portugal

Case-Based Decision Support Systems

Salem, Abdel-Badeeh M.; Baeshen, Nadia; ICEIS 2001; [2001], pp. 27; In English; See also 20040170490; Copyright; Avail: Other Sources

Information systems (IS) development methodologies are aimed at improving the management and control of development process, structuring it, reducing its complexity, and standardizing both the process and resulting product. Many of IS development methodologies have been developed over the years, some from practice and some from theory. Recently artificial intelligence researchers have begun to investigate the usage of the case-based reasoning (CBR) methodology in improving human decision making. CBR means reasoning from experiences or 'old cases' in an effort to solve problems, critique solutions, and explain anomalous situations. This paper will explore what CBR methodology involves and examine its processes and knowledge sources. These issues concerned with representing, indexing, organizing past cases, retrieving and modifying old cases, and assimilating new ones. Moreover, the paper discusses the potential role of the CBR methodology in the organizational knowledge management approach, and in the lessons learned information systems.
Author
Decision Support Systems; Information Systems; Decision Making

20040170578 Instituto Politecnico de Setubal, Setubal, Portugal
An Information System View Of Consistency And Integrity In Enterprise Operations
Shinkawa, Yoshlyuki; Matsumoto, Masao J.; ICEIS 2001; [2001], pp. 42; In English; See also 20040170490; Copyright; Avail: Other Sources

Mining for association rules is one of the fundamental data mining methods. In this paper we describe how to efficiently integrate association rule mining algorithms with relational database systems. From our point of view direct access of the algorithms to the database system is a basic requirement when transferring data mining technology into daily operation. This is especially true in the context of large data warehouses, where exporting the mining data and preparing it outside the database system becomes annoying or even infeasible. The development of our own approach is mainly motivated by shortcomings of current solutions. We investigate the most challenging problems by contrasting the prototypical but somewhat academic association mining scenario from basket analysis with a real-world application. We thoroughly compile the requirements arising from mining an operative data warehouse at Daimler/Chrysler. We generalize the requirements and address them by developing our own approach. We explain its basic design and give the details behind our implementation. Based on the warehouse, we evaluate our own approach together with commercial mining solutions. It turns out that regarding runtime and scalability we clearly outperform the commercial tools accessible to us. More important, our new approach supports mining tasks that are not directly addressable by commercial mining solutions.
Author
Information Systems; Consistency; Data Mining; Relational Data Bases

20040170592 Instituto Politecnico de Setubal, Setubal, Portugal
A Unified Framework to Incorporate Soft Query into Image Retrieval Systems
Shahabi, Cyrus; Chen, Yi-Shin; ICEIS 2001; [2001], pp. 17-18; In English; See also 20040170490; Copyright; Avail: Other Sources

We explore the use of soft computing and user defined classifications in multimedia database systems for content-based queries. With multimedia databases, due to subjectivity of human perception, an object may belong to different classes with different probabilities (\soft' membership), as opposed to \hard' membership supported by conventional database systems. Therefore, we propose a unified model that captures both hard and soft memberships. In practice, however, our model significantly increases the computation complexity (both online and off-line) and the storage complexity of content-based queries. Previously, we introduced a novel fuzzy-logic based aggregation technique to address the online computation complexity. In this paper, we propose novel techniques to cluster sparse user profiles (i.e,, items with missing data) to reduce both the off-line computation complexity and the storage complexity.
Author
Data Retrieval; Query Languages; Multimedia; On-Line Systems

20040170599 Instituto Politecnico de Setubal, Setubal, Portugal
Reducing Inconsistency in Data Warehouses
Lujan-Mora, Sergio; Montenegro, Enrique; ICEIS 2001; [2001], pp. 5; In English; See also 20040170490; Copyright; Avail: Other Sources

One of the main problems in integrating databases into a common repository is the possible inconsistency of the values stored in them, i.e., the very same term may have different values, due to misspelling, a permuted word order, spelling variants and so on. In this paper, we present an automatic method for reducing inconsistency found in existing databases, and thus,

improving data quality. All the values that refer to a same term are clustered by measuring their degree of similarity. The clustered values can be assigned to a common value that, in principle, could substitute the original values. We evaluate different similarity measures for clustering. The method we propose gives good results with a considerably low error rate. Author

Data Bases; Data Integration; Automatic Control

20040170603 Instituto Politecnico de Setubal, Setubal, Portugal

Inserting Data Warehouse in Corporations

Pereira, Walter Adel Leite; Becker, Karin; ICEIS 2001; [2001], pp. 13-14; In English; See also 20040170490; Copyright; Avail: Other Sources

A particular interest has been observed in the Data Warehouse (DW) technology by corporations aiming to improve their decision processes. A large number of corporations that have no tradition on the use of computer systems for decision support, has to rely on a team qualified in the development of traditional operational systems and database technology, but inexperienced on DW development issues. Moreover, for a number of reasons (e.g. availability, costs, privacy), it is not always possible to count on external development teams or consultants. This work presents a methodology targeted at the development of DW pilot projects, which aims at the smooth adoption of DW technology by corporations. The methodology has been successfully tested in a military DW pilot project, and the results obtained so far confirm its adequacy and consistency towards the established goals. The paper describes the striking features of methodology and analyses its application in a real case study.

Author

Data Bases; Consistency; Costs; Computers

20040170605 Instituto Politecnico de Setubal, Setubal, Portugal

Object Evolution Mechanisms In Object Databases

Hammoudi, Slimane; ICEIS 2001; [2001], pp. 12; In English; See also 20040170490; Copyright; Avail: Other Sources

Nowadays, most Object Oriented Database Systems (OODBs) display serious shortcoming in their ability to model the evolving and multifaceted nature of common real world entities. While researcher in knowledge representation systems have been aware of this problem for some time, database systems represent an environment in which this problem is particularly severe. OODBs store objects over longer periods, during which the represented entities evolve. The intimate and permanent binding of an object to a single type (class) inhibits the tracking of real-world entities over time. In recent years, various mechanisms for supporting many-faceted and evolving objects in the context of object oriented data models have been proposed in the literature. This paper examines in a first part the semantics associated with object evolution and explores the implications of these semantics on object oriented concepts. In a second part, we discusses features regarding the functionality's of various object evolution mechanisms proposed in the literature in the context of OODBs and finally compares four representatives and more recent works in this area.

Author

Data Bases; Object-Oriented Programming; Evolution (Development)

20040170606 Instituto Politecnico de Setubal, Setubal, Portugal

Integration Of Different Data Sources And Message Queuing System In Postnet-Case Studies

Damnjanovic, Dejan; Ristic, Zoran; Stanic, Miodrag; Opacic, Petar; Peric, Boban; Radovanovic, Maja; ICEIS 2001; [2001], pp. 12-13; In English; See also 20040170490; Copyright; Avail: Other Sources

In the last 3 years the Post of Serbia has built a large enterprise network called Postnet. It is organized like an intranet, connecting all parts of the postal system nationwide. Besides connecting internal users, the goal of Postnet was to connect various external systems such as banks, the Telecom of Serbia, Internet providers, tourist agencies etc. Many of them require on-line real time transactions to different data sources like Oracle, IBM DB2 or MS SQL Server DBMS. Since each post-office is using local SQL Server database with its copy of necessary data, it was needed to ensure that each transaction should occur across two, most likely different, databases. To solve this problem we discussed several different technologies like Microsoft DNA, Sun's EJB and OMG CORBA. We decided to use multitired architecture based on Microsoft Transaction Server (MTS) where each involved system is wrapped into one or more MTS components. Each component exposes corporate data and business logic through well-defined interfaces. The most interesting applications are those that integrate Postnet as infrastructure for the PostBank in its participation in new national payment system. These applications use MTS as transaction

integrator of IBM DB2, SQL Server and Microsoft Message Queue (MSMQ)
Author
Data Bases; Computer Networks; On-Line Systems; Messages

20040170608 Instituto Politecnico de Setubal, Setubal, Portugal
A Layered Architecture for Multi-Agent Systems to Support a Water Main Rehabilitation Strategy 299
Sharp, Bernadette; Edwards, E. Robert; Dean, Angela; ICEIS 2001; [2001], pp. 20; In English; See also 20040170490; Copyright; Avail: Other Sources

In complex applications like the water utilities the expertise that we are trying to integrate into our system consists of the various kinds of knowledge, skills and strategies possessed by different groups who collaborate to develop an efficient and pro-active water main rehabilitation strategy. A single knowledge based system would fail to integrate this diversity of knowledge and strategy. A multi agent system is an ideal set up to represent this diversity. This paper describes how a layered architecture can bring the local expertise and strategies of various groups together to meet the business objectives of an organisation and produce a coherent and pro-active rehabilitation strategy.
Author
Architecture (Computers); Knowledge Based Systems; Utilities

20040170613 Instituto Politecnico de Setubal, Setubal, Portugal
Conceptual Modeling of Fuzzy Object-Oriented Database Systems
Goswami, A.; Panigrahi, Prabin Kumar; ICEIS 2001; [2001], pp. 19; In English; See also 20040170490; Copyright; Avail: Other Sources

In this paper we propose a new approach for the development of Fuzzy Object Oriented Database model. Real world database application requires users to specify their need to represent, store and manipulate imprecise, uncertain, vague information in a natural language like English. The development of a model in a Relational Database Management System starts with user requirement specifications, normalization and then conversion to tables. Our aim is to develop an equivalent methodology for Fuzzy Object Oriented Database System.
Author
Data Base Management Systems; Fuzzy Systems; Object-Oriented Programming; Mathematical Models

20040170614 Instituto Politecnico de Setubal, Setubal, Portugal
Novel Data Visualization and Exploration in Multidimensional Datasets
Kotsis, Nikolaos; Weir, George R. S.; Ferguson, John D.; MacGregory, Douglas R.; ICEIS 2001; [2001], pp. 4; In English; See also 20040170490; Copyright; Avail: Other Sources

Commonly, decision support systems require large-scale data analysis facilities for efficient decision-making. While OLAP tools provide multidimensional analysis, traditional visualizations prove inadequate as means of viewing and exploring complex relationships across multiple dimensions. Commercial databases often support a variety of two or three dimensional visualisation facilities, including bar charts, scatter diagrams, data plots, and cross tabulations. In this context, the present paper describes a novel approach to the problem of access and visualisation for data in complex hierarchical datasets. The approach integrates a novel browsing technique, which affords user navigation in several levels of summary information, with a modified scatter projection of the measure of interest. A prototype implementation of the proposed approach has been developed. This is described and advocated as a multidimensional interface for OLAP that addresses several significant issues in visualisation and exploration of multidimensional datasets.
Author
Scientific Visualization; Data Processing; Decision Support Systems; Prototypes

20040170615 Instituto Politecnico de Setubal, Setubal, Portugal
An Algorithm for Determining Subspaces Containing Clusters with Multiple Minimum Density thresholds for Numerical Data
Rao, P. R.; ICEIS 2001; [2001], pp. 33; In English; See also 20040170490; Copyright; Avail: Other Sources

Clustering algorithms are used in database mining for finding interesting patterns in high dimensional data. These are useful in many applications of knowledge discovery in databases. Recently, there have been attempts to find clusters embedded in the subspaces of high dimensional data. CLIQUE is one such algorithm. In this algorithm, each attribute is partitioned into user-given number of intervals. Each interval is called a unit. A unit is called dense if it contains a user-given fraction of total

data points. Thus, the denseness of a unit is determined by a single user-given number, for all the attributes. A single denseness criterion for all the attributes implicitly means that all the attributes in the data set have similar frequencies. This is not the case in some real-life applications. In this paper the user is allowed to specify multiple denseness ,one for each attribute, to reflect the nature of their varied frequencies. An algorithm is designed for identification of subspaces that contain clusters, given the user-specified denseness value for each attribute.
Author
Algorithms; Cluster Analysis; Data Bases

20040170625 Instituto Politecnico de Setubal, Setubal, Portugal
Fuzzy Reasoning in Jess: the FuzzyJ Toolkit and FuzzyJess
Orchard, Robert; ICEIS 2001; [2001], pp. 33-34; In English; See also 20040170490; Copyright; Avail: Other Sources

Jess, the Java (TM) Expert System Shell, provides a rich and flexible environment for creating rule-based systems. Since it is written in Java it provides platform portability, extensibility and easy integration with other Java code or applications. The rules of Jess allow one to build systems that reason about knowledge that is expressed as facts. However, these facts and rules cannot capture any uncertainty or imprecision that may be present in the domain that is being modelled. This paper describes an extension to Jess that allows some forms of uncertainty to be captured and represented using fuzzy sets and fuzzy reasoning. We describe the NRC FuzzyJ Toolkit, a Java API that allows one to express fuzzy concepts using fuzzy variables, fuzzy values and fuzzy rules. Next, we describe a Java API called FuzzyJess that integrates the FuzzyJ Toolkit and Jess. Finally, we show the modifications that were made to the Jess code to allow this extension (and others with similar requirements) to be added with modest effort and with minimal or no impact as new releases of Jess are delivered.
Author
Fuzzy Sets; Expert Systems; Java (Programming Language); Computer Programs

20040170626 Instituto Politecnico de Setubal, Setubal, Portugal
Implementing Business Rules in an Object-Oriented System Using Jess
Mohan, Permanand; Yussuff, Sheik; ICEIS 2001; [2001], pp. 34; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper describes how the Jess expert system shell can be used to implement business rules in an object-oriented system. It presents a simple taxonomy of business rules and provides implementation details for the rules in this taxonomy. The paper shows that compared to other approaches, the Jess-based implementation is an attractive alternative since it supports the separation of domain objects from the business rules. Jess also allows rules to be specified in a declarative fashion, which is regarded as the best way to incorporate business rules in an information system.
Author
Expert Systems; Object-Oriented Programming; Taxonomy

20040170628 Instituto Politecnico de Setubal, Setubal, Portugal
Automation Query Processing Selection Algorithms
Teh, Ying Wah; Zaitun, Abu Bakar; Lee, Sai Peck; ICEIS 2001; [2001], pp. 14; In English; See also 20040170490; Copyright; Avail: Other Sources

In manufacturing environment, most of processing data is stored in the commercial databases and the design of database depends on the database designer. Given a query, the database management system picks up one of query processing strategies to full the user requirement. A user is given impression is hard to optimize the response time of a query. In this paper, we introduce the readers to current research activities pertaining to query processing in the manufacturing environment. We list out the possible query result, and recommend the appropriate query processing techniques for respective query result. And then we deduce an automation query processing selection algorithms to propose the appropriate query processing technique for users to improve the response time.
Author
Algorithms; Automatic Control; Data Processing; Query Languages

20040170629 Instituto Politecnico de Setubal, Setubal, Portugal
Design of Textual Dataweb
Khrouf, Kais; ICEIS 2001; [2001], pp. 14-15; In English; See also 20040170490; Copyright; Avail: Other Sources

The development of the Internet generated the increase in the volume of information available on this network. These

information are used more and more by the companies for economic, strategic, scientific or technical development. The most common way for a user to search these information across the web, is to use the 'search robots'. However, results on this kind of tools don't often satisfy the users. It is the reason why, the dataweb constitutes today a need for the companies in order to take maximum advantages of the web and information it contains. The proposed warehouse allows us to store and analyze any type of information extracted from the web.
Author
Internets; Computer Networks; Architecture (Computers)

20040170631 Instituto Politecnico de Setubal, Setubal, Portugal
Data Warehouse Striping: Improved Query Response Time
Bernardino, Jorge; Madeira, Henrique; ICEIS 2001; [2001], pp. 7; In English; See also 20040170490; Copyright; Avail: Other Sources

The increasing use of decision support systems led to an explosion in the amount of business information that must be managed by the data warehouses. Therefore, data warehouses must have efficient Online Analytical Processing (OLAP) that provides tools to satisfy the information needs of business managers, helping them to make faster and more effective decisions. Different techniques are used to improve query response time in data warehouses, ranging from classical database indexes and query optimization strategies to typical data warehouse materialized views and partitioning. But until now most of the works concentrate on centralized data warehouses where a single computer contains all the data However, a large centralized data warehouse is very expensive because of the great setup costs and does not take advantage of the distributed nature of actual organizations operating worldwide. In this paper, we propose a data partitioning approach specially designed for distributed data warehouse environments called data warehouse striping (DWS). This technique takes advantage of the specific characteristics of star schemas and typical OLAP query profile guaranteeing optimal load balance of query execution and assuring high scalability. The proposed schema is evaluated experimentally for most typical OLAP operations using different types of queries and it is shown that an optimal speedup can be obtained.
Author
Data Bases; Decision Support Systems; Information Management

20040170633 Instituto Politecnico de Setubal, Setubal, Portugal
Method for Obtaining Correct Metrics
Calero, Coral; Piattini, Mario; Genero, Marcela; ICEIS 2001; [2001], pp. 46; In English; See also 20040170490; Copyright; Avail: Other Sources

Metrics can be used as a mechanism for assuring product quality. However, metrics will have this application only if they are well-defined. To obtain correct metrics a number of steps must be followed. In this paper we present the method we have designed for obtaining correct metrics. This method is composed of the metrics definition, formal validation and empirical validation of the metrics. After these steps we can know if a metric is or not correct. However, this information is not sufficient and we must be able to make some kind of interpretation regarding the value that a metric takes. For this reason, we have added the psychological explanation step to the method.
Author
Methodology; Applications of Mathematics

20040170635 Instituto Politecnico de Setubal, Setubal, Portugal
Specializing Agents on Data Integration in a Data Warehousing System Environment
Goncalves, Joaquim; Lourenco, Analia; Belo, Orlando; ICEIS 2001; [2001], pp. 16-17; In English; See also 20040170490; Copyright; Avail: Other Sources

Data selection, extraction and processing are frequent tasks in enterprise information systems. Their relevance emerged from the information requirements of enterprise managers to have permanently available all the possible information about their working area. They try to reach important pieces of data that will allow them to extract useful and valuable knowledge in order to correct past misleads, to improve their performance inside the organization, or even to foresee market opportunities. Nowadays competitiveness between enterprises makes such process crucial. It is necessary, and convenient, to surround the decision-makers with all possible elements that might help them in their daily activities. In fact, most of the enterprises' decision-making processes need to be global and effective, as the enterprises' success depends on it. However, the data maintained in their operational systems is not commonly arranged according to their analytical needs and management perspectives, which do not contributes significantly to decision-makers effectiveness. Usually, the data is structured and treated

aiming to support operational tasks and backup daily activities. Obviously, some problems rise when it is intended to orient such data to analytical purposes. Many times its structure has to be rebuilt and its quality needs to be improved. With today's data growth, more and more, selecting, gathering and treating data are very complex and time-consuming tasks. In order to make these tasks easier, more reliable and faster, it was conceived and developed a specialized agent-based tool that provides a distributed computational platform especially designed and conceived to support such kind of tasks and provide a set of special means of bridging to integrate operational data into specific data warehousing systems. This paper describes it, presenting its main functional architecture and components, and emphasizing the aspects related to its development and implementation.
Author
Data Integration; Information Systems; Decision Making; Data Systems; Data Processing

20040170640 Instituto Politecnico de Setubal, Setubal, Portugal
The Use of Information on the Web to Enhance Teaching
Rizk, Nouhad J.; Gabor, Andras; ICEIS 2001; [2001], pp. 60-61; In English; See also 20040170490; Copyright; Avail: Other Sources

For well over a century, the higher education system has set the world standard for academic excellence and equitable access for all people. Today, the higher education sector--by which we mean both public and private institutions of post-secondary education and training such as colleges and universities--should pursue greater mission differentiation to streamline their services and better respond to the changing needs of their constituencies. Individual institutions and parts of statewide systems should focus on their points of comparative advantage rather than all striving to become full-service campuses. Community colleges, undergraduate universities, and research universities, for example, should embrace different missions, give priority to activities central to those missions, and reduce or eliminate more- marginal activities. Colleges and universities should also develop sharing arrangements to improve productivity. A greater sharing of resources--requirements, classes, services, infrastructure, and libraries--could lead to significant savings and even improve services. In the twenty first century, all people should be encouraged to pursue some form of post-secondary education or training, not only by searching using the Internet but also by taking advantages of all services of the World Wide Web. Designing one's web site is now, sharing one's lectures, laboratories, textbooks and handouts with the entire world. In this research, we will focus on the positive influence of technology in teaching and learning. Both teacher and student can replace the traditional methods of teaching and learning by technological tools starting with the small calculator up to the fastest and the most efficient way of information retrieval with the latest newcomer of the Internet: the Web.
Author
World Wide Web; Education; Information Retrieval

20040170685 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Implementing Institute of Electrical and Electronics Engineers (IEEE) 802. 11 Standard Medium Access Control Protocol for Wireless Local Area Networks (LANS) on a Laboratory Hardware Prototype
Green, Joshua D.; Jun. 2004; 217 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426652; AFIT/GE/ENG/04-11; No Copyright; Avail: Defense Technical Information Center (DTIC)

Wireless Local Area Networks (LANs) are extremely convenient, flexible, and easy to deploy. All LANs in which multiple hosts must access the same medium use a Medium Access Control (MAC) protocol to coordinate channel access. The MAC is part of the Data Link Layer of the Open Systems Interconnection (OSI) Reference Model. One MAC protocol in extensive use today is the Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard. Since IEEE 802. 11 devices are so prevalent in today s world, many researcher are exploring modifications and enhancements to the protocol. There are several well developed analytical and simulation models for IEEE 802.11 available to researchers, yet one significant obstacle remains: the lack of a means to obtain experimental data based on proposed protocol changes. Without real world experimental data, researchers lack the ability to test out their proposals in a real world environment. To fill this need, this thesis created a hardware prototype from which researchers can obtain experimental data about IEEE 802.11. This hardware prototype can now be used by researchers to gain real world data on their proposed modifications to IEEE 802.11.
DTIC
Access Control; Engineers; Laboratory Equipment; Local Area Networks; Protocol (Computers); Prototypes

20040170692 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Device Discovery in Frequency Hopping Wireless Ad Hoc Networks
Peterson, Brian S.; Sep. 2004; 242 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426661; AFIT/DS/ENG/04-06; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research develops a method for efficient discovery of wireless devices for a frequency hopping spread spectrum, synchronous, ad hoc network comprised of clustered sub-networks. The Bluetooth wireless protocol serves as the reference protocol. The development of a discovery, or outreach, method for scatternets requires the characterization of performance metrics of Bluetooth piconets, many of which are unavailable in literature. Precise analytical models characterizing the interference caused to Bluetooth network traffic by inquiring devices, the probability mass function of packet error rates between arbitrary pairs of Bluetooth networks, and Bluetooth discovery time distribution are developed. Based on the characterized performance metrics, three scatternet outreach methods are developed and compared. Outreach methods which actively inquire on a regular basis, as proposed in literature, are shown to produce lower goodput, have greater mean packet delay, require more power, and cause significant delays in discovery. By passively remaining available for outreach, each of these disadvantages is avoided.
DTIC
Communication Networks; Frequency Hopping; Wireless Communication

20040170719 Columbia Univ., New York, NY
Secure Overlay Services (SOS)
Keromytis, Angelos D.; Misra, Vishal; Rubenstein, Dan; Aug. 2004; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-02-2-0125; DARPA ORDER-N523; Proj-N523
Report No.(s): AD-A426757; AFRL-IF-RS-TR-2004-236; No Copyright; Avail: CASI; A03, Hardcopy

The goal of the Secure Overlay Services (SOS) project is to develop an infrastructure upon the existing, insecure Internet that allows an organization to install entities inside the network. An example of an entity is a military database that maintains timely or confidential information (e.g., intelligence). The SOS allows authorized users located anywhere in the Internet to communicate with the entity, and prevents unauthorized users from communicating with the entity. Furthermore, the SOS prevents unauthorized users from denying authorized users access to the entity.
DTIC
Internets; Security

20040170722 Massachusetts Inst. of Tech., Cambridge, MA
New ARCH: Future Generation Internet Architecture
Clark, David; Braden, Robert; Sollins, Karen; Wroclawski, John; Katabi, Dina; Aug. 2004; 81 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0553; DARPA ORDER-J958; Proj-J958
Report No.(s): AD-A426770; AFRL-IF-RS-TR-2004-235; No Copyright; Avail: CASI; A05, Hardcopy

This report describes an effort to understand how the Internet might be designed today if we could make a fresh start. The goal is to understand the current set of requirements that drive the Internet, and to offer long-term directions to help guide the evolution of the Internet in response to these requirements.
DTIC
Internets

20040170775 Cornell Univ., Ithaca, NY
CIPIAF for Information Assurance Institute
Schneider, Fred B.; Sep. 2, 2004; 12 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0312
Report No.(s): AD-A426856; TR-39412; AFRL-SR-AR-TR-04-0494; No Copyright; Avail: CASI; A03, Hardcopy

Three scientists were supported, each for one year, to learn about computer security. The research and educational accomplishments of each are summarized.
DTIC
Detection; Warning Systems

20040170810 Army Aviation and Missile Command, Redstone Arsenal, AL
The Distributed HLA Simulation Federation of the RDE 1st Application - The Network Architectural Design and Implementation
Roose, Kathryn; Birmingham, Jacob; Dykstra, Phillip; Kile, Tom; Heck, Mark; Sep. 2004; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426917; AMSAM-RD-TR-AMR-SS-04-31; No Copyright; Avail: Defense Technical Information Center (DTIC)

In October 2002, the Research, Development and Engineering Command (RDECOM) was established by the Army Materiel Command (AMC) to integrate the research, development and engineering components of AMC subordinate Commands. A Virtual Distributed Lab for Modeling and Simulation (VDLMS) was initiated and selected to execute the RDE Command's First Application (1stApp). This application was successfully executed in April 2003, and the goals were to provide insights into the Networked Fires process and performance for the Future Combat Systems (FCS). There were many participants in 1stApp;, however, four main sites were chosen to host the experiment. These included: AMRDEC/RTTC (Redstone Arsenal), ARL (aberdeen Proving Grounds), NVESD (Ft. Belvoir), and STC (Orlando, FL.).
DTIC
Communication Networks; Computer Networks; Simulation

20040171410 NASA Marshall Space Flight Center, Huntsville, AL, USA
Making Wireless Networks Secure for NASA Mission Critical Applications Using Virtual Private Network (VPN) Technology
Nichols, Kelvin F.; Best, Susan; Schneider, Larry; [2004]; 1 pp.; In English; 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada; No Copyright; Avail: Other Sources; Abstract Only

With so many security issues involved with wireless networks, the technology has not been fully utilized in the area of mission critical applications. These applications would include the areas of telemetry, commanding, voice and video. Wireless networking would allow payload operators the mobility to take computers outside of the control room to their off ices and anywhere else in the facility that the wireless network was extended. But the risk is too great of having someone sit just inside of your wireless network coverage and intercept enough of your network traffic to steal proprietary data from a payload experiment or worse yet hack back into your system and do even greater harm by issuing harmful commands. Wired Equivalent Privacy (WEP) is improving but has a ways to go before it can be trusted to protect mission critical data. Today s hackers are becoming more aggressive and innovative, and in order to take advantage of the benefits that wireless networking offer, appropriate security measures need to be in place that will thwart hackers. The Virtual Private Network (VPN) offers a solution to the security problems that have kept wireless networks from being used for mission critical applications. VPN provides a level of encryption that will ensure that data is protected while it is being transmitted over a wireless local area network (LAN). The VPN allows a user to authenticate to the site that the user needs to access. Once this authentication has taken place the network traffic between that site and the user is encapsulated in VPN packets with the Triple Data Encryption Standard (3DES). 3DES is an encryption standard that uses a single secret key to encrypt and decrypt data. The length of the encryption key is 168 bits as opposed to its predecessor DES that has a 56-bit encryption key. Even though 3DES is the common encryption standard for today, the Advance Encryption Standard (AES), which provides even better encryption at a lower cycle cost is growing acceptance. The user computer running the VPN client and the target site that is running the VPN firewall exchange this encryption key and therefore are the only ones that are able to decipher the data. The level of encryption offered by the VPN is making it possible for wireless networks to pass the strict security policies that have kept them from being used in the past. Now people will be able to benefit from the many advantages that wireless networking has to offer in the area of mission critical applications.
Author
Computer Information Security; Wireless Communication; Local Area Networks

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*.

20040170523 Instituto Politecnico de Setubal, Setubal, Portugal
A Knowledge-Acquisition Methodology For A Blast Furnace Expert System Using Machine Learning Techniques
Diaz, Eugenia; Tuya, Javier; Obeso, Faustino; ICEIS 2001; [2001], pp. 22; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper describes a methodology for obtaining the knowledge that an expert system needs for controlling a blast furnace as if it were an expert operator. The methodology separates useful knowledge from erroneous knowledge and refines the resulting rules so as to achieve a manageable and effective rules system.
Author
Furnaces; Expert Systems

20040170699 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Interference Suppression in Multiple Access Communications Using M-Ary Phase Shift Keying Generated via Spectral Encoding

Nunez, Abel S.; Mar. 2004; 127 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426704; AFIT/GE/ENG/04-20; No Copyright; Avail: Defense Technical Information Center (DTIC)

A conceptual transform domain communication system (TDCS) is shown capable of operating successfully using M-Ary phase shift keying (MPSK) data modulation in a multiple access environment. Using spectral encoding, the conceptual TDCS provides an effective means for mitigating interference affects while achieving multiple access communications. The use of transform domain processing with MPSK data modulation (TD-MPSK) provides higher spectral efficiency relative to other modulation techniques (antipodal signaling and cyclic shift keying) considered previously for TDCS applications. The proposed TD-MPSK technique uses spectral encoding for both data and multiple access phase modulations. Demodulation of the spectrally encoded TD-MPSK communication symbols is accomplished using conventional, multi-channel time domain correlation techniques. Analytic expressions for TD-MPSK probability of symbol error (PE) and probability of bit error (PB) are derived and validated using simulated results over the range of signal-to-noise ratios typically considered for communications. This validation includes scenarios with: 1) multiple access interference, 2) spectral notching, 3) jamming present and 4) combinations of all three. For a J/S of 3.14 dB and a Eb/N0 of 6 dB, PB dropped by up to a factor of 3 for TD- QPSK in a MA environment for the case when spectral notching was present versus the case when spectral notching wasn't present. The cross-correlation between communication symbols of different synchronous users can be made identically zero through proper selection of multiple access phase codes (orthogonal signaling). For a synchronous network containing orthogonal users, PE and PB are unaffected as the number of orthogonal network users increases. For a J/S of 3.14 dB and a Eb/N0 of 6 dB, PB dropped by a factor of 12 for TD-QPSK in a MA environment for the case when spectral notching was present versus the case when spectral notching wasn't present.

DTIC

Coding; Multiple Access; Phase Shift Keying; Signal to Noise Ratios; Spectra; Telecommunication

20040170830 Minnesota Univ., Minneapolis, MN

High-Speed and Low-Power VLSI Error Control Coders

Parhi, Keshab K.; Sep. 2004; 9 pp.; In English

Contract(s)/Grant(s): DAAD19-01-1-0705

Report No.(s): AD-A426960; AROD-42436.31-CI; No Copyright; Avail: Defense Technical Information Center (DTIC)

This final report describes our research results obtained during the period August 1, 2001 to July 31, 2004 by support from the ARO grant 'High Speed and Low Power VLSI Error Control Coders' (ARO Grant Number:DA/DAAD19-01-1-0705(42436-CI). Research results obtained in the areas of architectures for product turbo coders (based on component codes such as BCH codes, extended Hamming codes, and single parity check codes), space-time block codes, low-density parity check (LDPC) and long BCH codes are described. Efficient implementation of AES cryptosystems are described. Architectures for ultra wideband communication systems are summarized. Erasure decoding in Reed-Solomon codes and some preliminary results on soft-decision Reed-Solomon decoders are outlined.

DTIC

Coders; Error Correcting Codes; Errors; High Speed; Very Large Scale Integration

20040171187 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Formal Methods for Autonomic and Swarm-based Systems

Rouff, Christopher; Vanderbilt, Amy; Hinchey, Mike; Truszkowski, Walt; Rash, James; [2004]; 6 pp.; In English; 1st International Symposium on Leveraging Applications of Formal Methods, 30 Oct. - 2 Nov. 2004, Paphos, Greece; Copyright; Avail: CASI; A02, Hardcopy

Swarms of intelligent rovers and spacecraft are being considered for a number of future NASA missions. These missions will provide MSA scientist and explorers greater flexibility and the chance to gather more science than traditional single spacecraft missions. These swarms of spacecraft are intended to operate for large periods of time without contact with the Earth. To do this, they must be highly autonomous, have autonomic properties and utilize sophisticated artificial intelligence. The Autonomous Nano Technology Swarm (ANTS) mission is an example of one of the swarm type of missions NASA is considering. This mission will explore the asteroid belt using an insect colony analogy cataloging the mass, density, morphology, and chemical composition of the asteroids, including any anomalous concentrations of specific minerals.

Verifying such a system would be a huge task. This paper discusses ongoing work to develop a formal method for verifying swarm and autonomic systems.
Author
Artificial Intelligence; Roving Vehicles; Autonomous Navigation; Nanotechnology; Space Missions; Formalism

20040171202 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Hybrid Exploration Agent Platform and Sensor Web System
Stoffel, A. William; VanSteenberg, Michael E.; May 20, 2004; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

A sensor web to collect the scientific data needed to further exploration is a major and efficient asset to any exploration effort. This is true not only for lunar and planetary environments, but also for interplanetary and liquid environments. Such a system would also have myriad direct commercial spin-off applications. The Hybrid Exploration Agent Platform and Sensor Web or HEAP-SW like the ANTS concept is a Sensor Web concept. The HEAP-SW is conceptually and practically a very different system. HEAP-SW is applicable to any environment and a huge range of exploration tasks. It is a very robust, low cost, high return, solution to a complex problem. All of the technology for initial development and implementation is currently available. The HEAP Sensor Web or HEAP-SW consists of three major parts, The Hybrid Exploration Agent Platforms or HEAP, the Sensor Web or SW and the immobile Data collection and Uplink units or DU. The HEAP-SW as a whole will refer to any group of mobile agents or robots where each robot is a mobile data collection unit that spends most of its time acting in concert with all other robots, DUs in the web, and the HEAP-SWs overall Command and Control (CC) system. Each DU and robot is, however, capable of acting independently. The three parts of the HEAP-SW system are discussed in this paper. The Goals of the HEAP-SW system are: 1) To maximize the amount of exploration enhancing science data collected; 2) To minimize data loss due to system malfunctions; 3) To minimize or, possibly, eliminate the risk of total system failure; 4) To minimize the size, weight, and power requirements of each HEAP robot; 5) To minimize HEAP-SW system costs. The rest of this paper discusses how these goals are attained.
Derived from text
Multisensor Fusion; Spacecraft Instruments; Robot Control; Robot Sensors

20040171455 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Using an Extended Kalman Filter Learning Algorithm for Feed-Forward Neural Networks to Describe Tracer Correlations
Lary, David J.; Mussa, Yussuf; [2004]; 14 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

In this study a new extended Kalman filter (EKF) learning algorithm for feed-forward neural networks (FFN) is used. With the EKF approach, the training of the FFN can be seen as state estimation for a non-linear stationary process. The EKF method gives excellent convergence performances provided that there is enough computer core memory and that the machine precision is high. Neural networks are ideally suited to describe the spatial and temporal dependence of tracer-tracer correlations. The neural network performs well even in regions where the correlations are less compact and normally a family of correlation curves would be required. For example, the CH4-N2O correlation can be well described using a neural network trained with the latitude, pressure, time of year, and CH4 volume mixing ratio (v.m.r.). The neural network was able to reproduce the CH4-N2O correlation with a correlation coefficient between simulated and training values of 0.9997. The neural network Fortran code used is available for download.
Author
Algorithms; Kalman Filters; Feedforward Control; Neural Nets; Machine Learning; Correlation Coefficients

20040171570 NASA Wallops Flight Center, Wallops Island, VA, USA, Nova Southeastern Univ., Fort Lauderdale, FL, USA
Approach for Autonomous Control of Unmanned Aerial Vehicle Using Intelligent Agents for Knowledge Creation
Dufrene, Warren R., Jr.; [2004]; 9 pp.; In English; 23rd Digital Avionics Systems Conference, 24-28 Oct. 2004, Salt Lake City, UT, USA; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes the development of a planned approach for Autonomous operation of an Unmanned Aerial Vehicle (UAV). A Hybrid approach will seek to provide Knowledge Generation through the application of Artificial Intelligence (AI) and Intelligent Agents (IA) for UAV control. The applications of several different types of AI techniques for flight are explored during this research effort. The research concentration is directed to the application of different AI methods within the UAV arena. By evaluating AI and biological system approaches. which include Expert Systems, Neural Networks. Intelligent Agents, Fuzzy Logic, and Complex Adaptive Systems, a new insight may be gained into the benefits of AI and CAS techniques applied to achieving true autonomous operation of these systems. Although flight systems were explored, the benefits should

apply to many Unmanned Vehicles such as: Rovers. Ocean Explorers, Robots, and autonomous operation systems. A portion of the flight system is broken down into control agents that represent the intelligent agent approach used in AI. After the completion of a successful approach, a framework for applying an intelligent agent is presented. The initial results from simulation of a security agent for communication are presented.
Author
Approach Control; Artificial Intelligence; Pilotless Aircraft; Automatic Control; Autonomy; Expert Systems

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NUMERICAL ANALYSIS

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

20040170495 Instituto Politecnico de Setubal, Setubal, Portugal
SARPlan: A Decision Support System For Canadian Search And Rescue Operations
Abi-Zeid, Irene; ICEIS 2001; [2001], pp. 25; In English; See also 20040170490; Copyright; Avail: Other Sources

We present SARPlan, a decision support system designed to assist search mission coordinators (SMC) of the Canadian Forces in the optimal planning of search and rescue (SAR) missions. SARPlan is a geographic information system that provides an optimal allocation of the available search effort. The optimization modules are based on search theory and on Constraint Satisfaction Programming. Statistical models for determining the search object location distributions are also included. The anticipated benefits of SARPlan include speeding up search and rescue operations hence increasing the chances of finding lost aircraft and survivors, resulting in saved lives. In addition to being a new tool for the SMC, SARPlan introduces new elements to the current working procedures.
Author
Rescue Operations; Decision Support Systems; Mathematical Models

20040170570 Instituto Politecnico de Setubal, Setubal, Portugal
An Empirical Study Of The Business Model In The Korean Internet Stock Trading Market
Lee, Kun Chang; Kim, Jinsung; Chung, Nam-Ho; Kwon, Soonjae; ICEIS 2001; [2001], pp. 59; In English; See also 20040170490; Copyright; Avail: Other Sources

The objective of this paper is to empirically test the validity of the prevailing business model of the Korean Internet stock trading market, and search for the possibility of updating it to incorporate the changes in market needs. Since 1998, the Internet stock trading companies in Korea have been adopting the commission discount strategy as their major business model so as to attract more customers to their web site. However, customer needs as well as the Internet technology have changed drastically in the meantime, which means that their current business model should be adapted accordingly. Nevertheless, literature tackling this issue has seldom been reported. In this sense, this paper is aimed at empirically testing the validity of the current business model and seeking the possibility to revise it for the purpose of incorporating the changes in market trend. For this purpose, we collected 83 valid questionnaires and performed empirical analysis. Results showed that the commission discount policy, a currently prevailing business model in the Korean Internet stock trading market should be modified to incorporate several additional factors such as Easy to use, Reliability, Relative Advantage, and Need to Improve Speed.
Author
Numerical Analysis; Market Research; Industrial Management

20040170577 Instituto Politecnico de Setubal, Setubal, Portugal
Relationships Between The Decision Support System Subspecialties And Artificial Intelligence
Eom, Sean; ICEIS 2001; [2001], pp. 26-27; In English; See also 20040170490; Copyright; Avail: Other Sources

This is a comprehensive study, that, by means of an empirical assessment of the DSS literature, systematically identifies the DSS reference disciplines and traces how concepts and findings by researchers in the contributing disciplines have been picked up by DSS researchers to be applied, extended, and refined in the development of DSS research subspecialties. Cluster analysis was employed to an author co citation frequency matrix derived from a comprehensive database of the DSS literature over the period of 1970 through 1993. Twelve clusters were uncovered consisting of six major areas of DSS research (group DSS, foundations, model management, user interfaces, implementation, and multiple criteria DSS) and six contributing disciplines (multiple criteria decision making, cognitive science, organization science, artificial intelligence, group decision making, and systems science). This study concludes that artificial intelligence has made important contributions to the

development of foundational concepts, model management, and multiple criteria decision support systems.
Author
Decision Support Systems; Artificial Intelligence; Numerical Analysis; Models

20040170624 Instituto Politecnico de Setubal, Setubal, Portugal
The Use Of Formal And Informal Models In Object-Oriented Requirements Engineering
Dawson, Linda; ICEIS 2001; [2001], pp. 45; In English; See also 20040170490; Copyright; Avail: Other Sources

Little is understood, or reported on the basis of research, of the use of object-oriented models and methods by practicing professionals in the production of requirements specifications for commercial or industrial sized projects. This paper describes a research project and the findings from a set of six case studies that have been undertaken which examine the use of object-oriented models in professional requirements engineering practice. In these studies, it was found that the more formal models of object-orientation were rarely used to validate, or even clarify, the specification with clients or users. Rather, analysts tended to use informal models such as use cases or ad hoc diagrams, to communicate the specification to users. Formal models are more often used internally within the analysis team and for communicating the specification to the design team. Author
Object-Oriented Programming; Requirements

20040170649 Duke Univ., Durham, NC
Well-Conditioned Multi-Level Fast Multipole Modeling of Military Communication Channels
Carin, Lawrence; Aug. 30, 2004; 7 pp.; In English
Contract(s)/Grant(s): DAAD19-O1-1-O565
Report No.(s): AD-A426492; ARO-41693.2-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

Duke University and Virginia Polytechnic Institute and State University (VPI&SU) propose to team in a research effort to develop computer codes for the analysis and prediction of electromagnetic wave (EM) propagation over terrain. Those features of the terrain to be included are geographic scales of surface elevation, surface roughness, variable electrical constitutive properties, and vegetation cover (e.g., single and multiple trees). The frequencies to be considered include those of greatest interest to the U.S. Army in their current and projected communications and remote sensing needs. The approach will focus on the solution of appropriate integral equations describing the interaction of the EM waves and the terrain. Both institutions will work on developing the most appropriate integral equations to describe generic propagation scenarios. In the numerical solution of these integral equations, VPI&SU will concentrate on preconditioning or renormalizing them so as to minimize the number of iterations necessary to solve them to a given level of accuracy. Duke will focus on developing improved fast solvers for the preconditioned equations based upon their previous work with the Multi-Level Fast Multipole Algorithm (MLFMA). Both organizations also will attempt to keep the developed methods and codes general to the extent that they also may be applied to propagation in an urban environment. The rigorous, well-conditioned MLFMA models will be used as benchmarks to calibrate the accuracy of traditional electromagnetic propagation models, including ray, beam, and parabolic-equation (PE) solvers. (10 refs.)
DTIC
Channels (Data Transmission); Coding; Electromagnetic Scattering; Electromagnetic Wave Transmission; Integral Equations; Multipoles; Prediction Analysis Techniques; Terrain

20040170677 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Improving TCP Performance by Estimating Errors in a Long Delay, High Error Rate Environment
Carroll, Stephanie E.; Jul. 2004; 103 pp.; In English
Report No.(s): AD-A426634; AFIT/GCS/ENG/04-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

Interest in finding methods of improving TCP performance over satellite and wireless networks is high. This has been an active area of research within the networking community. This research develops an algorithm, CETEN-R for TCP to determine if a particular packet is lost due to congestion or corruption and react accordingly. An analysis of the performance of CETEN-R under a variety of conditions is studied and then compared to TCP Reno and TCP New Reno. When delay is high and the error rate is high CETEN-R showed a 77. 5% increase in goodput over TCP New Reno and a 33.8% increase in goodput over TCP Reno. When delay is low and the error rate is high, CETEN-R showed a 146% increase in goodput over TCP New Reno and a 77% increase in goodput over TCP Reno. At low error rates, CETEN-R provides no advantage over TCP Reno or TCP New Reno.
DTIC
Data Transmission; Error Analysis; Errors; Estimating

20040170689 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Quantifying Initial Condition and Parametric Uncertainties in a Nonlinear Aeroelastic System With an Efficient Stochastic Algorithm

Millman, Daniel R.; Sep. 2004; 115 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426657; AFIT/DS/ENY/04-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

There is a growing interest in understanding how uncertainties in flight conditions and structural parameters affect the character of a limit cycle oscillation (LCO) response, leading to failure of an aeroelastic system. Uncertainty quantification of a stochastic system (parametric uncertainty) with stochastic inputs (initial condition uncertainty) has traditionally been analyzed with Monte Carlo simulations (MCS). Probability density functions (PDF) of the LCO response are obtained from the MCS to estimate the probability of failure. A candidate approach to efficiently estimate the PDF of an LCO response is the stochastic projection method. The objective of this research is to extend the stochastic projection method to include the construction of B-spline surfaces in the stochastic domain. The multivariate B-spline problem is solved to estimate the LCO response surface. An MCS is performed on this response surface to estimate the PDF of the LCO response. The probability of failure is then computed from the PDF. This method is applied to the problem of estimating the PDF of a subcritical LCO response of a nonlinear airfoil in inviscid transonic flow. The stochastic algorithm provides a conservative estimate of the probability of failure of this aeroelastic system two orders of magnitude more efficiently than performing an MCS on the governing equations.

DTIC

Aeroelasticity; Algorithms; Computational Fluid Dynamics; Computerized Simulation; Nonlinear Systems; Stochastic Processes

20040170770 Miami Univ., Oxford, OH

Developing Signal Processing Algorithms for Weak GPS Signal Acquisition in Urban Environment

Jade Morton, Yu T.; Sep. 18, 2004; 33 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0225

Report No.(s): AD-A426847; AFRL-SR-AR-TR-04-0497; No Copyright; Avail: CASI; A03, Hardcopy

This report describes project progress on developing signal processing algorithms for weak GPS signal acquisition in typical urban environment where no more than three satellites are in direct view of a receiver. To successfully determine a user position, signals that are weakened due to presence of man-made and/or natural structures needs to be acquired. This can be a challenge task since the nominal level satellite signals act as interference during the weak signal acquisition. This report documents the progress we have made in accessing and mitigate the interference among satellite signals. The receiver platform with which we tested our algorithms is a software GPS receiver developed at AFRL/SNRP at WPAFB. As part of the proposed project, we worked on interfacing a portable GPS RF front end with a laptop PC via existing high speed USB2. This report also documents the successful implementation of software driver functions for the USB interface and other related projects.

DTIC

Algorithms; Cities; Computer Programs; Global Positioning System; Signal Processing

20040170792 Texas A&M Univ., College Station, TX

Aspects of Invariants for Object Recognition

Stiller, Peter F.; Aug. 2004; 11 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0031

Report No.(s): AD-A426885; AFRL-SR-AR-TR-2004-0573; No Copyright; Avail: CASI; A03, Hardcopy

This report is the Final Report for this contract. It details the work done since our last progress report and provides a summary of all the achievements and results that we have obtained. In particular, it details our success in applying newly developed techniques from geometric invariant theory and shape theory, including discrimination metrics, to problems in target recognition. One of the most significant successes was the creation of a global theory of object/ image equations for point features in the generalized weak perspective case. These equations offer a necessary and sufficient, pose independent, robust test for geometric consistency between an object and a purported image of that object. The work also included the development of optimal discrimination metrics and the proof of a metric duality result that shows one can work in either image space or object space to create a natural notion of distance between an object and an image. In addition, similar results were obtained in the radar case (orthographic projection) where the shape spaces, object/image equations, and metrics were worked out explicitly for small numbers of feature points.

DTIC

Pattern Recognition; Search Radar; Target Recognition

20040171062 Department of the Navy, Washington, DC

Enhanced System for Detection of Randomness in Sparse Time Series Distributions

O'Brien, Francis J., Inventor; Mar. 3, 2004; 42 pp.; In English

Patent Info.: Filed 3 Mar. 2004; US-Patent-Appl-SN-10794545

Report No.(s): AD-D020144; No Copyright; Avail: Defense Technical Information Center (DTIC)

A two-step method and apparatus are provided for automatically characterizing the spatial arrangement among the data points of a time series distribution in a data processing system wherein the classification of said time series distribution is required. In a first stage, the method and apparatus utilize a grid in Cartesian coordinates to determine (1) the number of cells in the grid containing at least one input data point of the time series distribution; (2) the expected number of cells which would contain at least one data point in a random distribution in said grid; and (3) an upper and lower probability of false alarm above and below said expected value utilizing a discrete binomial probability relationship in order to analyze the randomness characteristic of the input time series distribution. In a second stage, a statistical test of significance of the sparse data is utilized to determine the existence of noise and/or signal whereby a comparison of the results from the first stage and the second stage increase the probability of distinguishing noise from signal.

DTIC

Patent Applications; Statistical Tests; Time Series Analysis

20040171151 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Unique Approaches to Analysis of Time-Variable Gravity from GRACE

Lemoine, Frank G.; Luthcke, S. B.; Rowlands, D. D.; Cox, C. M.; Kloska, S. M.; Chinn, D. S.; [2004]; 1 pp.; In English; Joint CHAMP/GRACE Science Meeting, 6-8 Jul. 2004, Potsdam, Germany; No Copyright; Avail: Other Sources; Abstract Only

We have developed an innovative analysis strategy for analysis of GRACE data. We have developed a capability to recover local/regional gravity changes using non-global functional representations (Le. surface anomalies vs. global spherical harmonics) h m the GRACE data. Our approach can take regularly or irregularly shaped regions, populate them with surface anomaly blocks of suitable area and solve for the resulting mass flux with respect to a mean field. The surface mass or gravity anomalies benefit from the application of spatial and temporal constraints to add stability to the solution. In this paper we discuss the analysis of four months of GRACE Level 1B data (accelerometry, intersatellite data, attitude information and precise orbits) from July to October 2003, recently released to the GRACE Science Team. We compare and contrast this local approach to gravity recovery, with the more conventional approach using global spherical harmonics. We review simulations of this technique which allow us to pinpoint optimum strategies for applications of this local gravity recovery approach.

Author

Numerical Analysis; Time Functions; Gravity Anomalies

20040171535 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Parameter Trending, Geolocation Quality Control and the Procedures to Support Preparation of Next Versions of the TRMM Reprocessing Algorithm

Stocker, Erich Franz; [2004]; 1 pp.; In English; 2nd TRMM International Science Team Meeting, 5-10 Sep. 2004, Nara, Japan; No Copyright; Avail: Other Sources; Abstract Only

TRMM has been an imminently successful mission from an engineering standpoint but even more from a science standpoint. An important part of this science success has been the careful quality control of the TRMM standard products. This paper will present the quality monitoring efforts that the TRMM Science Data and Information System (TSDIS) conducts on a routine basis. The paper will detail parameter trending, geolocation quality control and the procedures to support the preparation of next versions of the algorithm used for reprocessing.

Author

Algorithms; Information Systems; Quality Control

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20040170647 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Image Super-Resolution Using Adaptive 2-D Gaussian Basis Function Interpolation

Hunt, Terence D.; Mar. 2004; 58 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426479; AFIT/GE/ENG/04-15; No Copyright; Avail: Defense Technical Information Center (DTIC)

Digital image interpolation using Gaussian radial basis functions has been implemented by several investigators, and promising results have been obtained; however, determining the basis function variance has been problematic. Here, adaptive Gaussian basis functions fit the mean vector and covariance matrix of a non-radial Gaussian function to each pixel and its neighbors, which enables edges and other image characteristics to be more effectively represented. The interpolation is constrained to reproduce the original image mean gray level, and the mean basis function variance is determined using the expected image smoothness for the increased resolution. Test outputs from the resulting Adaptive Gaussian Interpolation algorithm are presented and compared with classical interpolation techniques.
DTIC
Image Resolution; Interpolation

20040170674 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Value-Focused Thinking in the Presence of Weight Ambiguity: A Solution Technique Using Monte Carlo Simulation
Porter, Timothy W.; Mar. 2004; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426601; AFIT/GOR/ENS/04-15; No Copyright; Avail: Defense Technical Information Center (DTIC)

When a Decision Maker is asked to provide his or her preferences, the response represents a snapshot in time. While their preference structure elicited at any given moment may represent their revealed preferences at that point in time, it may change over time. These changing preferences over time represent ambiguity in the decision maker's preferences. Other sources of ambiguity may exist. One weakness of many decision analysis techniques today is the inability to incorporate ambiguity into the basic decision model. The existence of the problem has been known and commented on for many years. This research addresses that problem. It begins with the basic approach and methodology developed by Ralph Keeney, Value- Focused Thinking (VFT). This methodology is then expanded to allow decision makers to specify not just constant weights to demonstrate their preferences, but an entire distribution. These distributions are then incorporated with the value of the attributes and the whole is simulated using Monte Carlo Simulation provided by Crystal Ball. The result of incorporating these weight distributions into the model, is an empirical distribution for the value of an alternative. The alternative distributions can be compared in a number of ways to provide insight to the decision maker.
DTIC
Decision Theory; Monte Carlo Method

20040170757 New Mexico State Univ., Las Cruces, NM
Investigations into the Application of Cumulant Functions in Operations Research and Stochastic Modeling
Kolloffel, Martijn; Jan. 2003; 45 pp.; In English
Report No.(s): AD-A426832; No Copyright; Avail: CASI; A03, Hardcopy

This report is a chronological documentation of the research progress made by Martijn Kolloffel throughout the Fall Semester 2003. The research focuses on the use of cumulant functions in queueing theory and stochastic modeling. This report is a result of a DOD research grant proposed by Dr. Timothy. I. Matis, with the purpose to engage undergraduate students from New Mexico State University in research in stochastic models. My progress was monitored, evaluated, and documented through the participation in the undergraduate research course IE 400. The investigation into the application of cumulant functions in stochastic modeling is a continuation of research activities in the spring semester of 2003. The usefulness of cumulant based analysis methods is researched by the formulation of a suitable model. The first goal in this semesters research endeavor is the definition of a model that is relevant to military applications. After the model is completely defined, we use a cumulant derivation procedure to find an approximation to the measure of interest. We then validate our solution by comparing it to a model simulation. After validation we strive to expand the scale of the initial model, which can show the mathematical tractability of this procedure for large-scale systems. We also intend to expand the model by using phase type distributions, which allows us to model most probability distributions. During the summer of 2003 some ideas for formulating a model suitable for cumulant- based modeling had been generated in relation to a NASA research grant, that focused on the reliability of components that are used in space technology. We think that the stochastic analysis of component reliability in military applications can also be relevant and useful to the Department of Defense. Optimizing maintenance schedules of military equipment can prevent critical system failure and improve system availability.
DTIC
Mathematical Models; Operations Research; Stochastic Processes

20040170799 Defence Science and Technology Organisation, Edinburgh
Comparative Descriptive Statistics of Skewed Probability Distributions
Fewell, M. P.; Jul. 2004; 49 pp.; In English
Report No.(s): AD-A426898; DSTO-TR-1596; DODA-AR-013-136; No Copyright; Avail: CASI; A03, Hardcopy

This report addresses a technical issue in the current practice of operational analysis (OA). Increasingly, OA studies involve simulations of varying levels of sophistication. A feature of all simulations is the use of random variables, and this immediately raises the question of what distribution to employ. Should the random variable be taken as uniformly distributed over some range, should it follow a bell curve with some mean and standard deviation, or should it be exponentially distributed? Sometimes there are methodological or theoretical arguments favoring a particular distribution. In their absence, the modeler is forced to make an arbitrary choice of distribution, motivated perhaps by ease of use or personal familiarity. It then becomes interesting to know how sensitive the results of the analysis are to the choice of distribution: if another had been chosen, would the conclusions have been different? This report is a brief handbook on the comparative descriptive statistics of a wide variety of skewed probability distributions, both continuous and discrete. The aim is to facilitate the comparison of different distributions for use where random variables are employed without any firm information on their probability distributions. In this situation it is of interest to look for sensitivity to the distribution chosen. This can best be done by running the model with a variety of distributions, which then raises the question of how to compare distributions. The report advocates the use of moments and presents the requisite equations. As obvious as this approach may appear, many of the equations do not seem to have been published previously and some of the results are apparently wholly new. A total of 18 distributions are treated in detail, including all of the most commonly used skewed probability distributions.
DTIC
Probability Distribution Functions; Random Variables; Sensitivity; Skewness; Statistical Distributions

20040171276 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Conservative Analytical Collision Probability for Design of Orbital Formations
Carpenter, J. Russell; [2004]; 9 pp.; In English; 2nd International Symposium on Formation Flying, 14-16 Sep. 2004, Washington, DC, USA; No Copyright; Avail: CASI; A02, Hardcopy

The literature offers a number of approximations for analytically and/or efficiently computing the probability of collision between two space objects. However, only one of these techniques is a completely analytical approximation that is suitable for use in the preliminary design phase, when it is more important to quickly analyze a large segment of the trade space than it is to precisely compute collision probabilities. Unfortunately, among the types of formations that one might consider, some combine a range of conditions for which this analytical method is less suitable. This work proposes a simple, conservative approximation that produces reasonable upper bounds on the collision probability in such conditions. Although its estimates are much too conservative under other conditions, such conditions are typically well suited for use of the existing method. Author
Probability Theory; Statistical Correlation; Statistical Analysis; Orbital Assembly; Spacecraft Structures; Trajectory Analysis

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SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20040170579 Instituto Politecnico de Setubal, Setubal, Portugal
Analysis Of Suitability, Appropriateness And Adequacy Of Use Cases Combined With Activity Diagram For Business Systems Modeling
Shishkov, Boris; Dietz, Jan L. G.; ICEIS 2001; [2001], pp. 50; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper considers the potentials for application of use cases in business process analysis and modeling. In particular, it investigates suitability and appropriateness of use cases as tools for elicitation of processes, and the applicability of the use case diagram for visualizing the models of the business processes under study. It is shown that use cases represent a promising tool for business process modeling at the essential level. It is also studied that use cases could be combined with activity diagram, for building consistent and more complete models of a system, representing different system-actor interactions. Author
Stability; Mathematical Models; Suitability

20040170580 Instituto Politecnico de Setubal, Setubal, Portugal
Introducing Common Systems In International Financial Firms
Peters, Steve C. A.; Heng, Michael S. H.; ICEIS 2001; [2001], pp. 51; In English; See also 20040170490; Copyright; Avail: Other Sources

In international financial firms the Information Systems (IS) developments are normally centralized where the commercial activities are decentralized. This has specific effects on the use of information systems in these organizations. There is a strong movement towards a centralized development of systems because of expected higher efficiency in development and maintenance.Ignoring or being unaware of the differences in the system requirements for the foreign branches by assuming that all processes should be equal at a non-detailed level leads often to the proposal of a common system for the foreign branches. We investigated three cases, where common systems were introduced and failed over time because of similar reasons although all normal project conditions were established. The cases are with three global financial service companies where the holding resides in the Netherlands. In fact in all three cases the management had all the right arguments to start introducing common systems and made all the right actions to make the projects a success. Despite all, the projects did not give the wanted results. In all three cases the management could not foresee the failure because all measurements according to the current know how about global projects were taken. We did our research over a period of 10 years starting around 1990. The research is based on open discussions with central and local management including the members of the project. The results of the research show that the influence of local evolution of the organization has major impact on the introduction of common systems. This result can be used for the current projects introducing e-commerce activities for the global financial service companies.
Author
Electronic Commerce; Information Systems

20040170585 Instituto Politecnico de Setubal, Setubal, Portugal
Supporting Human Activities
Bourguin, Gregory; LePallec, Xavier; ICEIS 2001; [2001], pp. 47; In English; See also 20040170490; Copyright; Avail: Other Sources

Because we have been involved for many years in both the Computer Supported Cooperative Work (CSCW) and the Computer Supported Cooperative Learning (CSCL) research domains, we take particular interests in the results coming both from the human and the computer sciences. Thanks to this crossdisciplinary culture, we have understood that computer systems aim at supporting human activities and that these activities need systems better supporting their emergence. In other words, the systems we traditionally design lack in supporting the inevitable users emerging needs. This paper presents our new approach founded on the human science framework called the Activity Theory and some advanced software design techniques. It shows the results and promises we have found in intensively using the meta-level of the systems we design, thus better taking into account of the expansiveness property of the human activities we want to support.
Author
Man Machine Systems; Systems Engineering; Computer Systems Design

20040170623 Instituto Politecnico de Setubal, Setubal, Portugal
Integrating Organizational Semiotic Approach With The Temporal Aspects Of Petri Nets For Business Process Modeling
Barjis, Joseph; Chong, Samuel; ICEIS 2001; [2001], pp. 44-45; In English; See also 20040170490; Copyright; Avail: Other Sources

This issue of business process modeling has been debated in numerous papers. Despite the widely available source of information, this area of study is still a poorly understood issue. In this paper a methodology is proposed for business process modeling. The methodology introduced in this paper aims to create a more clearer, formalized and comprehensible approach to business process modeling. In this methodology we combine two different methods and modeling techniques in order to propose a more complete approach. These two methods are the well-tested semiotic approach and Petri net modeling method and technique. The aim is to bridge the gap between the precision of capturing business requirements using the semiotic approach with the graphical time sequence of the Petri net method. In order to demonstrate applicability and appropriateness of the proposed approach, the paper considers a real life example. The example case was conducted in the Electro-Medics International b.v. (EMI).
Author
Industrial Management; Mathematical Models; Commerce

20040170806 Society for Industrial and Applied Mathematics, Philadelphia, PA
SIAM International Conference on Numerical Combustion (10th), Held on May 9-12, 2004, in Sedona, Arizona
Crowley, James M.; May 12, 2004; 4 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0255
Report No.(s): AD-A426906; AFRL-SR-AR-TR-04-0498; No Copyright; Avail: CASI; A01, Hardcopy

The Society for Industrial and Applied Mathematics hosted the Tenth International Conference on Numerical Combustion held May 9-12, 2004 in Sedona, Arizona. This distinguished conference series began in 1985 in Sophia Antipolis, France and was followed by conferences in San Francisco, California (1987), Juan les Pins, France (1989), St. Petersburg Beach, Florida (1991), Garmisch, Germany (1993), New Orleans, Louisiana (1996), York, England (1998), Amelia Island Florida (2000), and Sorrento, Italy (2002). SIAM is widely recognized as the originator and the U.S. anchor of this important meeting whose topics concerns the applied mathematics and computation associated with combustion and reactive flow. In particular, the International Numerical Combustion Symposiums have become one of the international major venues for research on direct simulation and modeling turbulent reacting flow. It is also one of the major international venues for theoretical work in reacting flows.
DTIC
Combustion; Conferences

20040171403 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mode Transitions for the ST7 Disturbance Reduction System Experiment
Hsu, Oscar C.; Maghami, Peiman G.; Markley, Francis L.; ODonnell, James R., Jr.; [2004]; 13 pp.; In English; AIAA Guidance, Navigation and Control Conference, 16-19 Aug. 2004; No Copyright; Avail: CASI; A03, Hardcopy

The Space Technology 7 Disturbance Reduction System experiment will perform an on-orbit system-level validation of two technologies: a gravitational reference sensor employing a free-floating test mass and a set of colloidal micronewton thrusters. The Disturbance Reduction System is designed to maintain the spacecraft s position with respect to a free floating test mass to less than 10 nm/& over the frequency range of 1 to 30 m= mi paper presents the modes that compose the Disturbance Reduction System spacecraft control as well as the strategy used to transition between modes. A high-fidelity model of the system, which incorporates rigid-body models of the spacecraft and two test masses (18 degrees of freedom), is developed and used to evaluate the performance of each mode and the efficacy of the transition strategy.
Author
Spacecraft Control; Attitude Control

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THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20040171061 Department of the Navy, Washington, DC
Method for Detecting a Spatial Random Process Using Planar Convex Polygon Envelope
O'Brien, Francis J., Inventor; Oct. 14, 2004; 37 pp.; In English
Patent Info.: Filed 1 Jun. 2004; US-Patent-Appl-SN-10863840
Report No.(s): AD-D020143; No Copyright; Avail: Defense Technical Information Center (DTIC)

A method is provided for automatically characterizing data sets containing data points, which may be produced by measurements such as with sonar arrays, as either random or non-random. The data points for each data are located within a Cartesian space and a polygon envelope is constructed which contains the data points. The polygon is divided into grid cells by constructing a grid over the polygon. A prediction is made as to how many grid cells would be occupied if the data were merely a random process. The prediction takes one of two forms depending on the sample size. For small sample sizes, an exact Poisson probability method is utilized. For large sample sizes an approximation to the exact Poisson probability is utilized. A third test is utilized to test the adequacy of the Poisson based model is adequate to assess the data set as either random or non-random.
DTIC
Convexity; Detection; Patent Applications; Polygons; Random Processes

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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*.

20040170413 Massachusetts Inst. of Tech., Cambridge, MA, USA, Boston Univ., Boston, MA, USA, Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, American Physical Society, New York, NY, USA
Insight into Nucleon Structure from Lattice Calculations of Moments of Parton and Generalized Parton Distributions
Negele, J. W.; Brower, R. C.; Dreher, P.; Edwards, R.; Fleming, G.; Apr. 05, 2004; In English
Report No.(s): DE2004-824818; No Copyright; Avail: National Technical Information Service (NTIS)

This talk presents recent calculations in full QCD of the lowest three moments of generalized parton distributions and the insight they provide into the behavior of nucleon electromagnetic form factors, the origin of the nucleon spin, and the transverse structure of the nucleon. In addition, new exploratory calculations in the chiral regime of full QCD are discussed. NTIS
Nucleons; Partons; Chirality

20040170414 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
New Capture Gamma-Ray Library and Atlas of Spectra for All Elements
Firestone, R. B.; Revay, Z. S.; Molnar, G. L.; 2004; 12 pp.; In English
Report No.(s): DE2004-824636; No Copyright; Avail: Department of Energy Information Bridge

A new library comprising 30 thousand neutron capture gamma rays has been created by combining new measurements on natural elements from Budapest and literature data for all stable isotope targets. All energies and intensities are consistent in that they are based on the chlorine and nitrogen standards, respectively. Accurate neutron binding energies and thermal capture cross-sections could also be inferred for all cases where the level scheme is sufficiently complete. The new data can be used for nuclear structure investigations, reaction model calculations, and a number of applications, such as Prompt Gamma-ray Activation Analysis (PGAA).
NTIS
Gamma Rays; Spectra

20040170415 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Nagoya Univ., Nagoya, Japan, Syracuse Univ., NY, USA
Study of Scalar Mesons and Related Radiative Decays
Balc, D.; Harada, M.; Schechter, J.; 2004; 14 pp.; In English
Report No.(s): DE2004-824452; No Copyright; Avail: Department of Energy Information Bridge

After a brief review of the puzzling light scalar meson sector of QCD, a brief summary will be given of a paper concerning radiative decays involving the light scalars. There, a simple vector meson dominance model is constructed in an initial attempt to relate a large number of the radiative decays involving a putative scalar nonet to each other. As an application it is illustrated why a(sub 0)(980)-f(sub 0)(980) mixing is not expected to greatly alter the f(sub 0)/a(sub 0) production ratio for radiative(phi) decays.
NTIS
Mesons; Scalars

20040170416 Illinois Univ., Urbana-Champaign, IL, USA
High Energy Measurements of the Deuteron Photodisintegration Differential Cross Section
Schulte, E. C.; 2004; In English
Report No.(s): DE2004-824438; No Copyright; Avail: National Technical Information Service (NTIS)

New measurements of the high energy deuteron photodisintegration differential cross section were made at the Thomas Jefferson National Accelerator Facility in Newport News, Virginia. Two experiments were performed. Experiment E96-003 was performed in experimental Hall C. The measurements were designed to extend the highest energy differential cross section values to 5.5 GeV incident photon energy at forward angles. This builds upon previous high energy measurements in which scaling consistent with the pQCD constituent counting rules was observed at 90 degrees and 70 degrees in the center of mass. From the new measurements, a threshold for the onset of constituent counting rule scaling seems present at transverse momentum approximately 1.3 GeV/c. The second experiment, E99-008, was performed in experimental Hall A. The

measurements were designed to explore the angular distribution of the differential cross section at constant energy. The measurements were made symmetric about 90 degrees.
NTIS
Deuterons; Ionization Cross Sections; Scattering Cross Sections

20040170417 Hampton Univ., VA, USA
High Precision Hypernuclear Spectroscopy Study by the (e, e' K(sup +)) Reaction
Yuan, L.; Aug. 2002; In English
Report No.(s): DE2004-824433; No Copyright; Avail: National Technical Information Service (NTIS)
Jefferson Lab experiment E89009 is the first experiment to study hypernuclear spectroscopy by (e,e' K(sup+)) reaction. The 12 / LambdaB spectrum was observed from carbon target with the best energy resolution ever achieved from direct measurement of hypernuclear spectrum. The comparisons of the 12 / LambdaB spectrum with theoretical predictions were provided in terms of excitation strength and level separations. The overall excitation is in accord with theoretical calculations. The binding energies of p-shell and s-shell Lambda states were extracted. The photo-production cross section of the 12 / LambdaB ground state was also extracted.
NTIS
Hypernuclei; Spectroscopy

20040170418 Department of Energy, Washington, DC
Baryon Resonance Analysis from Two Pion Electroproduction at Jefferson Laboratory
2004; 10 pp.; In English
Report No.(s): DE2004-824394; No Copyright; Avail: Department of Energy Information Bridge
The cross section for the reaction ep(yields) e(prime)p(pi)(sup+)(pi)(sup -) was measured in the resonance region for 1.4 \h W \h 2.1 GeV and 0.5 \h Q(sup 2)\h 1.5 GeV(sup 2)/c(sup 2) using the CLAS detector at Jefferson Laboratory. The data show resonant structures not visible in previous experiments. The comparison of our data to a phenomenological prediction using available information on N* and (Delta) states shows an evident discrepancy. A better description of the data is obtained either by a sizeable change of the properties of the P(sub 13)(1720) resonance or by introducing a new baryon state, not reported in published analyses
NTIS
Baryon Resonance; Baryons; Pions

20040170426 Department of Energy, Washington, DC
Effect of Emittance and rms Phase Error on Angular Flux Density and Pinhole Flux. A Simulation Study of Two Undulaters at 10.5 mm Gap Incuding Very High Harmonics
Dejus, R. J.; 2004; 18 pp.; In English
Report No.(s): DE2004-822558; No Copyright; Avail: Department of Energy Information Bridge
There is a trade-off between how much effort should go into the tuning of insertion devices to reduce their rms phase errors and the actual benefits achieved in spectral quality when the real APS beam emittance and beam energy spread are taken into account. In the magnetic measurement laboratory, the measured magnetic fields are analyzed in terms of the rms phase error and the angular flux density, which is calculated from the measured fields for an ideal electron beam, i.e., a zero-emittance beam. In this study, we go beyond the case of an ideal beam to study the effect of the APS beam emittance and beam energy spread on the angular flux density and the pinhole flux (for a typical pinhole size that covers most of the central cone of the radiation) for real-field insertion devices to get an estimate of how low an rms phase error is reasonable to attain. The results presented here are directly applicable to the APS 'canted' undulators of type A (planar permanent-magnet hybrid insertion devices 2.1 m long and 3.3 cm period length) but also to the standard undulators A (which have a similar design with the same period length but are 0.3 m longer) unless otherwise noted, e.g., the asymptotic ratios of the real-to- ideal intensity at very high harmonic numbers differ.
NTIS
Permanent Magnets; Flux Density; Electron Beams; Emittance

20040170444 Michigan Univ., Ann Arbor, MI, USA
Operation of Beam Line Facilities for Real-time X-ray Studies at Sector 7 of the Advanced Photon Source
Clarke, R.; 2003; 26 pp.; In English
Report No.(s): DE2004-820616; DOE/ER-45743; No Copyright; Avail: Department of Energy Information Bridge

This Final Report documents the research accomplishments achieved in the first phase of operations of a new Advanced Photon Source beam line (7-ID MHATT-CAT) dedicated to real-time x-ray studies. The period covered by this report covers the establishment of a world-class facility for time-dependent x-ray studies of materials. During this period many new and innovative research programs were initiated at Sector 7 with support of this grant, most notably using a combination of ultrafast lasers and pulsed synchrotron radiation. This work initiated a new frontier of materials research: namely, the study of the dynamics of materials under extreme conditions of high intensity impulsive laser irradiation.
NTIS
Photon Beams; Laser Outputs

20040170467 State Univ. of New York, Albany, NY, USA, New Mexico Univ., Albuquerque, NM, USA
Fundamental Science of High-density Fluorocarbon Plasmas
Oehrlein, G. S.; Anderson, H. M.; Cecchi, J. L.; 2004; 24 pp.; In English
Report No.(s): DE2004-810328; No Copyright; Avail: Department of Energy Information Bridge

This report describes the results we obtained during the two and a half year of our work on the contract 'Fundamental Science of High-Density Fluorocarbon Plasmas.' In this program we established critical elements of the scientific knowledge base of high-density fluorocarbon plasmas used for SiO(sub 2) patterning. To this end we characterized the species that exist in the gas phase and the processes that occur at relevant surfaces in contact with the plasma using complementary diagnostic instrumentation for plasma and surface characterization at two universities. By moving diagnostics from one university to the other, the full spectrum of diagnostics was applied to a single plasma reactor and fluorocarbon plasma etching process. The results of these measurements were correlated with data obtained when patterning SiO(sub 2) using identical conditions. In parallel, a reactive beam scattering system was employed to establish the consequences of the interaction of mass- and energy-resolved low energy ions with SiO(sub 2) and resist surfaces.
NTIS
Plasmas (Physics); Fluorocarbons

20040170472 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Pacific Northwest National Lab., Richland, WA, USA, Lawrence Livermore National Lab., Livermore, CA
Current Status and Future Perspectives of Electron Interactions with Molecules, Clusters, Surfaces, and Interfaces
Becker, K. H.; McCurdy, C. W.; Orlando, T. M.; Rescigno, T. N.; Aug. 2000; 62 pp.; In English
Report No.(s): DE2004-809935; No Copyright; Avail: Department of Energy Information Bridge

Electron-molecule and electron-atom collisions initiate and drive almost all the relevant chemical processes associated with radiation chemistry, environmental chemistry, stability of waste repositories, plasma-enhanced chemical vapor deposition (CVD), plasma processing of materials for microelectronic devices and other applications, and novel light sources for research purposes (e.g. excimer lamps in the extreme ultraviolet) and in everyday lighting applications. The life sciences are a rapidly advancing field where the important role of electron-driven processes is only now beginning to be recognized. It has been shown very recently that low-energy electrons with energies significantly below the ionization energies of DNA molecules can initiate single and double strand-breaking in DNA molecules. Sanche and co- workers identified some of the key mechanisms involved as electron attachment processes. Electrons also drive many of the key processes in chemical synthesis, in planetary atmospheres, and in low-pressure and high-pressure plasmas used in environmental remediation applications.
NTIS
Molecular Electronics; Interactions

20040170488 Minnesota Univ., Minneapolis, MN, USA
Thin Film Adhesion by Nanoindentation-Induced Superlayers
Gergerich, W. W.; Volinsky, A. A.; 2004; 74 pp.; In English
Report No.(s): DE2004-809372; No Copyright; Avail: Department of Energy Information Bridge

This work has analyzed the key variables of indentation tip radius, contact radius, delamination radius, residual stress and superlayer/film/interlayer properties on nanoindentation measurements of adhesion. The goal to connect practical works of adhesion for very thin films to true works of adhesion has been achieved. A review of this work titled 'Interfacial toughness measurements of thin metal films,' which has been submitted to Acta Materialia, is included.
NTIS
Thin Films; Adhesion

20040170654 Army Research Lab., Aberdeen Proving Ground, MD

Finite Element Modeling and Analysis of an M855 Cartridge

South, Joseph T.; Burton, Larry W.; Sep. 2004; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426556; ARL-TR-3301; No Copyright; Avail: Defense Technical Information Center (DTIC)

A finite element model of an M855 brass cartridge inside an M16A4 barrel has been generated. The goal of the research was to develop and validate a baseline mechanical model for a brass M855 cartridge during realistic firing conditions. This model incorporates the strength changes in the cartridge attributable to the variation in the hardness and microstructure produced during manufacturing. The results of the model are used to evaluate the stress, strains, and resulting deformation that a brass cartridge case undergoes during ignition. The model predicts a stress state within the brass that demonstrates a 1.8 factor of safety. The results were validated with experimental measurements from expended M855 cartridges and showed good correlation with the predicted plastic deformation of the model. the creation of the validated model serves as a platform from which alternate lightweight materials for the cartridge case can be evaluated analytically.

DTIC

Cartridges; Finite Element Method; Stress Analysis

20040170660 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Multiple Access Interference Characterization for Direct-Sequence Spread-Spectrum Communications Using Chip Waveform Shaping

Glen, Matthew G.; Mar. 2004; 78 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426571; AFIT/GE/ENG/04-10; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research characterizes MAI effects on DS/SSMA system performance through simulation in Matlab , and explores the impact of multiple access code selection, chip waveform shaping, and multiple access code length on BER for both synchronous and asynchronous multiple access networks. In addition, the simulated DS/SSMA model permits rapid research into the effects of additional factors on BER. Prior to experimental testing, model validation is conducted through single user trials and by comparison with existing research for similar system designs. For synchronous and asynchronous networks, Gold coding improves BER by 7.5 and 4.0 dB, respectively, relative to aperiodic random spreading codes. Synchronous network results show that chip waveform shaping provides no significant BER improvement for the Blackman or Lanczos shapes. However, asynchronous network results show a potential BER improvement for Blackman and Lanczos shapes. Increasing code length from 31 to 511 resulted in a 7.5 dB BER improvement. Collectively, these results directly relate changes in BER to waveform cross-correlation statistics.

DTIC

Characterization; Chips; Electromagnetic Interference; Multiple Access; Spread Spectrum Transmission; Waveforms

20040170671 Air Force Inst. of Tech., Wright-Patterson AFB, OH

An Electromagnetic Tool for Damping and Fatigue Analysis

Hoover, Todd M.; Mar. 2004; 109 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426593; AFIT/GSS/ENY/04-M04; No Copyright; Avail: Defense Technical Information Center (DTIC)

An automated test system was developed by the USAF Turbine Engine Fatigue Facility (TEFF). This system was initially designed to reduce the time and manpower required to characterize damping treatments. It is based on a digitally controlled environmental chamber with automated data acquisition and processing. Several outputs are available including identification of natural frequencies, modal damping ratios from the acquiries frequency responses, and changes in damping with response amplitude; however, the TEFF additionally desires the capability to study fatigue under a free boundary condition. The system consists of a test specimen suspended by a pendulum to closely simulate free boundary conditions and to minimize the dissipation of vibrational energy. Two rare earth magnets are attached to a specimen. The magnetized end is inserted into an orthogonal magnetic field produced by an electromagnet. Alternating the current oscillates the direction of the magnetic field by 180 degrees. The effect of the electromagnet's magnetic field on the specimen's magnets is the application of a torque; as this torque alternates directions, it excites vibration in the beam. This torque, while useful, was not fully understood. The purpose of this thesis is threefold: 1. Develop an equation to predict the magnetic field produced by an electromagnetic coil; 2. Develop an equation for predicting the torque exerted on the beam; and 3. Experimentally validate the accuracy of these equations.

DTIC

Damping; Electromagnetism

20040170731 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Excited States of Silicon Carbide Clusters by Time Dependent Density Functional Theory

Boyd, John E.; Jun. 2004; 173 pp.; In English; Original contains color illustrations

Report No.(s): AD-A426785; AFIT/GNE/ENP/04-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

Previous AFIT research with density functional theory (DFT) has shown DFT to be accurate for the ground states of small SimCn (m,n \h 5) clusters. Evaluating the accuracy of time dependent DFT (TDDFT) to calculate the excited states of these clusters was the focus of this research. It is shown that for the excited states that can be expressed as a single electron configuration, energies calculated are generally within .1 e V or better of experimental differences. A possible scheme for correcting multiconfigurational singlet states, is also presented, which also brings their energies to within .1 eV of experiment. Calculations on larger, cage-like structures show excitation energies consistent with spectroscopic measurements of SiC surface defects, suggesting the possibility that the SiC surface forms similar clusters. Calculations on the equilibrium geometries and vibrational frequencies of yet unobserved states of the smaller clusters can aid in their detection in interstellar atmospheres and the laboratory. Finally, this research offers further insight into how silicon and carbon interact with one another as stoichiometry changes, which may one. da lead to better semiconductors for aerospace applications.

DTIC

Excitation; Semiconductors (Materials); Silicon Carbides; Time Dependence

20040170761 California Univ., Los Angeles, CA

Magnetostrictive Particulate Composites for Damping

Carman, Greg P.; McKnight, Geoff; Chaplya, Pavel; Nersessian, Nersesse; Oct. 11, 2004; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-01-1-0037

Report No.(s): AD-A426838; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this research effort was to develop a new passive smart damping material applicable to a wide range of aerospace structures. We believe that this innovative damping technology is defining a new standard for the field based primarily on the research conducted under this grant. The novel damping approach absorbs energy using domain wall/detwinning concepts dependent upon stress amplitude and independent of vibrational frequency. This new approach was dramatically different than either viscoelastic materials that are frequency dependent and thermally limited or active approaches that require power supplies and external control electronics. As shown in Figure 1 (from Brodt and Lakes) the new materials investigated at UCLA had both large stiffness and large tan delta unlike traditional materials that either had high stiffness with low tan delta (e.g metals or graphite epoxy composites) or low stiffness with high tan delta (e.g. elastomers). The research conducted under this grant helped the scientific community understand some basic physical properties of a wide range of materials under varying thermal- mechanical-magnetic-electrical loading conditions. This research effort was designed to develop a fundamental understanding for these new smart materials.

DTIC

Composite Materials; Damping; Magnetostriction; Particulates

20040170797 Air Force Research Lab., Rome, NY

RF Photonic Link Test Bed

Ware, Charles; Payson, Paul; Michalak, Richard; Brost, George; Sep. 2004; 55 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A426892; AFRL-SN-RS-TM-2004-2; No Copyright; Avail: Defense Technical Information Center (DTIC)

Described is a modular photonic RF link test bed integrated with the C-band radar operated by the Air Force Research Laboratory Sensors Directorate s Radar Technology Branch (SNRT). This flexible, multi-channel, test bed allows in-situ testing and evaluation of commercial and developmental photonic components in a convenient, yet realistic environment for their intended application, air and spaceborne RF sensing. This report documents the design and construction of a commercial off the shelf technology (COTS) based RF link transmitter and receiver, as well as the installation and testing of the multi-channel fiber optic link within the C- band radar. Performance of the COTS based link is reported and compared to requirements of the C-band radar for supporting typical experiments. A section on proposed future work is also presented.

DTIC

Photons; Radio Frequencies; Test Stands

20040171079 Aerospace Corp., El Segundo, CA

Strength Degradation of Filament-Wound Graphite/Epoxy Tubes Due to Either Impact Damage or Fabrication Defects

Chang, D. J.; Katzman, H. A.; Aug. 2004; 17 pp.; In English

Contract(s)/Grant(s): F04701-00-C-0009

Report No.(s): AD-A426853; TR-2003(1413)-1; SMC-TR-04-19; No Copyright; Avail: CASI; A03, Hardcopy

Two test series were conducted to assess the strength degradation of filament-wound graphite/epoxy tubes caused by impact damage or fabrication defects. The defects were either helical wrinkles or a hoop wrinkle inside the tube walls. The baseline tube configuration had a nine-ply (+10 deg, -10 deg, 90 deg)3 lay-up, with the exception of one tube having a (+15 deg, -l5 deg, 90 deg, 90 deg)3 stacking sequence. The latter lay-up configuration was to induce helical fiber- dominated failure. The tubes were subjected to either pneumatic or hydrostatic internal pressure, creating a biaxial stress state in the tube walls. The test results show that the burst pressure decreases significantly with increasing impact force for impact-damaged tubes. For impact loads of 823 to 1470 N (185 to 330 lb), the burst pressure dropped by 24% to 32%, respectively, compared to those with no impact damage. Most failures initiated at the impact locations. Some originated from locations other than the impact sites. For the wrinkle-defect specimens, minor helical wrinkles had no measurable effect on the burst pressure. More severe helical wrinkles decreased the burst pressure by 8%. Hoop wrinkles caused a significant degradation in strength (14% on average).

DTIC

Defects; Degradation; Fabrication; Fatigue Tests; Filament Winding; Graphite-Epoxy Composites; Impact Damage; Impact Tests

20040171087 National Inst. of Standards and Technology, Boulder, CO, USA

Radiaton Limits for NB(3)SN Superconductors for Iter Magnets: A Literature Review

Simon, N. J.; Feb. 1995; 160 pp.; In English

Report No.(s): DE2004-761709; No Copyright; Avail: Department of Energy Information Bridge

Results of a literature search on the radiation sensitivity of Nb(sub 3)Sn conductors are reported. An introductory section examines differences in newer N(sub 3)Sn conductor fabrication techniques, since most data were acquired on older, bronze processed material. Then, data on the radiation sensitivity of the transition temperature, the critical temperature, the critical current, and the upper critical field are compiled. This data base is assessed to determine radiation limits for the use &f these conductors in ITER TF (toroidal field) magnets.

NTIS

Superconducting Magnets; Fusion Reactors; Superconductors (Materials)

20040171091 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

What Can Lattice QCD Theorists Learn from NMR Spectroscopists

Fleming, G. T.; 2004; 16 pp.; In English

Report No.(s): DE2004-822284; No Copyright; Avail: Department of Energy Information Bridge

Euclidean-time hadron correlation functions computed in Lattice QCD (LQCD) are modeled by a sum of decaying exponentials, reminiscent of the exponentially damped sinusoid models of free induction decay (FID) in Nuclear Magnetic Resonance (NMR) spectroscopy. We present our initial progress in studying how data modeling techniques commonly used in NMR perform when applied to LQCD data.

NTIS

Quantum Chromodynamics; Nuclear Magnetic Resonance; Spectroscopy; Lattice Parameters

20040171095 Iowa State Univ. of Science and Technology, Ames, IA

Homogeneous Precipitation of Nickel Hydroxide Powders

Mavis, B.; 2003; 130 pp.; In English

Report No.(s): DE2004-822049; No Copyright; Avail: Department of Energy Information Bridge

Precipitation and characterization of nickel hydroxide powders were investigated. A comprehensive precipitation model incorporating the metal ion hydrolysis, complexation and precipitation reactions was developed for the production of the powders with urea precipitation method. Model predictions on Ni(sup 2+) precipitation rate were confirmed with precipitation experiments carried out at 90 C. Experimental data and model predictions were in remarkable agreement. Uncertainty in the solubility product data of nickel hydroxides was found to be the large contributor to the error. There were demonstrable compositional variations across the particle cross-sections and the growth mechanism was determined to be the aggregation

of primary crystallites. This implied that there is a change in the intercalate chemistry of the primary crystallites with digestion time. Predicted changes in the concentrations of simple and complex ions in the solution support the proposed mechanism. The comprehensive set of hydrolysis reactions used in the model described above allows the investigation of other systems provided that accurate reaction constants are available. the fact that transition metal ions like Ni(sup 2+) form strong complexes with ammonia presents a challenge in the full recovery of the Ni(sup 2+). On the other hand, presence of Al(sup 3+) facilitates the complete precipitation of Ni(sup 2+) in about 3 hours of digestion. A challenge in their predictive modeling studies had been the fact that simultaneous incorporation of more than one metal ion necessitates a different approach than just using the equilibrium constants of hydrolysis, complexation and precipitation reactions. Another limitation of using equilibrium constants is that the nucleation stage of digestion, which is controlled mainly by kinetics, is not fully justified. A new program released by IBM Almaden Research Center (Chemical Kinetics Simulator(trademark), Version 1.01) lets the user change the order of kinetic components of a reaction which was set to stoichiometric constant with which the species appear in the reaction in KINSIM by default. For instance, in the case of LDH precipitation, the new program allows to change the order of species in the reactions associated with Al(sup 3+) and let the Ni(sup 2+) reactions take over. This could be carried on iteratively until a good fit between the experimental data and the predictions were observed. However for such studies availability of accurate equilibrium constants (especially for the solubility products for the solid phase) is a prerequisite.
NTIS
Kinetics; Ureas; Decomposition

20040171220 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Review of Work Done with Professor Nussenzveig Regarding the Mie Theory
Wiscombe, W.; [2003]; 1 pp.; In English; Conference Highlights in Contemporary Physics, 26-28 Mar. 2003, Rio de Janeiro, Brazil; No Copyright; Avail: Other Sources; Abstract Only

Prof. Nussenzveig has dedicated part of his career to a surprising and unusual pursuit harking back to the heyday of classical physics: Mie theory, or the scattering of electromagnetic radiation by a homogeneous sphere. M e theory was not put forward until around 1908 (nearly simultaneously by Debye in a different form) and was quickly forgotten in the rush to the then-new quantum mechanics. It remained somewhat of a backwater until Prof. Nussenzveig brought it back by adapting complex angular momentum ideas from Regge pole theory, which had originally been invented for quantum mechanics. Since 1960, he has made fundamental contributions to actually understanding (as opposed to merely calculating) Mie theory. I became involved with this work in 1978 by inviting Prof. Nussenzveig to visit me at the National Center for Atmospheric Research. Since then we have written several papers together on approximate methods for Mie cross-sections, bubble scattering, and other subjects. This lecture will review that work, ending with his recent work on Mie resonances. The emphasis will be on the applications in atmospheric sciences.
Author
Angular Momentum; Atmospheric Physics; Electromagnetic Radiation; Mie Scattering

20040171323 Old Dominion Univ., Norfolk, VA, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Advances in Generalized Parton Distribution Study
Radyushkin, A.; May 16, 2004; In English
Report No.(s): DE2004-824774; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available
Partons; Quantum Chromodynamics

20040171324 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Wide Angle Compton Scattering Experimental Overview
Wojtsekhowski, B.; Apr. 03, 2003; In English
Report No.(s): DE2004-824806; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available
Protons; Photons; Compton Effect

20040171325 George Washington Univ., Washington, DC, USA
Medium Modification of the Proton Form Factor
Aug. 26, 2003; 10 pp.; In English
Report No.(s): DE2004-824827; No Copyright; Avail: Department of Energy Information Bridge

I argue that the double ratio of proton-recoil polarization-transfer coefficients, P(prime)(sub x) and P(prime)(sub z), of the quasielastic(sup 4)He(e, e(prime)p)(sup 3)H reaction with respect to the elastic(sup 1)H(e,e(prime)p) reaction is sensitive to possible medium modifications of the proton form factor in(sup 4)He. Recent measurements at both Mainz and Jefferson Lab of this double ratio at four-momentum transfers squared between 0.4 (GeV/c)(sup 2) and 2.6 (GeV/c)(sup 2) are discussed. I show that the data challenge state-of-the-art conventional meson-nucleon calculations, as these are unable to describe the results. The data hint at the need to include medium modifications of the proton form factor, as predicted by a quark-meson-coupling model, in the calculations. A recently approved follow-up experiment at a Q(sup 2) of 0.8 (GeV/c)(sup 2) and 1.3 (GeV/c)(sup 2) with unprecedented precision will provide one of the most stringent tests of the applicability of various calculations.
NTIS
Form Factors; Meson-Nucleon Interactions

20040171326 New Mexico State Univ., Las Cruces, NM, USA
Nuclear Transparency and Single Particle Spectral Functions from Quasielastic A(e, e'p) Reactions up to Q(2)=8.1 GeV(2)
McKee, D. W.; May 2003; In English
Report No.(s): DE2004-824828; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
Spectra; Nuclear Particles

20040171327 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Virtual Compton Scattering at Low Energy and the Generalized Polarizabilities of the Nucleon
Fonvieille, H.; 2004; 12 pp.; In English
Report No.(s): DE2004-824829; No Copyright; Avail: Department of Energy Information Bridge
Virtual Compton Scattering (VCS)(gamma)*p(yields)(gamma)p at low CM energy gives access to the Generalized Polarizabilities of the nucleon. These observables generalize the concept of electromagnetic polarizabilities to the case of a virtual photon. Dedicated VCS experiments have been performed at MAMI, Jefferson Lab and MIT-Bates. The experimental status is reviewed, including analysis methods and physics results. The measurement of absolute (ep(yields) ep(gamma)) cross sections allows the extraction of the two unpolarized VCS structure functions P(sub LL)-P(sub TT)/(epsilon) and P(sub LT), which are combinations of the Generalized Polarizabilities of the proton. Future prospects in the field of VCS at low energy are also presented.
NTIS
Electron Scattering; Photons; Polarization Characteristics

20040171348 European Organization for Nuclear Research, Geneva, Switzerland
CKM Matrix and the Unitarity Triangle
Mattaglia, M.; Buras, A. J.; Gambino, P.; Stocchi, A.; Oct. 10, 2003; In English
Report No.(s): DE2004-822646; No Copyright; Avail: National Technical Information Service (NTIS)
This report contains the results of the Workshop on the CKM Unitarity Triangle, held at CERN on 1316 February 2002, to study the determination of the Cabibbo-Kobayashi-Maskawa (CKM) matrix from the available data of K, D, and B physics. This is a coherent document with chapters covering the determination of CKM elements from tree-level decays and K- and B-meson mixing and the global fits of the unitarity triangle parameters. The impact of future measurements is also discussed.
NTIS
Kaons; Quantum Chromodynamics; Mesons; Standard Model (Particle Physics)

20040171356 George Washington Univ., Washington, DC, USA
Helicity-Dependent Angular Distributions in Double-Charged-Pion Photoproduction
Strauch, S.; Jan. 28, 2004; 12 pp.; In English
Report No.(s): DE2004-824735; No Copyright; Avail: Department of Energy Information Bridge
Two-pion photoproduction in the reaction(gamma)p(yields) p(pi)(sup+)(pi)(sup -) has been studied at Jefferson Lab Hall B using a circularly-polarized tagged photon beam in the energy range between 0.6 GeV and 2.3 GeV. Owing to the large angular acceptance of the CLAS detector, complete beam-helicity-dependent angular distributions of the final-state particles were measured. The large cross-section asymmetries exhibit strong sensitivity to the kinematics of the reaction and provide

valuable information on the reaction dynamics. Preliminary results are presented.
NTIS
Photoproduction; Pions

20040171363 Adelaide Univ., Australia, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Leading Quenching Effects in the Proton Magnetic Moment
Young, R. D.; Leinweber, D. B.; Thomas, A. W.; 2004; 14 pp.; In English
Report No.(s): DE2004-824680; No Copyright; Avail: Department of Energy Information Bridge

We present the first investigation of the extrapolation of quenched nucleon magnetic moments in quenched chiral effective field theory. We utilize established techniques in finite-range regularization and compare with standard dimensional regularization methods. Finite-volume corrections to the relevant loop integrals are also addressed. Finally, the contributions of dynamical sea quarks to the proton moment are estimated using a recently discovered phenomenological link between quenched and physical QCD.
NTIS
Magnetic Moments; Phenomenology; Quantum Chromodynamics

20040171364 Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA, Duke Univ., Durham, NC, USA
ELRADGEN: Monte Carlo Generator for Radiative Events in Elastic Electron-Proton Scattering
Afanasev, A. V.; Akushevich, I.; Ilyichev, A.; 2004; 10 pp.; In English
Report No.(s): DE2004-824451; No Copyright; Avail: Department of Energy Information Bridge

The theoretical approach and practical algorithms of radiative events in elastic ep-scattering are discussed. A new Monte Carlo generator for real photon emission events in the process of elastic electron-proton scattering is presented. A few consistency checks are performed and numerical results are presented.
NTIS
Monte Carlo Method; Photons

20040171365 Hampton Univ., VA, USA
Pion Electroproduction from Helium3, Deuterium, and Hydrogen
Avery, S. M.; May 2002; In English
Report No.(s): DE2004-824440; No Copyright; Avail: National Technical Information Service (NTIS)

A series of measurements for pion electroproduction from helium-3, deuterium, and hydrogen were completed at the Thomas Jefferson National Accelerator Facility by the NucPi Collaboration. E91003 began taking data in February 1998 and was completed in April 1998. The longitudinal and transverse parts of the differential cross section were extracted, by means of a Rosenbluth type separation, in the direction parallel to the virtual photon, at Q 2= 0.4 GeV 2 , for W= 1.15 and W= 1.6 GeV. The mass dependence of the longitudinal cross section should provide insight into the surprising apparent absence of any significant cross section enhancement due to excess pions in the nuclear medium.
NTIS
Pions; Deuterium; Helium Isotopes

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*.

20040170759 Woods Hole Oceanographic Inst., MA
Sound Sources and Levels in the Ocean
Carey, William M.; May 24, 2004; 72 pp.; In English
Contract(s)/Grant(s): N00014-02-0-0242; Proj-130224200
Report No.(s): AD-A426834; No Copyright; Avail: CASI; A04, Hardcopy

The standard definitions found in the American National Standards on Acoustics are applied to common sound sources used in both underwater acoustics research and in naval sonar systems operation. Recommended metrics are quantified for both continuous and transient sources of sound. The standard definitions are reviewed with theoretical sound source models. Requisite metrics are derived and applied to examples of energy sources of sound such as transients from a small omni

explosive, an air-gun, a light bulb and a Dolphin. A generic model of surface ship sonar system emissions is developed as a quantitative model. Active sonar transmissions are analyzed with the requisite quantitative metrics required to characterize these emissions. These results should be useful in environmental assessments, biological experiments and in the system design. DTIC

Oceans; Sound Transmission; Underwater Acoustics

20040171355 West Virginia Univ., Morgantown, WV

Portable Acoustic Monitoring Package (PAMP) 4th Quarterly Report

Loth, J. L.; Morris, G. J.; Jul. 2003; 32 pp.; In English

Report No.(s): DE2004-822766; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Natural Gas; Transmission Lines; Detection; Acoustics; Portable Equipment

20040171359 West Virginia Univ., Morgantown, WV

Acoustic Detecting and Locating Gas Pipe Line Infringement

Loth, J. L.; Morris, G. J.; Apr. 01, 2003; 28 pp.; In English

Report No.(s): DE2004-822767; No Copyright; Avail: Department of Energy Information Bridge

The West Virginia University natural gas transmission line leak detection research is only considering using readily available 1/2 inch pipeline access ports for the detection of leak generated signals. The main problem with leak signals is the low signal to noise ratio. One of the acoustic signals associated with gas escaping through a leak is only temporary and is in the form of a rarefaction wave originating when the leak is formed. Due to pipeline friction, over distance such a step function transitions to a ramp function. The ability to identify a leak by pipeline monitoring and signal processing depends a great deal on the quality and signal to noise ratio of the characteristics of the detectors used. Combinations of sensing devices are being used for the WVU sensor package and are contained in a removable sensor housing. The four sensors currently installed are a 1/2 inch 3 Hz-40 Khz microphone, an audible range moving coil sensor, a piezo-electric pressure transducer, and the WVU designed floating 3 inch diameter diaphragm to detect flow transient induced pressure ramp type signals. The WVU diaphragm sensor, which is currently under development, uses the same diaphragm principle as a high quality capacitance type microphone, but utilizes aerodynamic signal amplification. This type of amplification only amplifies the ramp-signal itself, not the random pipeline noise.

NTIS

Detection; Gas Pipes; Natural Gas; Pipelines; Acoustics; Leakage

20040171607 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Radio Sounding Science at High Powers

Green, J. L.; Reinisch, B. W.; Song, P.; Fung, S. F.; Benson, R. F.; Taylor, W. W. L.; Cooper, J. F.; Garcia, L.; Markus, T.; Gallagher, D. L., et al.; [2004]; 9 pp.; In English

Contract(s)/Grant(s): NASW-02037; NASW-99029; NASW-02005; WBS 51-973-80-60; Copyright; Avail: CASI; A02, Hardcopy

Future space missions like the Jupiter Icy Moons Orbiter (JIMO) planned to orbit Callisto, Ganymede, and Europa can fully utilize a variable power radio sounder instrument. Radio sounding at 1 kHz to 10 MHz at medium power levels (10 W to kW) will provide long-range magnetospheric sounding (several Jovian radii) like those first pioneered by the radio plasma imager instrument on IMAGE at low power (less than l0 W) and much shorter distances (less than 5 R(sub E)). A radio sounder orbiting a Jovian icy moon would be able to globally measure time-variable electron densities in the moon ionosphere and the local magnetospheric environment. Near-spacecraft resonance and guided echoes respectively allow measurements of local field magnitude and local field line geometry, perturbed both by direct magnetospheric interactions and by induced components from subsurface oceans. JIMO would allow radio sounding transmissions at much higher powers (approx. 10 kW) making subsurface sounding of the Jovian icy moons possible at frequencies above the ionosphere peak plasma frequency. Subsurface variations in dielectric properties, can be probed for detection of dense and solid-liquid phase boundaries associated with oceans and related structures in overlying ice crusts.

Author

Atmospheric Sounding; Distance; Echoes; Plasma Frequencies; Liquid Phases

20040171660 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Exploration of Geometric Noise Suppression in Transition Edge Sensors
Chervenak, J. A.; Allen, C. A.; Abrahams, J. A.; Miller, T. M.; Talley, D. J.; Staguhn, J. G.; Benford, D. J.; Mosely, S. H.; Finkbeiner, F. M.; Brekosky, R. G., et al.; September 27, 2004; 1 pp.; In English; Applied Superconductivity Conference
Contract(s)/Grant(s): 263-10-12; No Copyright; Avail: Other Sources; Abstract Only

We present noise data on Mo/Au superconducting transition edge sensors featuring the noise suppression geometry using normal metal bars transverse to the bias current. The effectiveness of the bars in far-infrared bolometers and x-ray microcalorimeters is evaluated. We have examined the effect of the resistivity of the superconducting bilayer on excess noise in bolometer devices. We have also studied the effect of bar density on energy resolution in x-ray devices. We address the question of whether the reduction is noise is necessarily coupled to a reduction in the effective transition sharpness. We propose a fabrication technique experiment to examine the dependence of alpha and noise suppression in similar transverse bar densities.
Author
Noise Reduction; Superconductivity; Calorimeters; Bolometers; Electrical Resistivity

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*.

20040170695 North Carolina Univ., Chapel Hill, NC
Carbon Nanotube Based Anode for High Power Microwave Systems
Zhou, Otto; Washburn, Sean; Sep. 30, 2004; 4 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0396
Report No.(s): AD-A426677; AFRL-SR-AR-TR-04-0505; No Copyright; Avail: CASI; A01, Hardcopy

High power microwave tubes are used for both civilian and military applications. Due to the power requirement, tremendous amounts of electrons (up to 100A/cm2) are extracted from the cathodes and bombard on the anodes with very high kinetic energy. Overheating, out-gassing, and formation of secondary electrons of the anode cause serious problems. Preliminary results at the AFRL suggest that carbon coating can reduce SE. We investigated the effect of carbon nanotube (CNT) coating on the anode surface. Initial experiments show that CNT is more efficient in absorbing SE compared to the reference metal at low energy. Further experiments are required to study and understand the effect at high energy.
DTIC
Anodes; Carbon Nanotubes; Microwave Equipment; Microwave Tubes

20040170720 Pennsylvania Univ., Philadelphia, PA
Structure and Reactivity within Ultrathin Molecular Films
Dai, Hai-Lung; Sep. 27, 2004; 7 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0517
Report No.(s): AD-A426761; AFRL-SR-AR-TR-04-0511; No Copyright; Avail: CASI; A02, Hardcopy

A new technique based on the nonlinear optical phenomenon - second harmonic generation - has been developed for probing the structure of nano- to micrometer thickness thin films made of small and medium size organic molecules. It was found that the magnitude of the inter-molecular interaction plays a critical role in determining the growth mechanism, structure, crystallization kinetics, and phase transitions of the thin molecular films. The nonlinear optical technique can even allow the determination of the orientation and alignment of the molecules at the interface between the thin film and the substrate. Order of the molecules in the interfacial layer affects the crystallization mechanism in the thin film.
DTIC
Molecular Structure; Nonlinear Optics; Reactivity; Thin Films

20040170803 Michigan Univ., Ann Arbor, MI
Atom Manipulation Using Optical Fields
Berman, Paul R.; Sletor, Tycho; Sep. 15, 2004; 7 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0412
Report No.(s): AD-A426903; ARO-41113.21-PH; No Copyright; Avail: Defense Technical Information Center (DTIC)

The long range goal of this project was the creation of nanostructures using light fields to manipulate atoms. By passing an atomic beam through one or more standing wave light fields, it is possible to create modulations in the atomic density having periods which are a fraction of the period of the standing wave light fields. Patterns having periods as small as lambda/10 were observed using optical masks and clear evidence for matter-wave effects were established. Several theoretical methods for achieving sub- lambda matter wave patterns were developed, Moreover it was shown that it is possible to create optical lattices having reduced periodicity using Raman transitions in a novel atom- field geometry Experiments were carried out in both magneto- optical traps and atomic beams. In both experimental set-ups, pulsed standing wave optical fields were used to excite the atoms. At some later time the atoms were probed by a traveling wave field, revealing the spatial patterns that had evolved as a result of the atom-field interaction.
DTIC
Nanostructures (Devices)

20040170805 Vescent Photonics, Inc., Denver, CO
Photonic Nose for Chemo- and Bio-Agent Detection: A Novel Surface Enhanced Raman Approach
Davis, Scott; Sep. 2004; 25 pp.; In English
Contract(s)/Grant(s): F49620-03-C-0053
Report No.(s): AD-A426905; AFRL-SR-AR-TR-04-0510; No Copyright; Avail: CASI; A03, Hardcopy

Critical feasibility concerns, and therefore phase I objectives, are: 1) transfer of the technology from an academic lab (JILA) to industry (Vescent), 2) thin film characterization and definition of a manufacturing protocol to provide reproducible SERS active sites, and 3) demonstration of the Raman enhancement via recording the spectrum of a known analyte. All of the phase I objectives were met. Vescent Photonics worked within the JILA laboratory in order to learn both the synthesis techniques and the metrology methodology associated with photo-generated SERS films. This experience facilitated the design of a Vescent experimental apparatus, which enabled production and analysis of SERS films at the Vescent facility. This was one of the key objectives for technology transfer from JILA ato industry. The polymer films were scrutinized by stylus profilometry, and atomic force microscopy. The process tolerances for uniform film generation were refined, and most notably, the film thickness was determined to be \hlOnm. This is qualitatively different than previous estimates of = lOOnm. Parameter space was explored and a manufacturing protocol was established for reproducible manufacturing of these ultra-thin films. A final objective of this phase I contract was to record the SERS spectrum of a known analayte. Multiple techniques of exposing the SERS- active to known analytes were explored. The best results were obtained via doping of analytes into the polymer film, which yielded spectral features for trans 1-2 bis (3-pyridyl) enhylene (BPE) and toluene. The time resolved nature of these spectra (e.g. blinking) is strongly suggestive of single molecule behavior.
DTIC
Biological Effects; Biological Weapons; Chemical Warfare; Detection; Photons; Raman Spectra

20040170829 California Univ., Berkeley, CA
Electronic Wavefunction Imaging and Spectroscopy in Metallic and Magnetic Nanostructure by Millikelvin Scanning Tunneling Microscopy
Davis, J. C.; Oct. 2004; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-02-1-0043
Report No.(s): AD-A426959; AROD-43360.1-PH-QC; No Copyright; Avail: Defense Technical Information Center (DTIC)

We developed a mK scanning tunneling microscope whereby we can interrogate the wavefunction of donor states at individual dopant atoms to determine if they are useful as qubits.
DTIC
Atomic Spectra; Imaging Techniques; Nanostructure (Characteristics); Nanostructures (Devices); Scanning Tunneling Microscopy; Semiconductors (Materials); Spectroscopy; Wave Functions

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20040161556 NASA Marshall Space Flight Center, Huntsville, AL, USA
Gain-Assisted Superluminal Propagation in Coupled Optical Resonators
Chang, Hong-Rok; Smith, David D.; [2004]; 1 pp.; In English; Optical Society of America Frontiers in Optics Conference, 10-14 Oct. 2004, Rochester, NY, USA; No Copyright; Avail: Other Sources; Abstract Only

We predict superluminal pulse propagation in co-resonant coupled optical resonators, when a gain element is placed in the resonator closest to the excitation waveguide, provided the resonator farthest from the excitation waveguide is under-coupled.
Author
Optical Resonators; Excitation

20040161576 NASA Marshall Space Flight Center, Huntsville, AL, USA
Gamma-Ray Focusing Optics for Small Animal Imaging
Pivovaroff, M. J.; Barber, W. C.; Craig, W. W.; Hasegawa, B. H.; Ramsey, B. D.; Taylor, C.; [2004]; 1 pp.; In English; IEEE Rome 2004 Medical Imaging Conference, 16-22 Oct. 2004, Rome, Italy; No Copyright; Avail: Other Sources; Abstract Only

There is a well-established need for high-resolution radionuclide imaging techniques that provide non-invasive measurement of physiological function in small animals. We, therefore, have begun developing a small animal radionuclide imaging system using grazing incidence mirrors to focus low-energy gamma-rays emitted by I-125, and other radionuclides. Our initial prototype optic, fabricated from thermally-formed glass, demonstrated a resolution of 1500 microns, consistent with the performance predicted by detailed simulations. More recently, we have begun constructing mirrors using a replication technique that reduces low spatial frequency errors in the mirror surface, greatly improving the resolution. Each technique offers particular advantages: e.g., multilayer coatings are easily deposited on glass, while superior resolution is possible with replicated optics. Scaling the results from our prototype optics, which only have a few nested shells, to system where the lens has a full complement of several tens of nested shells, a sensitivity of approx. 1 cps/micro Ci is possible, with the exact number dependent on system magnification and radionuclide species. (Higher levels of efficiency can be obtained with multi-optic imaging systems.) The gamma-ray lens will achieve a resolution as good as 100 microns, independent of the final sensitivity. The combination of high spatial resolution and modest sensitivity will enable in vivo single photon emission imaging studies in small animals.
Author
Gamma Rays; Imaging Techniques; Nonintrusive Measurement; Iodine 125

20040170420 Nuonics, Inc., Winter Park, FL, USA
Ultra-High Temperature Sensors Based on Optical Property Modulation and Vibration-Tolerant Interferometry
Riza, N. A.; Apr. 01, 2004; 36 pp.; In English
Report No.(s): DE2004-824009; No Copyright; Avail: Department of Energy Information Bridge

The goals of the first six months of this project were to lay the foundations for both the SiC front-end optical chip fabrication as well as the free-space laser beam interferometer designs and preliminary tests. In addition, a Phase I goal was to design and experimentally build the high temperature and pressure infrastructure and test systems that will be used in the next 6 months for proposed sensor experimentation and data processing. All these goals have been achieved and are described in detail in the report. Both design process and diagrams for the mechanical elements as well as the optical systems are provided. In addition, photographs of the fabricated SiC optical chips, the high temperature & pressure test chamber instrument, the optical interferometer, the SiC sample chip holder, and signal processing data are provided. The design and experimentation results are summarized to give positive conclusions on the proposed novel high temperature optical sensor technology.
NTIS
Optical Properties; Interferometry; Temperature Sensors

20040170438 Houston Univ., TX, USA
Method of Determining the Thickness and Uniformity of Application for Thermoplastic Pavement Marking Material
Liu, R.; Li, J.; Chen, X.; Chen, Y.; Xing, H.; Oct. 2002; 46 pp.; In English
Report No.(s): PB2005-100542; No Copyright; Avail: CASI; A03, Hardcopy

A laser thickness-measurement device for measuring the thickness of thermoplastic pavement marking material (TPMM) has been successfully developed. The system has been installed onto a pushcart for easy field operation. The device is based on a laser triangulation measurement system and it uses a position sensitive device (PSD) as the detector. The hardware developed includes a laser thickness detector, mechanical scanner, angle encoder, distance encoder, global positioning system (GPS) and interface circuitry, data acquisition and control circuitry, and data display. Software functions developed include data processing, embedded computer control, data filtering and the user interface. The system operates at a sampling rate of 175 kHz, which significantly increases the accuracy and speed of the thickness measurement and provides more quantitative

information for determination of the TPMM and pavement profiles. The flexible hardware design enhances the system's performance under varied pavement conditions. The high response frequency allows the system to quickly adapt to sudden changes in slope and color. Lab and field tests demonstrated that the measured thicknesses were very close to the actual thickness of the tapes measured. Measurement error on smooth pavements (asphalt and concrete) was less than 5 mils. Measurement error on grade 3 surface treatments was within 10 mils.
NTIS
Pavements; Thermoplasticity; Lasers; Laser Applications

20040170641 Rochester Univ., NY
Quantum and Nonlinear Optical Imaging
Boyd, Robert W.; Jul. 2004; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0623
Report No.(s): AD-A426394; ARO-41891.16-PH; No Copyright; Avail: Defense Technical Information Center (DTIC)
This document is the final report of a successful research program in the area of quantum and nonlinear optical imaging. This research area implements ideas and techniques from the fields of quantum optics and quantum information science to perform image formation with sensitivity and resolution exceeding that available using classical techniques. Examples of improved image formation addressed in this work included techniques to form images with resolution exceeding the traditional Rayleigh limit and techniques based on entangled photons to allow the formation of sharp images using photons that have never interacted with the object to be imaged. Quantum imaging systems can also be used to detect weak phase and amplitude objects in the presence of background noise with a sensitivity that exceeds the classical shot-noise limit. Possible long term implications of this work include their implementation in systems for quantum computing and quantum teleportation, thereby greatly increasing their information capacity by exploiting the parallelism intrinsic to image-bearing optical beams.
DTIC
Images; Imaging Techniques; Nonlinearity; Quantum Theory

20040170663 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Atmospheric Simulation Using a Liquid Crystal Wavefront Controlling Device
Brooks, Matthew R.; Mar. 23, 2004; 92 pp.; In English
Report No.(s): AD-A426575; AFIT/GE/ENG/04-01; No Copyright; Avail: Defense Technical Information Center (DTIC)
Test and evaluation of laser warning devices is important due to the increased use of 1aser devices in aerial applications. In this thesis, an atmospheric aberrating system is deve1oped to enable in-1ab testing of laser warning devices. This system employs laser 1ight at 632.8nm from a He1ium-Neon source and a spatial light modulator (SLM) to cause phase changes using a birefringent liquid crystaJ material. Before the system can be used, the SLM phase response must be quantified to ensure proper manipulation of index of refrnction. Additionally, diffraction from the SLM and rea1- world system scaling are addressed. Once completed, the atmospheric simulator is demonstmted and verified. Control of the SLM is achieved by 1oading 256 1evel bitmaps which dictate the desired index of refraction changes (called phase screens). Phase screens are created using a Fourier series technique applied to an atmospheric model in the form of a power spectrum. Five laser propagation scenarios are created, each with a set of screens describing turbulence for a particular case. Outgoing radiation from the SLM is then measured using a CCD targetboard for intensity and a Shack-Hartmann wavefront sensor for phase. Comparing system output phase statistics to atmospheric theory reveals a moderate correlation in a11 turbu1ence cases indicating desired performance. Intensity statistics are compared to the log normal distribution governed by the weak fluctuation regime. An error analysis reveals that strong turbu1ence data matches theory but that weak turbulence data is inconclusive due to measurement precision issues. As an additional check on performance, a wave optics computer simu1ation is created ana1ogous to the 1ab-bench design. Phase and intensity data affirm lab-bench results so that the aberrating SLM system can be operated confidently.
DTIC
Early Warning Systems; Liquid Crystals; Simulation; Wave Fronts

20040170664 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Simulating a Chromotomographic Sensor for Hyperspectral Imaging in the Infrared
Dearinger, Anthony J.; Mar. 2004; 156 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426576; AFIT/GE/ENG/04-05; No Copyright; Avail: Defense Technical Information Center (DTIC)
Hyperspectral imaging systems passively sense radiant electromagnetic energy from a remote scene to form a three

dimension profile of the remote scene. The data contained in this profile describes real images of the remote scene for a certain number of spectral wavelength bands across a finite spectral range of electromagnetic radiation. Typical grating type hyperspectral imaging systems collect spectral electromagnetic radiation in the visible and near infrared spectral range, by incrementally scanning across the spatial extent of the remote scene. The legacy of low optical throughput because of the optical scanning techniques employed in these systems means adapting these systems for spectral ranges extending into the mid wave and long wave infrared is difficult. A chromotomographic imaging system utilizing a sensor optics system with significantly greater optical throughput of electromagnetic radiation has been reported to demonstrate reasonable quality hyperspectral images for finite spectral ranges in the visible, mid wave, and long wave infrared. The spectral electromagnetic radiation collected through the sensor optics system angularly multiplexes the electromagnetic radiation collected from the remote scene using a rotating prism to disperse and spatially separate the electromagnetic radiation spectral components onto a focal plane array detector. Using optics principles and wave optics propagation theory, a software model was designed based on linear systems principles to emulate the point spread function attributes of the chromotomographic sensor, equivalent to the impulse response for a linear system.
DTIC
Imagery; Imaging Techniques; Infrared Radiation; Simulation

20040170727 Universitaet der Bundeswehr, Hamburg
A Contribution to the Development of Angle- Resolving Diffused Light Sensors for Characterizing Surfaces (Ein Beitrag zur Entwicklung von winkelaufloessenden Streulichtsensoren fuer die Oberflaechencharakterisierung)
Kasper, Andre; Jan. 2000; 132 pp.; In German
Report No.(s): AD-A426781; No Copyright; Avail: CASI; A07, Hardcopy

Diffused light processes have been particularly effective for the quality control of surfaces-from atom-sized surfaces to sections of topography. The purpose of this dissertation is to create an angle-resolving sensor for measuring diffused light. An optical fiber diffused light sensor based on the patent of Rothe and Riedel is developed further and a new planar diffused light sensor is also developed. One area of emphasis involves experiments to solve the problem of inverse diffusion.
DTIC
Diffusion; Optical Measuring Instruments; Resolution

20040170760 Old Dominion Univ., Norfolk, VA
Colored Dissolved Organic Matter in Sediments and Seagrass Beds and Its Impact on Benthic Optical Properties of Shallow Water Marine Environments - Data Analysis and Synthesis, and Student Support
Burdige, David J.; Sep. 8, 2004; 16 pp.; In English
Contract(s)/Grant(s): N00014-97-1-0005
Report No.(s): AD-A426835; No Copyright; Avail: CASI; A03, Hardcopy

The optical properties of shallow water coastal environments are a complex function of physical and biogeochemical processes occurring both in sediments and in the water column. Developing models of the optical properties of these environments requires further knowledge of the processes affecting light alteration and modification by biogeochemical reactions in the surficial sediments and at the sediment-water interface. The goal of our work has been to examine one aspect of this problem, namely the impact of dissolved organic matter (DOM) in sediment pore waters on benthic optical properties.
DTIC
Coasts; Color; Dissolved Organic Matter; Marine Environments; Ocean Bottom; Optical Properties; Sea Grasses; Sediments; Shallow Water; Students

20040170802 Universidad Politecnica de Madrid, Madrid
Dispersion Effects in Nonlinear Light Propagation in 1-D Fiber Gratings
Martel, Carlos; Sep. 12, 2003; 81 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8655-02-M4087
Report No.(s): AD-A426901; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report results from a contract tasking Universidad Politecnica of Madrid as follows: The contractor will investigate the use of the so-called nonlinear coupled mode equations (NLCME) to obtain approximate solutions of Maxwells equations for light propagation in periodic optical fiber structures. In particular, one class of solutions called 'Gap Solitons.' exhibit the ability to propagate at any speed from zero to the local speed of light, and offer great promise for various optical storage and buffer devices. This project will test the accuracy of the NLCME approximation for the propagation of gap solitons in optical

fibers with material dispersion, by comparing NLCME solutions with exact solutions of the Maxwell's equations.
DTIC
Fiber Optics; Nonlinearity; Transmission Lines

20040170820 California Univ., San Diego, La Jolla, CA
Adaptive Lens Inspired by Bio-Visual Systems
Lo, Yu-Hwa; Oct. 6, 2004; 18 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0426
Report No.(s): AD-A426945; No Copyright; Avail: CASI; A03, Hardcopy

During the DARPA BOSS I program, the UCSD team has made substantial progress in the following areas: (a) We have identified and demonstrated the merits of PDMS elastomer for lens membranes. The PDMS-based fluidic lens process has been proven to be simple, controllable, and scalable to form lenses from 10 urn to several centimeters in diameter. (b) We have demonstrated fluidic tunable lenses with an exceedingly wide tuning range and strong lens power. Most tunable lenses that have been demonstrated today can only achieve a large f-number (or weak lens power)in the order of 10 to 15. Our tunable lens is the first and only device that can achieve an f-number of 0. 7 and an extremely wide tuning range from f# = 0.7 to \g 100. The strong lens power and the wide tuning range are the keys to many superior and unique functions of imaging systems. (c) We have successfully extended the single-chamber fluidic lens structure into multi-chamber lens structures. As a result, one can not only achieve a wide tuning range in focal distance, f- number, and numerical aperture, but also obtain the extreme structure can be transformed into any of the following structures: plano-convex, plano-concave, double-convex, double-concave, positive-meniscus, and negative-miniscus, reversibly.
DTIC
Adaptation; Lenses; Visual Acuity; Visual Signals

20040171144 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Wavefront Sensing via High Speed DSP
Smith, J. Scott; Dean, Bruce; [2004]; 27 pp.; In English; Tech Days Conference, 17-19 Aug. 2004, Huntsville, AL, USA; No Copyright; Avail: CASI; A03, Hardcopy

Future light-weighted and segmented primary mirror systems require active optical control to maintain mirror positioning and figure to within nanometer tolerances. Current image-based wavefront sensing approaches rely on post-processing techniques to return an estimate of the aberrated optical wavefront with accuracies to the nanometer level. But the lag times between wavefront sensing, and then control, contributes to a significant latency in the wavefront sensing implementation. In this analysis we demonstrate accelerated image-based wavefront sensing performance using multiple digital signal processors (DSP's). The computational architecture is discussed as well as the heritage leading to the approach.
Author
Detection; Signal Processing; Digital Systems; Optical Control; Wave Fronts

20040171330 Ecole Polytechnique, Palaiseau, France
LULI Annual Report, 2003. Plasma Physics on LULI Facilities
Amiranoff, F.; Jun. 2004; 250 pp.; In French
Report No.(s): PB2005-100298; No Copyright; Avail: CASI; A11, Hardcopy

Work performed at LULI during the year 2003 is described in a set of 59 original contributions covering topics such as: laser-matter interaction, laser acceleration, fast ignition, shocks, hydrodynamics, and equations of states, atomic physics, X-ray lasers, material treatment, optics, and laser technology research and development (R&D), instrumentation.
NTIS
Plasma Physics; Laser Applications; Electromagnetic Interactions

20040171432 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Figuring Large Mandrels for Forming X-Ray Mirrors Substrates
Wright, Geraldine; Fleetwood, Charles; Content, David; Saha, Timo; Kolos, Linette; Colella, David; [2004]; 12 pp.; In English; Technology Days in Government MSFC, 17-19 Aug. 2004, Huntsville, AL, USA; Copyright; Avail: CASI; A03, Hardcopy

Constellation X mirrors are discussed in this presentation. Topics include:assemblies, mirror segments, optical assemble

pathfinder mandrels, the figuring process, and a best quadrant,clear aperture, and full aperture.
Derived from text
Mandrels; Telescopes

20040171447 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Absolute Measurement of Tilts via Fourier Analysis of Interferograms
Toland, Ronald W.; [2004]; 5 pp.; In English; SPIE - Optical Science and Technology Annual Meeting, 2-6 Aug. 2004, Denver, CO, USA; No Copyright; Avail: CASI; A01, Hardcopy

The Fourier method of interferogram analysis requires the introduction of a constant tilt into the interferogram to serve as a carrier signal for information on the figure of the surface under test. This tilt is usually removed in the first steps of analysis and ignored thereafter. However, in the problem of aligning optical components and systems, knowledge of part orientation is crucial to proper instrument performance. This paper outlines an algorithm which uses the normally ignored carrier signal in Fourier analysis to compute an absolute tilt (orientation) of the test surface. We also provide a brief outline of how this technique, incorporated in a rotating Twyman-Green interferometer, can be used in alignment and metrology of optical systems.
Author
Fourier Analysis; Interferometers; Attitude (Inclination); Optical Equipment; Signal Analysis; Alignment

20040171452 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High Precision Metrology on the Ultra-Lightweight W 50.8 cm f/1.25 Parabolic SHARPI Primary Mirror using a CGH Null Lens
Antonille, Scott; [2004]; 1 pp.; In English; SPIE Conference, 19-25 Jun. 2004, Glasgow, Scotland, UK
Report No.(s): AS04-AS08-85; No Copyright; Avail: Other Sources; Abstract Only

For potential use on the SHARPI mission, Eastman Kodak has delivered a 50.8cm CA f/1.25 ultra-lightweight UV parabolic mirror with a surface figure error requirement of 6nm RMS. We address the challenges involved in verifying and mapping the surface error of this large lightweight mirror to +/-3nm using a diffractive CGH null lens. Of main concern is removal of large systematic errors resulting from surface deflections of the mirror due to gravity as well as smaller contributions from system misalignment and reference optic errors. We present our efforts to characterize these errors and remove their wavefront error contribution in post-processing as well as minimizing the uncertainty these calculations introduce. Data from Kodak and preliminary measurements from NASA Goddard will be included.
Author
Metrology; Mirrors; Errors; Deflection; Misalignment

20040171453 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Swift Gamma Ray Burst Mission
Gehrels, N.; Chincarini, G.; Giommi, P.; Mason, K. O.; Nousek, J. A.; Wells, A. A.; White, N. E.; Barthelmy, S. D.; Burrows, D. N.; Cominsky, L. R., et al.; January 2004; 38 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The Swift mission: scheduled for launch in early 2004: is a multiwavelength observatory for gamma-ray burst (GRB) astronomy. It is the first-of-its-kind autonomous rapid-slewing satellite for transient astronomy and pioneers the way for future rapid-reaction and multiwavelength missions. It will be far more powerful than any previous GRB mission, observing more than 100 bursts per year and performing detailed X-ray and UV/optical afterglow observations spanning timescales from 1 minute to several days after the burst. The objectives are to: 1) determine the origin of GFU3s; 2) classify GRBs and search for new types; 3) study the interaction of the ultra-relativistic outflows of GRBs with their surrounding medium; and 4) use GRBs to study the early universe out to z greater than 10. The mission is being developed by a NASA-led international collaboration. It will carry three instruments: a new-generation wide-field gamma-ray (15-150 keV) detector that will detect bursts, calculate 1-4 arcmin positions: and trigger autonomous spacecraft slews; a narrow-field X-ray telescope that will give 5 arcsec positions and perform spectroscopy in the 0.2 to 10 keV band; and a narrow-field UV/optical telescope that will operate in the 170-600 nm band and provide 0.3 arcsec positions and optical finding charts. Redshift determinations will be made for most bursts. In addition to the primary GRB science, the mission will perform a hard X-ray survey to a sensitivity of approx. 1 mCrab (approx. 2 x l0(exp -11) erg/sq cm s in the 15-150 keV band), more than an order of magnitude better than HEAO A-4. A flexible data and operations system will allow rapid follow-up observations of all types of high-energy transients. with rapid data downlink and uplink available through the NASA TDRSS system. Swift transient data will be rapidly distributed to the astronomical community and all interested observers are encouraged to participate in follow-up

measurements. A Guest Investigator program for the mission will provide funding for community involvement. Innovations from the Swift program applicable to the future include: 1) a large-area gamma-ray detector us- ing the new CdZnTe detectors; 2) an autonomous rapid slewing spacecraft; 3) a multiwavelength payload combining optical, X-ray, and gamma-ray instruments; 4) an observing program coordinated with other ground-based and space-based observatories; and 5) immediate multiwavelength data flow to the community. The mission is currently funded for 2 years of operations and the spacecraft will have a lifetime to orbital decay of approx. 8 years.
Author
Gamma Ray Bursts; Observatories; Solar Optical Telescope; Spaceborne Telescopes

20040171470 NASA Goddard Space Flight Center, Greenbelt, MD, USA
TPF Telescope I and T Concepts
Smith, Andrew; Ohl, Raymond; [2004]; 18 pp.; In English; Terrestrial Planet Finder Coronagraph Minimum Mission Review, 28-29 Apr. 2004; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation describes potential verification and testing procedures for the primary mirror of the Terrestrial Planet Finder (TPF).
CASI
Spaceborne Telescopes; Optical Measurement; Static Tests; Ground Tests

20040171479 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Metrology for the Segmented Optics on the Constellation-X Spectroscopy X-Ray Telescope
Content, David; Colella, David; Fleetwood, Charles; Hadjimichael, Theo; Lehan, John; McMann, Joseph; Reid, Paul; Saha, Timo; Wright, Geraldine; Zhang, William; [2004]; 1 pp.; In English; SPIE Conference, 19-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

We present the metrology requirements and metrology implementation necessary to prove out the reflector technology for the Constellation X(C-X) spectroscopy X-ray telescope (SXT). This segmented, 1.6m diameter highly nested Wolter-1 telescope presents many metrology and alignment challenges. In particular, these mirrors have a stringent imaging error budget as compared to their intrinsic stiffness; This is required for Constellation-X to have sufficient effective area with the weight requirement. This has implications for the metrology that can be used. A variety of contract and noncontact optical profiling and interferometric methods are combined to test the formed glass substrates before replication and the replicated reflector segments.The reflectors are tested both stand-alone and in-situ in an alignment tower.Some of these methods have not been used on prior X-ray telescopes and some are feasible only because of the segmented approach used on the SXT. Methods discussed include high precision coordinate measurement machines using very low force or optical probe axial interferometric profiling azimuthal circularity profiling and use of advanced null optics such as conical computer generated hologram (CGHs).
Author
Holography; Interferometry; Mirrors; Metrology; Spaceborne Astronomy; Satellite Constellations

20040171482 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High-Accuracy Surface Figure Measurement of Silicon Mirrors at 80 K
Blake, Peter; Mink, Ronald G.; Chambers, John; Davila, Pamela; Robinson, F. David; [2004]; 11 pp.; In English; SPIE Conference, 19-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: CASI; A03, Hardcopy

This report describes the equipment, experimental methods, and first results at a new facility for interferometric measurement of cryogenically-cooled spherical mirrors at the Goddard Space Flight Center Optics Branch. The procedure, using standard phase-shifting interferometry, has an standard combined uncertainty of 3.6 nm rms in its representation of the two-dimensional surface figure error at 80, and an uncertainty of plus or minus 1 nm in the rms statistic itself. The first mirror tested was a concave spherical silicon foam-core mirror, with a clear aperture of 120 mm. The optic surface was measured at room temperature using standard absolute techniques; and then the change in surface figure error from room temperature to 80 K was measured. The mirror was cooled within a cryostat. and its surface figure error measured through a fused-silica window. The facility and techniques will be used to measure the surface figure error at 20K of prototype lightweight silicon carbide and Cesic mirrors developed by Galileo Avionica (Italy) for the European Space Agency (ESA).
Author
Mirrors; Cryogenic Cooling; Silicon Carbides; Accuracy; Surface Geometry

20040171490 NASA Langley Research Center, Hampton, VA, USA

Advancement of High Power Quasi-CW Laser Diode Arrays For Space-based Laser Instruments

Amzajerdian, Farzin; Meadows, Byron L.; Baker, nathaniel R.; Baggott, Renee S.; Singh, Upendra N.; Kavaya, Michael J.; October 15, 2004; 6 pp.; In English; SPIE's 4th International Asia-Pacific Symposium on Remote Sensing of the Atmosphere, Ocean, Environment, and Space, 8-12 Nov. 2004, Honolulu, HI, USA

Contract(s)/Grant(s): 258-80-48; No Copyright; Avail: CASI; A02, Hardcopy

Space-based laser and lidar instruments play an important role in NASA s plans for meeting its objectives in both Earth Science and Space Exploration areas. Almost all the lidar instrument concepts being considered by NASA scientist utilize moderate to high power diode-pumped solid state lasers as their transmitter source. Perhaps the most critical component of any solid state laser system is its pump laser diode array which essentially dictates instrument efficiency, reliability and lifetime. For this reason, premature failures and rapid degradation of high power laser diode arrays that have been experienced by laser system designers are of major concern to NASA. This work addresses these reliability and lifetime issues by attempting to eliminate the causes of failures and developing methods for screening laser diode arrays and qualifying them for operation in space.

Author

Lasers; Diodes; Optical Radar; Solid State Lasers; Satellite-Borne Instruments

20040171518 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Spherical Primary Optical Telescope (SPOT): An Architecture Demonstration for Cost-effective Large Space Telescopes

Feinberg, Lee; Hagopian, John; Budinoff, Jason; Dean, Bruce; Howard, Joe; [2005]; 1 pp.; In English; IEEE Aerospace Conference, 6-13 Mar. 2004, Big Sky, MT, USA; No Copyright; Avail: Other Sources; Abstract Only

This paper summarizes efforts underway at the Goddard Space Flight Center to demonstrate a new type of space telescope architecture that builds on the rigid, segmented telescope heritage of the James Webb Space Telescope but that solves several key challenges for future space telescopes. The architecture is based on a cost-effective segmented spherical primary mirror combined with a unique wavefront sensing and control system that allows for continuous phasing of the primary mirror. The segmented spherical primary allows for cost-effective 3-meter class (eg, Midex and Discovery) missions as well as enables 30-meter telescope solutions that can be manufactured in a reasonable amount of time and for a reasonable amount of money. The continuous wavefront sensing and control architecture enables missions in low-earth-orbit and missions that do not require expensive stable structures and thermal control systems. For the 30-meter class applications, the paper discusses considerations for assembling and testing the telescopes in space. The paper also summarizes the scientific and technological roadmap for the architecture and also gives an overview of technology development, design studies, and testbed activities underway to demonstrate it s feasibility.

Author

Spaceborne Telescopes; Segmented Mirrors; Cost Effectiveness

20040171540 NASA Marshall Space Flight Center, Huntsville, AL, USA

Fabrication and Testing of Binary-Phase Fourier Gratings for Nonuniform Array Generation

Keys, Andrew S.; Crow, Robert W.; Ashley, Paul R.; Nelson, Tom R., Jr.; Parker, Jack H.; Beecher, Elizabeth A.; [2004]; 3 pp.; In English; Optical Society of America's Diffractive Optics and Micro-Optics Conference, 9-13 Oct. 2004, Rochester, NY, USA; Copyright; Avail: CASI; A01, Hardcopy

This effort describes the fabrication and testing of binary-phase Fourier gratings designed to generate an incoherent array of output source points with nonuniform user-defined intensities, symmetric about the zeroth order. Like Dammann fanout gratings, these binary-phase Fourier gratings employ only two phase levels to generate a defined output array. Unlike Dammann fanout gratings, these gratings generate an array of nonuniform, user-defined intensities when projected into the far-field regime. The paper describes the process of design, fabrication, and testing for two different version of the binary-phase grating; one designed for a 12 micron wavelength, referred to as the Long-Wavelength Infrared (LWIR) grating, and one designed for a 5 micron wavelength, referred to as the Mid-Wavelength Infrared Grating (MWIR).

Author

Fabrication; Optical Filters; Infrared Filters; Performance Tests; Gratings (Spectra)

20040171554 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Overview of the James Webb Space Telescope Project

Sabelhaus, Phillip A.; Decker, John; [2004]; 1 pp.; In English; SPIE Conference, 19-26 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

The JWST project at the GSFC is responsible for the development, launch, operations and science data processing for the James Webb Space Telescope. The JWST project is currently in phase B with its launch scheduled for August 2011. The project is a partnership between NASA, ESA and CSA. The U.S. JWST team is in place with the selection of Northrop Grumman Space Technology (NGST) as the prime contractor for the telescope and the Space Telescope Science Institute (STScI) as the mission operations and science data processing lead. This paper will provide an overview of the current JWST architecture and mission status including technology developments and risks.
Author
Data Processing; James Webb Space Telescope; Spaceborne Telescopes

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20040170686 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Magnetogasdynamic Flow Acceleration in a Scramjet Nozzle
Harrington, Brian H.; Jun. 2004; 83 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426653; AFIT/GAE/ENY/04-J03; No Copyright; Avail: Defense Technical Information Center (DTIC)

The effect of magnetogasdynamic (MGD) interactions on flow acceleration and thrust in a scramjet accelerator/nozzle are examined numerically at a free-stream flight condition of Mach 8. The parameters of conductivity pattern and load factor are varied in both inviscid and viscous flow regimes with the intent of increasing axial force exerted on the flow through a scramjet accelerator. The numerical code solves the Navier-Stokes equations with additional source terms for the MGD forces and energy interactions. An accelerating Lorentz force is applied to the flow resulting from a constant magnetic field and an electric field produced by two continuous side wall electrodes. The specific thrust across the accelerator/nozzle is improved in the MGD solutions over the non-MGD solutions when the load factor is increased and an electron beam type ionization pattern is used. The largest increase in specific thrust is observed in viscous and inviscid flow regimes with a load factor of 1.8 producing 226% and 154% thrust increases, respectively. Flows showing increases in specific thrust with higher load factors also show significant increases in temperature due to the energy interaction term.
DTIC
Magnetohydrodynamics; Ramjet Engines; Supersonic Combustion Ramjet Engines

20040171232 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Superposed Epoch Analysis of Ring Current Geoeffectiveness Related to Solar Wind and Plasma Sheet Drivers
Liemohm, M. W.; Kozyra, J. U.; Thomsen, M. F.; Borovsky, J. E.; Gahurthakurta, Madulika, Technical Monitor;]2004]; 9 pp.; In English
Contract(s)/Grant(s): NAG5-10850; No Copyright; Avail: CASI; A02, Hardcopy

The goal of that proposal was to examine the relationship between solar wind drivers and ring current dynamics through data analysis and numerical simulations. The data analysis study was a statistical examination (via superposed epoch analyses) of a solar cycle's worth of storm data. Solar wind data, geophysical indices, and geosynchronous plasma data were collected for every time period with Dst\h -50 nT from 1989 through 2002, and the storm list now exceeds 400 entries. This work was first conducted by a summer undergraduate student, Mr. John Vann (University of Kansas), with funding from the NSF Research Experience for Undergraduates program. It was then continued by a University of Michigan graduate student, Mr. Jichun Zhang. Mr. Zhang is now in his fourth year at U-M and is progressing very well toward a PhD in space science. His dissertation will be based on his data analysis and modeling efforts using this geomagnetic storm database. The results of the data analysis study have been the focus of several conference presentations, and the first manuscript has just been published. Two additional papers are presently being prepared, one on average (superposed) solar wind features for various storm subsets (e.g., intense storms at solar maximum), and another on geosynchronous plasma features for these same storm subsets. The latter result was highlighted by the TR&T program director in his presentation at the COSPAR meeting this summer.
Derived from text
Solar Wind; Plasmas (Physics); Ring Currents; Plasma Interactions

20040171624 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Thermal Control Utilizing an Thermal Control Utilizing an Two-Phase Loop with High Heat Flux Source

Jeong, Seong-Il; Didion, Jeffrey; [2004]; 8 pp.; In English; International Mechanical Engineering Congress and Exposition, 13-19 Nov. 2004, Anaheim, CA, USA

Report No.(s): IMECE2004-60210; No Copyright; Avail: CASI; A02, Hardcopy

The electric field applied in dielectric fluids causes an imbalance in the dissociation-recombination reaction generated free space charges. The generated charges are redistributed by the applied electric field resulting in the heterocharge layers in the Vicinity of the electrodes. Proper design of the electrodes generates net axial flow motion pumping the fluid. The electrohydrodynamic (EHD) conduction pump is a new device that pumps dielectric fluids utilizing heterocharge layers formed by imposition of electrostatic fields. This paper evaluates the experimental performance of a two-phase breadboard thermal control loop consisting of an EHD conduction pump, condenser, pre-heater, high heat flux evaporator (HE), transport lines, and reservoir (accumulator). The generated pressure head and the maximum applicable heat flux are experimentally determined at various applied voltages and sink temperatures. Recovery from dryout condition by increasing the applied voltage to the pump is also demonstrated.

Author

Heat Flux; Temperature Control; Electrohydrodynamics; Conduction; Heat Sources

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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*.

20040170445 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Istituto Nazionale di Fisica Nucleare, Frascati, Italy, Brookhaven National Lab., Upton, NY, Los Alamos National Lab., NM

CW Energy Recovery Operation of an XFEL

Sekutowicz, J.; Bogacz, S. A.; Ferrario, M.; Ben-Zvi, I.; Rose, J.; 2004; In English

Report No.(s): DE2004-820179; No Copyright; Avail: National Technical Information Service (NTIS)

Commissioning of two large coherent light facilities at SLAC and DESY should begin in 2008 and in 2011 respectively. In this paper we look further into the future, hoping to answer, in a very preliminary way, two questions. First: 'What will the next generation of the XFEL facilities look like.' Believing that super-conducting technology offers several advantages over room-temperature technology, such as high quality beams with highly populated bunches and the possibility of energy recovery or higher overall efficiency, we focus this preliminary study on the superconducting option. From this belief the second question arises: 'What modifications in superconducting technology and in machine design are needed, as compared to the present DESY XFEL, and what kind of R&D program is required over the next few years to arrive at a technically feasible solution with even higher brilliance and increased overall conversion of AC power to photon beam power'. In this paper we will very often refer to and profit from the DESY XFEL design, acknowledging its many technically innovative solutions.

NTIS

Superconductivity; Research and Development; Coherent Light

20040170447 Arizona Univ., Tucson, AZ, USA

Early Stage Crystallization Kinetics of Lithium Disilicate and Sodium Silicate Glasses

Burgner, L. L.; Weinberg, M. C.; Simmons, J. H.; 2004; 66 pp.; In English

Report No.(s): DE2004-811186; No Copyright; Avail: Department of Energy Information Bridge

Crystallization kinetics of glasses remains an active area of inquiry due to its technological and scientific importance. In the realm of technology, knowledge of crystal nucleation and growth rates in glasses at different temperatures is essential for preparing glass-ceramics, where promoting and controlling nucleation and growth of the desired crystal phases in the desired proportions offers a means of tailoring the properties of the final material. Knowledge of crystallization kinetics is also vital for predicting glass stability in applications where crystallization must be avoided, such as optical fibers, where crystal nucleation and growth would degrade the performance of the material. Understanding transformation kinetics is also important

for preparing novel glasses with unique properties, for instance, to aid in determining the quench rate necessary to obtain an amorphous form of a given substance, e.g. metallic glasses.
NTIS
Crystallization; Metallic Glasses; Kinetics

20040171092 Massachusetts Inst. of Tech., Lexington, MA, USA, AmberWave Systems Corp., Salem, NH, USA, Lockheed Martin Corp., Schenectady, NY, USA
Self-Organized Vertical Superlattices in Epitaxial GaInAsSb
Wand, C. A.; Vineis, C. J.; Calawa, D. R.; Feb. 09, 2004; 20 pp.; In English
Report No.(s): DE2004-822281; LM-04K002; No Copyright; Avail: Department of Energy Information Bridge

Self-organized superlattices are observed in GaInAsSb epilayers grown nominally lattice matched to vicinal GaSb substrates. The natural superlattice (NSL) is detected at the onset of growth; is continuous over the lateral extent of over several microns; and persists vertically throughout several microns of the epilayer. Furthermore, the NSL is inclined by an additional 4(sup o) with respect to the vicinal (001) GaSb substrate. The tilted NSL intersects the surface of the epilayer, and the NSL period is geometrically correlated with surface undulations. While the principle driving force for this type of phase separation arises from solution thermodynamics, the mechanism for the self-organized microstructure is related to local strains associated with surface undulations. By using a substrate with surface undulations, the tilted NSL can be induced in layers with alloy compositions that normally do not exhibit this self-organized microstructure under typical growth conditions. These results underscore the complex interactions between compositional modulations and morphological perturbations.
NTIS
Superlattices; Microstructure; Gallium Antimonides

20040171347 California Univ., Berkeley, CA, USA
Nitrogen Doped Zinc Oxide Thin Film
Li, S. X. Z.; 2003; In English
Report No.(s): DE2004-821916; No Copyright; Avail: National Technical Information Service (NTIS)

To summarize, polycrystalline ZnO thin films were grown by reactive sputtering. Nitrogen was introduced into the films by reactive sputtering in an NO(sub 2) plasma or by N(sup+) implantation. All ZnO films grown show n-type conductivity. In unintentionally doped ZnO films, the n-type conductivities are attributed to Zn(sub i), a native shallow donor. In NO(sub 2)-grown ZnO films, the n-type conductivity is attributed to (N(sub 2))(sub O), a shallow double donor. In NO(sub 2)-grown ZnO films, 0.3 atomic nitrogen was found to exist in the form of N(sub 2)O and N(sub 2). Upon annealing, N(sub 2)O decomposes into N(sub 2) and O(sub 2). In furnace-annealed samples N(sub 2) redistributes diffusively and forms gaseous N(sub 2) bubbles in the films. Unintentionally doped ZnO films were grown at different oxygen partial pressures. Zinc was found to form even at oxygen-rich condition and led to n-type conductivity.
NTIS
Doped Crystals; Nitrogen Oxides; Oxide Films; Thin Films; Zinc Oxides

20040171370 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
QCD/SM Working Group: Summary Report
Dobbs, M.; Mar. 09, 2004; In English
Report No.(s): DE2004-823450; No Copyright; Avail: National Technical Information Service (NTIS)

Among the many physics processes at TeV hadron colliders, we look most eagerly for those that display signs of the Higgs boson or of new physics. We do so however amid an abundance of processes that proceed via Standard Model (SM) and in particular Quantum Chromodynamics (QCD) interactions, and that are interesting in their own right. Good knowledge of these processes is required to help us distinguish the new from the known. Their theoretical and experimental study teaches us at the same time more about QCD/SM dynamics, and thereby enables us to further improve such distinctions. This is important because it is becoming increasingly clear that the success of finding and exploring Higgs boson physics or other New Physics at the Tevatron and LHC will depend significantly on precise understanding of QCD/SM effects for many observables. To improve predictions and deepen the study of QCD/SM signals and backgrounds was therefore the ambition for our QCD/SM working group at this Les Houches workshop. Members of the working group made significant progress towards this on a number of fronts. A variety of tools were further developed, from methods to perform higher order perturbative calculations or various types of resummation, to improvements in the modeling of underlying events and parton showers. Furthermore,

various precise studies of important specific processes were conducted. A significant part of the activities in Les Houches revolved around Monte Carlo simulation of collision events.
NTIS
Particle Accelerators; Hadrons; Higgs Bosons

20040171373 College of William and Mary, Williamsburg, VA, USA, Norfolk State Univ., VA, USA
Measurements of the Proton Electric Form Factor at Jefferson Lab
Pentchev, L.; Perdrisat, C. F.; Punjabi, V.; 2004; In English
Report No.(s): DE2004-824734; No Copyright; Avail: National Technical Information Service (NTIS)

The ratio of the electric to magnetic proton form factors, G(sub E(sub p))/G(sub M(sub p)), has been obtained in two Hall A experiments, by measuring the polarization of the recoil proton in the elastic scattering of polarized electrons,(rvec e)p(yields) e(rvec p), covering the Q(sup 2) range of 0.5 to 5.6 GeV(sup 2). A linear decrease of the form factor ratio over the whole range is observed in contrast to the previous measurements done with Rosenbluth separation method. The polarization technique discussed here, reduces drastically the systematic uncertainties of the results as compared with the Rosenbluth separation measurements.
NTIS
Elastic Scattering; Form Factors; Recoil Protons

20040171499 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Assurance Against Radiation Effects on Electronics
LaBel, Kenneth A.; [2004]; 27 pp.; In English; Quality Leadership, 28 Sep. 2004, Orlando, FL, USA; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: The Space Radiation Environment. The Effects on Electronics. The Environment in Action. NASA Approaches to Commercial Electronics: the mission mix, flight projects, and proactive research. Final Thoughts: atomic interactions, direct ionization, interaction with nucleus.
CASI
Extraterrestrial Radiation; Radiation Effects; Electronic Equipment

20040171664 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Angular Effects in Proton-Induced Single-Event Upsets in Silicon-on-Sapphire and Silicon-on-Insulator Devices
Kniffin, S. D.; Sanders, A. B.; Reed, R. A.; LaBel, K. A.; Liu, M. S.; Tabbert, C. J.; Swonger, J. W.; McCabe, J. F.; Gardner, G. A.; Lintz, J., et al.; [2004]; 4 pp.; In English; 2004 IEEE Nuclear and Space Radiation Effects Conference, 19-23 Jul. 2004, Atlanta, GA, USA
Contract(s)/Grant(s): DTRA-IACRO-03-40351; DTRA-IACRO-04-40641; No Copyright; Avail: CASI; A01, Hardcopy

We present new data in the ongoing effort to bound the effect of proton angle of incidence on the single-event upset (SEU) rate in silicon-on-sapphire (SOS) and silicon-on-insulator (SOI) devices.
Author
Data Acquisition; Single Event Upsets; Protons

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*.

20040171192 NASA Goddard Space Flight Center, Greenbelt, MD, USA
How To Be A Scientist
Figueroa-Feliciano, Enectali; [2004]; 1 pp.; In English; Talk on becoming a NASA Scientist, 18 Jun. 2004, New Haven, CT, USA; No Copyright; Avail: Other Sources; Abstract Only

I will talk about my personal experiences to a group of students and discuss with them the different paths to becoming a NASA Scientist.
Author
Scientists; Education; Occupation

20040171284 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Implementing Recommendations of the Columbia Accident Investigation Board
Ottens, B.; La, A.; Brown, T.; Parker, B.; Jenings, D.; Townsend, J., et al.; [2004]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

As many are aware, a piece of insulating foam liberated itself from the external tank and impacted the leading edge of Columbia during ascent on STS-107. It is believed that this impact left a hole in the thermal protection system (TPS), which protects the shuttle from hot plasma generated during re-entry. Unfortunately, the orbiter did not have the margin to withstand this compromise, and it is believed that the result of these events caused the loss of crew and orbiter.
Author
Accident Investigation; Foams; External Tanks; Insulation; Space Transportation System

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20040161583 NASA Marshall Space Flight Center, Huntsville, AL, USA
Lessons for STEP from GP-6
Kolodziejczak, Jeff; [2004]; 1 pp.; In English; Testing the Equivalence Principle on Ground and in Space, 20-24 Sep. 2004, Pescara, Italy; No Copyright; Avail: Other Sources; Abstract Only

The STEP concept and GP-B share a much heritage. The development, verification and recent launch and initialization of GP-B can therefore act as a pathfinder for the shared aspects of STEP. This talk describes the common characteristics of STEP and GP-B and discusses potential applications of GP-B lessons-learned to a stronger flight-heritage based concept for STEP.
Author
Gravity Probe B; Gravitational Effects

20040170517 Instituto Politecnico de Setubal, Setubal, Portugal
Business Process Reengineering And e-Commerce: Croatian Perspective
Vuksic, Vesna Bosilj; ICEIS 2001; [2001], pp. 48; In English; See also 20040170490; Copyright; Avail: Other Sources

The Internet is altering the ways in which businesses operate and interact with customers, suppliers and partners. According to recognized trends, business process reengineering should influence not only internal, but also inter-organizational processes in order to support the demands of e-commerce. The paper stresses the necessity for organizational restructuring in the context of global information connectivity (e-commerce). The characteristics and perspectives of business process reengineering efforts in Croatia are presented. The research is based on a questionnaire about Business Process Reengineering (BPR) projects implemented in Croatian companies. The main goal of the paper was to identify whether the managers of country in the transition have recognized the importance of business process reengineering and e-commerce for their companies.
Author
Electronic Commerce; Internets; Commerce

20040170525 Instituto Politecnico de Setubal, Setubal, Portugal
The Meeting Report Process: Bridging EMS With PDA
Costa, Carlos J.; Antunes, Pedro; Dias, Joao Ferreira; ICEIS 2001; [2001], pp. 48-49; In English; See also 20040170490; Copyright; Avail: Other Sources

Personal Digital Assistants (PDA) are important tools to support personal processes. However, their contribution to co-operative processes, like meetings, is reduced. On the other hand, the link between meetings and other processes existent in organizations is also a problem. This paper discusses the integration of results produced during meeting sessions supported by Electronic Meeting Systems (EMS) with other processes, especially the ones supported by scheduling tools implemented by PDA. The paper develops a framework linking 'personal data' and 'meeting data.' The framework originated a combined PDA-EMS system. The system was experimented by an organisation in order to evaluate the concept.
Author
Conferences; Reports

20040170529 Instituto Politecnico de Setubal, Setubal, Portugal

Multi-Agent Dynamic Scheduling And Re-Scheduling With Global Temporal Constraints

Reis, Joaquim; Mamede, Nuno; ICEIS 2001; [2001], pp. 21; In English; See also 20040170490; Copyright; Avail: Other Sources

A co-ordination mechanism is proposed for multi-agent production-distribution cooperative scheduling problems, based on a purely temporal perspective. This mechanism is based on communication among pairs of client-supplier agents involved in the problem, and allows agents to locally perceive hard global temporal constraints. By exchanging limited specific information, the agents are able to recognize non over-constrained problems and, in that case, rule out non temporally-feasible solutions and establish an initial solution. The information is then used to guide re-scheduling and repair the initial solution and converge to a final one.

Author

Scheduling; Information Dissemination; Dynamic Models

20040170533 Instituto Politecnico de Setubal, Setubal, Portugal

Experiences In The Development Of Information Systems In An Industrial Innovation Context

Soares, Antonio Lucas; Gaida, Waldemar; Schmidt, Christian; ICEIS 2001; [2001], pp. 50; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper describes the methods and experiences of developing of an information system in an industrial innovation context. The case analysed respects to a system supporting quality management tasks of working teams in industrial companies, developed within a research & development EU funded project. The initial concept of the system is described first, followed by the way how requirements where elicited and structured and the system specified. Next, design and prototyping are analysed, detailing the end-users evaluation approach. Conclusions are drawn on the opportunities and difficulties of R&D involving industrial enterprises.

Author

Information Systems; Industrial Management

20040170535 Instituto Politecnico de Setubal, Setubal, Portugal

A GDSS For Supporting Management Decisions

Carneiro, Alberto; ICEIS 2001; [2001], pp. 31; In English; See also 20040170490; Copyright; Avail: Other Sources

This article is concerned with the decision process and examines the relationships among strategic alternatives' evaluation, groupware technology, and group decision support systems (GDSS). The whole evaluation and comparison process includes two phases: the establishment and selection of basic strategic evaluation criteria and the appreciation of the ranking of the strategic alternatives. A GDSS model has been developed and used to support the evaluation of strategic alternatives. The experimental results show that the proposed model produces better results in evaluating strategic alternatives with multicriteria methods. The major findings are discussed and directions for future research are suggested.

Author

Decision Support Systems; Management

20040170536 Instituto Politecnico de Setubal, Setubal, Portugal

Managing Risk in Extended Enterprises

Vassiliadis, B.; Tsakalidis, A.; Giotopoulos, K.; Likothanassis, S.; Bogonikolos, N.; Gatonmatis, P.; Platilostas, K.; ICEIS 2001; [2001], pp. 47-48; In English; See also 20040170490; Copyright; Avail: Other Sources

Because we have been involved for many years in both the Computer Supported Cooperative Work (CSCW) and the Computer Supported Cooperative Learning (CSCL) research domains, we take particular interests in the results coming both from the human and the computer sciences. Thanks to this crossdisciplinary culture, we have understood that computer systems aim at supporting human activities and that these activities need systems better supporting their emergence. In other words, the systems we traditionally design lack in supporting the inevitable users emerging needs. This paper presents our new approach founded on the human science framework called the Activity Theory and some advanced software design techniques. It shows the results and promises we have found in intensively using the meta-level of the systems we design, thus better taking into account of the expansiveness property of the human activities we want to support.

Author

Management Methods; Risk

20040170549 Instituto Politecnico de Setubal, Setubal, Portugal

Knowledge Transfer As Enterprise Perpetuum Mobile?

Ko, Andrea; Gabor, Andras; ICEIS 2001; [2001], pp. 32; In English; See also 20040170490; Copyright; Avail: Other Sources

Many companies agree that their success in a micro and macro level is depending on how fast they can response for the challenges of the knowledge society. One interesting area is the levereging human capital, efficient compensation of knowledge workers. The paper introduces a knowledge based model of compensation system. Building the knowledge base the enterprise ontology creation was followed. The applied methodology is the CommonKADS. The paper discusses the maintenance conditions of a cafeteria benefit system.

Author

Knowledge Based Systems; Maintenance; Personnel

20040170558 Instituto Politecnico de Setubal, Setubal, Portugal

Business Renovation Projects in Slovenia

Groznik, Ales; Kovacic, Andrej; Jaklic, Jurij; Stemberger, Mojca Indihar; ICEIS 2001; [2001], pp. 50; In English; See also 20040170490; Copyright; Avail: Other Sources

The main goal of the paper is to present the characteristics of business renovation efforts in Slovenia. The research is based on the questionnaire about BPR projects and strategic IS planning, methods and tools implemented in Slovenian organizations. The results of the research are analyzed. The paper focuses on using business renovation concept, as well as on the necessity of strategic IS planning for developing an information system that will be able to successfully support renovated processes. It stresses necessity for changes in organizations. Organizations become more reactive and self-adaptive, faster to respond and capable to deal with the changing environment.

Author

Industrial Management; Information Systems

20040170561 Instituto Politecnico de Setubal, Setubal, Portugal

Representing Business Strategy Through Goal Modeling

Mendes, Ricardo; Vasconcelos, Andre; Caetano, Artur; Neves, Joao; Sinogas, Pedro; Tribolet, Jose; ICEIS 2001; [2001], pp. 53; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper focuses on the representation of business strategy through goal modeling. Traditional approaches to goal modeling focus on capturing the business goals into an accurate representation. Business goals originate from the vision and strategy of the company being modeled. By restraining to model the business goals, traditional approached often fail to capture the meaning of goals and the managers' vision of business. By capturing some of the concepts underlying management theories such as the Balanced Scorecard, a new approach to goal modeling is presented. This approach aims at providing a modeling language that is closer to the manager's and business needs.

Author

Commerce; Goal Theory; Models

20040170586 Instituto Politecnico de Setubal, Setubal, Portugal

Towards E-Management as Enabler for Accelerated Change

Lerias, Hugo; Luz, Joao; Moura, Pedro; Mendes, Ana; Teixeira, Isabel; Teixeira, J. Paulo; ICEIS 2001; [2001], pp. 48; In English; See also 20040170490; Copyright; Avail: Other Sources

The new economy is the result of the information revolution that promotes the emergence of efficient, ubiquitous and virtual-based business models. It is a common belief that the Extended Enterprise (EE) model has the potential to be a competitive advantage, particularly nowadays when the globalization of trade has increased the number of competitors. Nevertheless, it is necessary to consider the EE as another business model, which has not yet overcome classic problems, such as the management of risk. In this paper we examine the notion of risk, its impact on EE functions and propose a framework for its control.

Author

Industrial Management; Management Methods; Risk

20040170607 Instituto Politecnico de Setubal, Setubal, Portugal

Strategic Is Planning Practices

Spremic, Mario; Strugar, Ivan; ICEIS 2001; [2001], pp. 10; In English; See also 20040170490; Copyright; Avail: Other Sources

The role of information technology in recent years grows in its importance. Thus the strategic IS planning becomes a part of company strategic business plans. This paper presents the results of survey on the strategic IS planning practices of Croatian companies. The result of the survey are compared with similar surveys in Slovenia and Singapore. In large Croatian companies IT is still concerned just as a tool for automatization of present business processes, completely neglecting challenging role of IT as competitive resource on market. It is obvious that source of this problems comes from lack of knowledge and interest from top management structures of large corporations. Thus the significant efforts must be done on management side, and solution lays maybe in necessity to develop completely new hybrid manager profile. Evidently that this type of manager must get additional knowledge in strategic business planning and IT management.
Author
Strategy; Management Planning; Surveys; Organizations; Commerce

20040170617 Instituto Politecnico de Setubal, Setubal, Portugal
Domain Knowledge As Corporate Resource Of Financial Firms
Heng, Michael S. H.; Peters, Steve C. A.; ICEIS 2001; [2001], pp. 1-2; In English; See also 20040170490; Copyright; Avail: Other Sources

It is almost a clich'e to say that we live in a knowledge society and that knowledge is an important resource of firms in their production of goods and provision of services to their clients. However it is not so easy to find many examples showing the use of domain knowledge in financial companies. This paper reports the case of how a vehicle lease company in the Netherlands combines the use of domain knowledge and information technology into an expert system to automate the control of vehicle maintenance activity. The results benefit all parties concerned. The lease company can control the vehicle repair and maintenance works more efficiently. For the customers, it is higher rate of vehicle utilisation, greater safety and lower costs. The dealers who carry out the repairs and maintenance can do their work faster, and are paid immediately and automatically via the banks, resulting in lower administrative costs. The case story suggests that domain knowledge can be perceived as a corporate resource and its utilisation can produce values for the stakeholders. We propose that financial firms (1) see themselves as knowledge system, as a network of knowledge nodes serving their customers, (2) consider knowledge intensive firms as their role models. We draw on an idea of Friedrich Hayek who perceives the economic problem of society as a problem of the utilisation of knowledge not given to anyone in its totality. The paper concludes by discussing some organizational obstacles on the road to re-invent banks into knowledge systems.
Author
Expert Systems; Information Systems; Economics; Maintenance

20040170620 Instituto Politecnico de Setubal, Setubal, Portugal
A Strategy to Development Adaptive Workers Information Management Systems
Ruiz, Irene Luque; LopezEspinosa, Enrique; Garcia, Gonzalo Cerruela; Gomez-Nieto, Miguel Angel; ICEIS 2001; [2001], pp. 5-6; In English; See also 20040170490; Copyright; Avail: Other Sources

Difficulties arising in the management of the information corresponding to the workers (Curriculum Vitae) are created on one hand by the heterogeneity (multimedia data), lack of structure and sheer volume of this information, and on the other by the need to analyze and make best use of these data through complex queries whose results must comply with predetermined standards or preferences ---delicate processes indeed, given the nature of the information tinder scrutiny. A system for the management of this information must thus combine a multitude of features to permit the manipulation of highly-structured data (classical business management systems), immense volumes of information (electronic libraries) and multimedia (image databases, sound, etc.). The present study is centered on an analysis of the characteristics of this information and presents a model which, by focusing on the nature of basic information units and taking into account the independence between structure and information, strives to afford adaptability to the requirements and standards of the organizational environment, while remaining highly adaptable to subsequent changes.
Author
Management Information Systems; Management Methods; Data Structures; Education

20040170622 Instituto Politecnico de Setubal, Setubal, Portugal
Integrating Enterprise Models For Banks
Naboulsi, Khaled; ICEIS 2001; [2001], pp. 1; In English; See also 20040170490; Copyright; Avail: Other Sources

The demand for change in the banking industry has been continuous. During the past decade alone, the banking industry has encountered events that have forced banking to an enterprise level never before seen. These events include increased

competition both among banks and non-banks competitors, an increased awareness in customer preferences, and technological advances in distributed systems. Banking institutions need to adopt new system approaches to compete, or face their own demise. Traditional integration models focus on application logic to solve compatibility issues. We examined the Application Development Model (AD) and the Workflow Management System that uses CORBA-Event Services as two alternative approaches to resolving the banking industry's problems. However, due to the volatility of banking as an industry, it would appear more appropriate for developers to seek out alternatives that offer more flexibility, especially in light of the problems related to legacy systems. Utilizing a middleware such as CORBA provides an industry such as banking with solutions that address the issues of scalability, performance, and flexibility.
Author
Management Systems; Industries; Applications Programs (Computers); Industrial Management

20040171112 NASA Marshall Space Flight Center, Huntsville, AL, USA
Simulation Based Acquisition for NASA's Office of Exploration Systems
Hale, Joe; [2004]; 1 pp.; In English; Huntsville Simulation Conference, 19-21 Oct. 2004, Huntsville, AL, USA; No Copyright; Avail: Other Sources; Abstract Only

In January 2004, President George W. Bush unveiled his vision for NASA to advance U.S. scientific, security, and economic interests through a robust space exploration program. This vision includes the goal to extend human presence across the solar system, starting with a human return to the Moon no later than 2020, in preparation for human exploration of Mars and other destinations. In response to this vision, NASA has created the Office of Exploration Systems (OExS) to develop the innovative technologies, knowledge, and infrastructures to explore and support decisions about human exploration destinations, including the development of a new Crew Exploration Vehicle (CEV). Within the OExS organization, NASA is implementing Simulation Based Acquisition (SBA), a robust Modeling & Simulation (M&S) environment integrated across all acquisition phases and programs/teams, to make the realization of the President s vision more certain. Executed properly, SBA will foster better informed, timelier, and more defensible decisions throughout the acquisition life cycle. By doing so, SBA will improve the quality of NASA systems and speed their development, at less cost and risk than would otherwise be the case. SBA is a comprehensive, Enterprise-wide endeavor that necessitates an evolved culture, a revised spiral acquisition process, and an infrastructure of advanced Information Technology (IT) capabilities. SBA encompasses all project phases (from requirements analysis and concept formulation through design, manufacture, training, and operations), professional disciplines, and activities that can benefit from employing SBA capabilities. SBA capabilities include: developing and assessing system concepts and designs; planning manufacturing, assembly, transport, and launch; training crews, maintainers, launch personnel, and controllers; planning and monitoring missions; responding to emergencies by evaluating effects and exploring solutions; and communicating across the OExS enterprise, within the Government, and with the general public. The SBA process features empowered collaborative teams (including industry partners) to integrate requirements, acquisition, training, operations, and sustainment. The SBA process also utilizes an increased reliance on and investment in M&S to reduce design risk. SBA originated as a joint Industry and Department of Defense (DoD) initiative to define and integrate an acquisition process that employs robust, collaborative use of M&S technology across acquisition phases and programs. The SBA process was successfully implemented in the Air Force s Joint Strike Fighter (JSF) Program.
Author
Space Exploration; Mars (Planet); Information Systems; Simulation; Models; Decision Making

20040171264 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Science Goal Monitor: Science Goal Driven Automation for NASA Missions
Koratkar, Anuradha; Grosvenor, Sandy; Jung, John; Pell, Melissa; Matusow, David; Bailyn, Charles; [2004]; 9 pp.; In English; SPIE Europe International Symposium, 21-25 Jun. 2004, Glasgow, Scotland; No Copyright; Avail: CASI; A02, Hardcopy

Infusion of automation technologies into NASA s future missions will be essential because of the need to: (1) effectively handle an exponentially increasing volume of scientific data, (2) successfully meet dynamic, opportunistic scientific goals and objectives, and (3) substantially reduce mission operations staff and costs. While much effort has gone into automating routine spacecraft operations to reduce human workload and hence costs, applying intelligent automation to the science side, i.e., science data acquisition, data analysis and reactions to that data analysis in a timely and still scientifically valid manner, has been relatively under-emphasized. In order to introduce science driven automation in missions, we must be able to: capture and interpret the science goals of observing programs, represent those goals in machine interpretable language; and allow spacecrafts onboard systems to autonomously react to the scientist's goals. In short, we must teach our platforms to dynamically understand, recognize, and react to the scientists goals. The Science Goal Monitor (SGM) project at NASA

Goddard Space Flight Center is a prototype software tool being developed to determine the best strategies for implementing science goal driven automation in missions. The tools being developed in SGM improve the ability to monitor and react to the changing status of scientific events. The SGM system enables scientists to specify what to look for and how to react in descriptive rather than technical terms. The system monitors streams of science data to identify occurrences of key events previously specified by the scientist. When an event occurs, the system autonomously coordinates the execution of the scientist s desired reactions. Through SGM, we will improve om understanding about the capabilities needed onboard for success, develop metrics to understand the potential increase in science returns, and develop an operational prototype so that the perceived risks associated with increased use of automation can be reduced.
Author
Cost Reduction; Data Acquisition; Machine Oriented Languages; Streams; Workloads (Psychophysiology)

20040171282 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Risk Management of New Microelectronics for NASA: Radiation Knowledge-base
LaBel, Kenneth A.; [2004]; 10 pp.; In English; 2004 Hardened Electronics and Radiation Technology Conference, 2004; No Copyright; Avail: CASI; A02, Hardcopy

Contents include the following: NASA Missions - implications to reliability and radiation constraints. Approach to Insertion of New Technologies Technology Knowledge-base development. Technology model/tool development and validation. Summary comments.
CASI
Management Analysis; Microelectronics; Risk

20040171464 NASA Marshall Space Flight Center, Huntsville, AL, USA
The 2003 NASA Faculty Fellowship Program Research Reports
Nash-Stevenson, S. K.; Karr, G.; Freeman, L. M.; Bland, J., Editor; May 2004; 350 pp.; In English
Contract(s)/Grant(s): NAG8-1904
Report No.(s): NASA/CR-2004-213285; M-1117; No Copyright; Avail: CASI; A15, Hardcopy

For the 39th consecutive year, the NASA Faculty Fellowship Program (NFFP) was conducted at Marshall Space Flight Center. The program was sponsored by NASA Headquarters, Washington, DC, and operated under contract by The University of Alabama in Huntsville. In addition, promotion and applications are managed by the American Society for Engineering Education (ASEE) and assessment is completed by Universities Space Research Association (USRA). The nominal starting and finishing dates for the 10-week program were May 27 through August 1, 2003. The primary objectives of the NASA Faculty Fellowship Program are to: (1) Increase the quality and quantity of research collaborations between NASA and the academic community that contribute to NASA s research objectives; (2) provide research opportunities for college and university faculty that serve to enrich their knowledge base; (3) involve students in cutting-edge science and engineering challenges related to NASA s strategic enterprises, while providing exposure to the methods and practices of real-world research; (4) enhance faculty pedagogy and facilitate interdisciplinary networking; (5) encourage collaborative research and technology transfer with other Government agencies and the private sector; and (6) establish an effective education and outreach activity to foster greater awareness of this program.
Author
Education; Technology Transfer; Universities; Students

20040171599 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Harnessing Systems Engineering Methodology in Using Earth Science Research Data for Real Applications
Habib, Shahid; Policelli, Fritz S.; Zanoni, Vicki M.; [2004]; 3 pp.; In English; International Geoscience and Remote Sensing Symposium, 20-24 Sep. 2004, Anchorage, AK, USA; No Copyright; Avail: CASI; A01, Hardcopy

For the last three decades, Earth science remote sensing technologies have been providing an enormous amount of useful data and information serving to broaden our understanding of the home planet as a system. NASA's Earth science program has deployed about 18 complex satellites and is in the process of defining and launching multiple observing systems in this decade. At the same time, the European Community and many other countries such as Russia, France, India, Japan, and China have also significantly contributed to Earth science research. To date, the majority of such efforts have concentrated on expanding our scientific understanding of the multiple nonlinear and chaotic processes of Earth's behavior. In recent years, legislators and stakeholders have put serious pressure on the science community to devote more attention to making use of scientific results for societal benefit. For instance, there are a number of areas such as energy forecasting, aviation safety,

agricultural efficiency, disaster management, air quality and public health that can directly take advantage of Earth science results to analyze and predict large scale problems and conditions. This is becoming even more important now that we live in a global economy interconnected via the internet and transportation systems; regional environmental conditions can have far reaching impact across continental boundaries. These factors dictate requirements for global data that can help us assess and control the devastating problems of famine, water resources, wildfires, human health and more. To do this requires a serious, organized, and systematic approach that transfers fundamental research products to the applied sciences domain. This paper presents a systems engineering and management process that can effectively make such transfer of data to the user community. Examples are presented on how the above decision making framework can help in solving critical problems such as the spread of vector borne diseases, forecasts of harmful algal blooms as well as forest fires and wildfires, and the intercontinental transport of dust storms and pollution.
Author
Remote Sensing; Safety Management; Earth Sciences; Decision Making; Engineering Management

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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*.

20040170490 Instituto Politecnico de Setubal, Setubal, Portugal
ICEIS 2001
[2001]; 74 pp.; In English; International Conference on Enterprise Information Systems, 7-10 Jul. 2001, Setubal, Portugal; See also 20040170491 - 20040170640; Copyright; Avail: Other Sources

The main topic areas from the International Conference on Enterprise Information Systems, 2001 (ICEIS) included:Databases and Information Systems Integration; Artificial Intelligence and Decision Support Systems; Information Systems Analysis and Specification; and Internet Computing and Electronic Commerce. Abstracts are presented from these topic areas.
Derived from text
Information Systems; Software Engineering; Data Bases; Decision Support Systems; Artificial Intelligence

20040170497 Instituto Politecnico de Setubal, Setubal, Portugal
Unified Resource Modelling
Neves, Joao; Vasconcelos, Andre; Caetano, Artur; Sinogas, Pedro; Mendes, Ricardo; Tribolet, Jose; ICEIS 2001; [2001], pp. 54; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents an overview of the state of the art of resource modelling used by either information systems specialists and human resources professionals. A generic framework for resource modelling is used for comparing these two approaches in terms of the context and description of the work the resource does and is able to do. This is a base work to the development of a new tool for human resources management that makes explicit the connection between human resources and business processes.
Author
Resources Management; Information Systems

20040170513 Instituto Politecnico de Setubal, Setubal, Portugal
Organization of Analysis Patterns for Effective Reuse
Ferreira, Maria Joao; Loucopoulos, Pericles; ICEIS 2001; [2001], pp. 45-46; In English; See also 20040170490; Copyright; Avail: Other Sources

Since the introduction of patterns in Computer Science, a large number of libraries of patterns for different domains have been identified. In most cases these patterns are represented in a 'flat' fashion making their use difficult especially when there is a large number of patterns to consider in a particular application. In this paper we propose both an analysis pattern classification scheme and an analysis pattern representation - usage perspective - for enhancing the reuse of analysis patterns. The proposed classification scheme associates a problem (embodied in an analysis pattern), to a set of pre-defined terms

whereas the representation scheme -pattern template- provides the necessary information for a designer to evaluate and revise a solution embodied in an analysis pattern.
Author
Classifications; Information Retrieval

20040170534 Instituto Politecnico de Setubal, Setubal, Portugal
A Universal Technique For Relating Heterogeneous Data Models
Nelson, David; Heather, Michael; Rossiter, Brian Nicholas; ICEIS 2001; [2001], pp. 9-10; In English; See also 20040170490; Copyright; Avail: Other Sources

Interoperability is considered in the context of the ISO standards for the Information Resource Dictionary System (IRDS) which provide a complete definition of an information system from real-world abstractions through constructs employed for data and function descriptions to the physical data values held on disk. The IRDS gives a four-level architecture which is considered: 1) Informally in terms of an interpretation of the levels and the level-pairs between them; 2) In terms of mappings between the levels; 3) Formally in terms of a composition of functors and adjoints across the various levels. An example is given of the application of IRDS in a categorical context comparing the mappings from abstractions to values in relational and object-based systems. Such comparisons provide a route for interoperability between heterogeneous systems.
Author
Interoperability; Information Systems; Data Management; Data Simulation

20040170542 Instituto Politecnico de Setubal, Setubal, Portugal
An Integrated Approach Of Modelling, Transformation And Measurement To Evaluate Business Process Re-Engineering
Poels, Geert; Dedene, Guido; ICEIS 2001; [2001], pp. 41-42; In English; See also 20040170490; Copyright; Avail: Other Sources

We present an approach that combines systems modelling with complexity measurement to evaluate business process complexity changes that are caused by Business Process Re-engineering (BPR). Reduced business process complexity is one of the criteria typically used to evaluate the effectiveness of BPR. In our approach conceptual schemata are used to model the current and the envisioned business process. The complexity properties of the AS-IS and TO-BE schemata are measured using a suite of conceptual schema measures presented in the paper. The complexity changes caused by generic patterns of BPR, modelled as schema transformations, are also measured. As a 'proof of concept' the approach is applied to a reference framework for business transformation that is used in the context of a high-level, strategic approach to BPR.
Author
Commerce; Models; Product Development

20040170554 Instituto Politecnico de Setubal, Setubal, Portugal
An Analysis Of B2B Catalogue Integration Problems
Omelayenko, Borys; Fensel, Dieter; ICEIS 2001; [2001], pp. 56-57; In English; See also 20040170490; Copyright; Avail: Other Sources

Content Management becomes a cornerstone of successful B2B electronic commerce. The B2B players use different document standards to represent their business documents, and different content standards to specify the products. Thousands of the players meet together at B2B marketplaces, and the marketplaces must be able to integrate numerous document and content standards. The large number of the standards and their significant complexity make the integration problems non-trivial and require development of special integration architecture. In the present paper we discuss the tasks and the problems which occur during the content and document integration, and survey possible solutions and available techniques.
Author
Catalogs (Publications); Electronic Commerce

20040170566 Instituto Politecnico de Setubal, Setubal, Portugal
Supporting Development Of Business Applications Based On Ontologies
Izumi, Noriaki; Yamaguchi, Takahira; ICEIS 2001; [2001], pp. 54; In English; See also 20040170490; Copyright; Avail: Other Sources

This report proposes an integrated support methodology for constructing business models including employing new business models, transplanting existing business activities to computers, and decision making support in employing new

environment of computers. In order to model enterprises and business activities and to implement them as software applications, two business repository in different granularities are devised based on ontologies: Business specification repository and Business software repository. By developing a framework, which transforms descriptions in Business specification repository into ones in Business software repository, our framework achieves the reuse of existing repositories of business activities and software libraries. We have implemented the prototype system by JAVA and confirmed that it supports us in various phases of business application development including business model manifestation, detailed business model definition and an implementation of business software applications.
Author
Decision Making; Commerce; Transplantation; Prototypes

20040170587 Instituto Politecnico de Setubal, Setubal, Portugal
Modelling Data Integration in an Object Based Geographical Information System
Damiani, Maria Luisa; ICEIS 2001; [2001], pp. 8-9; In English; See also 20040170490; Copyright; Avail: Other Sources

The integration of geographical data from multiple and heterogeneous sources is a complex process generally performed in an incremental way. Current GIS systems provide a wide range of services to support at least physical data integration. A critical point in the development of a GIS application is the design of the integration process. Such a design is necessary to plan out the integration operations which are to be performed to achieve an effective database. Integration process modeling can simplify both the analysis and the documentation of the database construction. In the paper a possible and general approach to the problem is discussed. A case study of spatial data integration in the nautical field is finally presented.
Author
Data Integration; Geographic Information Systems; Data Simulation

20040170589 Instituto Politecnico de Setubal, Setubal, Portugal
Integrating Association Rule Mining Algorithms with Relational Database Systems
Hipp, Jochen; Guntzer, Ulrich; Grimmer, Udo; ICEIS 2001; [2001], pp. 9; In English; See also 20040170490; Copyright; Avail: Other Sources

Mining for association rules is one of the fundamental data mining methods. In this paper we describe how to efficiently integrate association rule mining algorithms with relational database systems. From our point of view direct access of the algorithms to the database system is a basic requirement when transferring data mining technology into daily operation. This is especially true in the context of large data warehouses, where exporting the mining data and preparing it outside the database system becomes annoying or even infeasible. The development of our own approach is mainly motivated by shortcomings of current solutions. We investigate the most challenging problems by contrasting the prototypical but somewhat academic association mining scenario from basket analysis with a real-world application. We thoroughly compile the requirements arising from mining an operative data warehouse at DaimlerChrysler. We generalize the requirements and address them by developing our own approach. We explain its basic design and give the details behind our implementation. Based on the warehouse, we evaluate our own approach together with commercial mining solutions. It turns out that regarding runtime and scalability we clearly outperform the commercial tools accessible to us. More important, our new approach supports mining tasks that are not directly addressable by commercial mining solutions.
Author
Relational Data Bases; Data Mining

20040170601 Instituto Politecnico de Setubal, Setubal, Portugal
An Approach For Coordination Problem Solving
Etcheverry, Patrick; Lopisteguy, Philippe; Dagorret, Pantxika; ICEIS 2001; [2001], pp. 52-53; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper focuses on the problem of coordination specification. Two principles rule our work: On the one hand, coordination problems are recurrent problems and on the other hand, tested forms of coordination exist. We define a typology of coordination problems that can be solved by the enforcement of well known coordination forms. We present a catalogue of coordination patterns that makes an inventory of a set of coordination problems, and a set of solutions that describe how these problems can be solved. After describing an example of coordination pattern, we finally present an approach that uses the catalogue in a process modelling context.
Author
Coordination; Specifications; Pattern Registration

20040170611 Instituto Politecnico de Setubal, Setubal, Portugal

Defining Pattern Class Stereotypes in UML

Kuzniarz, Ludwik; Plasecki, Maciej; ICEIS 2001; [2001], pp. 35; In English; See also 20040170490; Copyright; Avail: Other Sources

Stereotype in UML was introduced as a mean to allow its extension by defining specific semantics for a chosen modelling element. Possible usage of stereotype is constrained by the type of model element to which it can be applied and usually also by the context defined by configuration of other model elements. The paper examines some basic properties that characterize stereotypes. Three categories of stereotypes are examined and elaborated in more detail. These include their characteristics, the way of defining them formally within the UML, and finally their usage as a mean for presentation of models in more compact form and as a set of 'reusable' elements for modelling.

Author

Semantics; Natural Language Processing; Words (Language)

20040170618 Instituto Politecnico de Setubal, Setubal, Portugal

Evaluation Of A Visualisation Design For Knowledge Sharing And Information Discovery

Gouveia, Luis Borges; Gouveia, Feliz Ribeiro; ICEIS 2001; [2001], pp. 2; In English; See also 20040170490; Copyright; Avail: Other Sources

This paper presents a tool using a 3D interactive visualisation system that allows knowledge sharing and information discovery. The tool proposes a visualisation design using direct manipulation techniques to convey information about a structure for knowledge sharing. The structure describes a knowledge theme described as a set of concepts. The set of concepts provides a particular context description about the knowledge being shared. The application tested and presented in this paper uses the set of concepts to direct searches in the World Wide Web. The visualisation design is briefly presented and preliminary evaluation results are reported. These results show that the system tends to be better supporting people with some knowledge expertise about the knowledge being shared even if they have little World Wide Web expertise. These results seem to show some potential for the visualisation design as an interface for both knowledge sharing and information discovery for people that have already some knowledge expertise about a given theme, but usually suffer from information overload or lack of knowledge about the structure of large information spaces, such as the World Wide Web.

Author

Information Management; Evaluation; Knowledge Based Systems; Data Transmission

20040170619 Instituto Politecnico de Setubal, Setubal, Portugal

Information Systems Planning: Contributions From Organizational Learning

Audy, Jorge Luis Nicolas; Becker, Joao Luiz; Freitas, Henrique; ICEIS 2001; [2001], pp. 52; In English; See also 20040170490; Copyright; Avail: Other Sources

A new outlook on the process of information systems planning is required with the emergence and consolidation of new perceptions and concepts of organizational learning. The field of organizational learning offers viable opportunities for gains in the planning processes of organizations. Several authors point to processing of information as a relevant source of increased productivity and competitive advantage in our society. However, within the field of Information Systems (IS), several problems pertaining to planning and effective use of new Information Technologies (IT) have challenged researchers to find ways of minimizing the problems pertaining to IS planning, and implementation. This paper analyses the impact of Organizational Learning, and the opportunities generated by Organizational Learning on IS planning, as responses to the difficulties of implementation of technology-based plans and the resulting organizational changes.

Author

Information Systems; Planning; Organizations

20040170630 Instituto Politecnico de Setubal, Setubal, Portugal

Toward Measuring the Scalability of Enterprise Information Systems

Giachetti, Ronald E.; Chen, Chin-Shen; Saenz, Oscar A.; ICEIS 2001; [2001], pp. 15; In English; See also 20040170490; Copyright; Avail: Other Sources

Scalability describes a desirable characteristic of a system that has come to the forefront with the emergence of the Internet as a platform for business systems. Scalability broadly defined as the ability of a system to adapt to change while maintaining an acceptable level of performance is a critical characteristic any system dealing with the Internet must possess. Most all software vendors, system architectures, and system designers claim to have a scalable system. This article develops

a mathematical foundation on which scalability measurement of enterprise information systems can be based. The mathematical foundation is based on measurement theory and this paper shows how this can be applied to measure scalability of enterprise systems in the context of business-to-business commerce in supply chains.
Author
Information Systems; Mathematical Models

20040170638 Instituto Politecnico de Setubal, Setubal, Portugal
The Concept Of Informational Ecology
Lancieri, Luigi; ICEIS 2001; [2001], pp. 8; In English; See also 20040170490; Copyright; Avail: Other Sources

Through the metaphor of informational ecology this document gives a report on the various information re-use strategies in the company. We propose a segmentation model of these strategies and an evaluation method of its benefit. We insist on the re-use of the information contained in intermediate spaces of storages which are the proxy-caches, the news servers or other types of shared memories available in the company. We show, with examples, that informational ecology can be advantageous in more than one way and in particular to optimize the information management in the company.
Author
Information Management; Information Theory

20040170673 Air Force Inst. of Tech., Wright-Patterson AFB, OH
An Update on Analyzing Differences Between Public and Private Sector Information Resource Management: Strategic Information Challenges and Critical Technologies
Orlovsky, James R.; Jun. 2004; 125 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426599; AFIT/GIR/ENV/04M-17; No Copyright; Avail: Defense Technical Information Center (DTIC)

Change is a constant within our contemporary IRM environment. The rapid development of information and communication technologies has been the most predominant among the many agents of change that are forcing a reevaluation of the role of the IRM professional. Few studies to date have compared public and private sector CIO perceptions concerning the IRM challenges and critical technologies faced by their organization. An earlier study concluded that the sectors CIOs do perceive to be faced with many of the same challenges and also view many of the same technologies as critical to the organization's operations. A limiting factor identified in that study was the temporal separation of sector sampling. Any conclusions comparing the public and private sectors were based on survey responses separated by almost one year. The goal of this research is to validate if public and private sector senior IRM managers perceive to still be faced with the same challenges and view the same technologies as being critical to an organization's IRM requirements. The results of a 2002 annual survey of public sector CIOs and senior IRM managers are compared with data collected from 2002 private sector CIOs. This research concluded that performing an analysis on datasets obtained from both sectors during the same time period provided a more appropriate comparison between sectors. Findings from this study provide sufficient evidence that both sectors have developed a closer correlation than was previously concluded.
DTIC
Information Systems; Resources Management

20040170693 National Defense Univ., Washington, DC
Entropy-Based Warfare: Modeling the Revolution in Military Affairs (Joint Force Quarterly, Autumn/Winter, 1998-1999)
Herman, Mark; Jan. 1999; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426666; No Copyright; Avail: Defense Technical Information Center (DTIC)

A hypothesis first proposed by the Soviets in the late 1970s claimed that a new generation of precision weapons coupled with sensor and information architectures would lead to a revolution in military affairs (RMA). Such thinking is embodied in Joint Vision 2010. As the RMA concept develops, the international community must grapple with the impact of advanced concepts like information warfare and the advantages conferred by high levels of situation awareness on the battlefield. Unfortunately, inadequate comprehension of the dynamics of war beyond the attrition-based paradigm has constrained understanding of RMA. Virtually all current models, simulations, and wargames are fundamentally attrition based. Analytically they often provide quantitative results that support one recommendation over another. But they do not account for many factors that affect the outcome. The few that do quantify factors like command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) lack an analytic construct to accurately account for their effects. They

simply measure the influence of these factors as increases or decreases in attrition.
DTIC
Autumn; Entropy; Warfare; Winter

20040170706 National Defense Univ., Washington, DC
Organizing National Level Imagery and Mapping
Strebeck, John; Jan. 1998; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426730; No Copyright; Avail: CASI; A02, Hardcopy

One category of battlespace information particularly relevant to operational commanders is the physical environment. Imagery, imagery intelligence, and geospatial information (mapping, charting, and geodesy) portray that environment and are thus important bands along the battlespace information spectrum. They enable commanders to place myriad battlespace data into a framework based on time and location. Fusing all data sources in this manner allows for the development of an awareness of the battlespace so that decisions can be made faster than an enemy can act -- the core concept of knowledge-based warfare. Accordingly, intelligence and information are the basis of dominant battlespace awareness. The National Imagery and Mapping Agency (NIMA) was established by Congress in 1996 to furnish imagery, imagery intelligence, and geospatial information in support of national security objectives. It is the combat support/intelligence community agency charged with merging imagery and mapping from separate intelligence and defense organizations. NIMA has broad authority over the U.S. imagery and geospatial information system (USIGS) and the production/dissemination of imagery, intelligence, and geospatial information that permit commanders on all levels to acquire access to common references and information. One challenge facing NIMA is to construct imagery and geospatial data bases with a global framework on which to build a common view of the battlespace. Within the information domain, NIMA is one step toward achieving the information superiority envisioned in Joint Vision 2010. This article examines the impact of NIMA on military operations with emphasis on the synergy of merging imagery and geospatial databases. (4 figures, 4 photographs)
DTIC
Data Bases; Geodesy; Image Processing; Imagery; Information Systems; Multisensor Fusion

20040170709 Monmouth Univ., West Long Branch, NJ
Technologies for Army Knowledge Fusion
Scherl, Richard; Ulery, Dana L.; Sep. 2004; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-02-D-0001
Report No.(s): AD-A426738; ARL-TR-3279; No Copyright; Avail: CASI; A04, Hardcopy

The fusing of information to provide a real-time situational awareness and common relevant operational picture of events both within and outside the battlespace requires the integration and use of heterogeneous civilian and military sources. Knowledge fusion, also called information fusion and multisensor data fusion, names the body of techniques needed to accomplish this critical need of the U.S. Army. The area builds upon and integrates results from a variety of fields, including multiagent systems, information integration, the semantic web, and the classical (mathematically based, engineering in orientation) fusion methodologies. The goal of work in knowledge fusion is to intelligently fuse massive amounts of heterogeneous information (not only from sensors, but also from databases, files, web pages, etc.) into a form which may be used by humans to yield actionable knowledge. This report surveys the literature relevant to the evolving field of knowledge fusion.
DTIC
Information Retrieval; Information Systems; Multisensor Fusion

20040170742 SRI International Corp., Menlo Park, CA
Link Analysis Workbench
Berry, Pauline M.; Harrison, Ian; Lowrance, John D.; Rodriguez, Andres C.; Ruspini, Enrique H.; Sep. 2004; 87 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-C-0193; Proj-EELD
Report No.(s): AD-A426802; AFRL-IF-RS-TR-2004-247; No Copyright; Avail: CASI; A05, Hardcopy

In the wake of the 9/11 terrorist attacks on the USA, many questions have been asked and investigations were conducted to determine how these attacks could have happened. The consensus is information was available to warn U.S. intelligence organizations of the impending attacks but were not able to 'connect the dots,' that is bring the vital pieces of information together to paint a clear picture of what is about to happen. An important role of the intelligence organizations is to identify

and track situations of interest -terrorist and criminal activity, signs of impending political upheaval abroad. The problem is the analyst is overwhelmed with intelligence reports from many sources that may provide them with incomplete or misleading information. There is a need for information technology to help the analyst with identification of threat cases, tracking and analysis of the data to confirm the emerging threat. The approach taken here is one of link discovery by matching transactional data stored in a relational database to a well- defined scenario describing a threat situation. The Link Analysis Workbench (LAW) is designed to find patterns (scenarios) buried within vast quantities of large and noisy datasets helping analysts find evidence to support the threat described in the pattern.
DTIC
Data Processing; Pattern Recognition; Relational Data Bases

20040170821 Imperial Coll. of Science, Technology and Medicine, London
Employing Noisy Environments to Support Quantum Information Processing
Plenio, Martin B.; Huelga, Susana F.; Sep. 14, 2004; 5 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0161
Report No.(s): AD-A426946; ARO-43371.7-PH-QC; No Copyright; Avail: Defense Technical Information Center (DTIC)
In this project we have investigated the use of noise to support the generation of noise and coherent quantum information processing. We have presented schemes to this effect firstly in quantum optical settings (optical cavity QED, ion traps) and then in condensed matter environments (nano- mechanical oscillators and SQUID technologies). Abstract theoretical investigations into the usefulness of noise for quantum information processing have been carried out. The work on this project has led to 7 publications, of which 2 appeared in Physical Review Letters and one in PRA Rapid Communications. The work of this project has been presented in 17 talks at international conferences and university colloquiuae.
DTIC
Data Processing; Quantum Theory

20040170825 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD
Linguistic-Fuzzy Classifier for Discrimination and Confidence Value Estimation
Nelson, Bruce; Birenzvigo, Ammon; Jul. 2004; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426951; ECBC-TR-353; No Copyright; Avail: CASI; A03, Hardcopy
This report describes a new method for assigning an event to a particular class. An event is described by some attributes (e.g., size, shape, and intensity and their changes). These attributes have a distribution. Fuzzy membership functions provide a means for quantifying the importance of an attribute based on its value and distribution. With proper selection of attributes, we can calculate the probability that an event belongs to a particular class by selecting appropriate membership functions. We applied this to visible and IR camera data generated to support the DSI Program. The goal of the program is to investigate the possibility of using disparate sensors to serve as a chemical and biological early warning system and integrate them into the CB command and control network. Detecting when CB munitions are deployed requires developing algorithms that differentiate between the detonation of conventional and CB munitions. This report describes how we applied this new classification method to video signals generated from the visible cameras used during DSI field test. The report provides examples of how to use this method to estimate class confidence and will also show how the confidence values were used to discriminate between CB and conventional munitions detonations.
DTIC
Classifiers; Linguistics

20040170828 Environmental Protection Agency, Washington, DC
Uniform Federal Policy For Quality Assurance Project Plans. Part 2B, Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities
Jul. 2004; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426957; No Copyright; Avail: Defense Technical Information Center (DTIC)
This Quality Assurance/Quality Control Compendium (QA/QC Compendium) has been prepared by the Intergovernmental Data Quality Task Force (IDQTF) to supplement Part 1 of the Uniform Federal Policy for Quality Assurance Project Plans (the UFP-QAPP Manual). The UFP-QAPP Manual and the QA/QC Compendium along with the UFP-QAPP Workbook and Example QAPPs, serve as companion documents to the IDQTF's Uniform Federal Policy for Implementing Environmental Quality Systems (UFP-QS). The UFP-QS and the UFP-QAPP were developed as consensus initiatives by the U.S. Environmental Protection Agency (EPA), the Department of Defense (DoD), and the Department of

Energy (DOE). The purpose of the UFP-QAPP is to serve as a single national consensus document for consistent and systematic implementation of project specific guidelines per Section 6 (Part B) of ANSI/ASQ E4 (Quality Systems for Environmental Data and Technology Programs -- Requirements with guidance for use). The purpose of this QA/QC Compendium is to establish minimum specifications for data quality activities for all phases and data uses in the CERCLA process.
DTIC
Data Acquisition; Environment Management; Policies; Quality Control

20040171064 Department of the Navy, Washington, DC
Multi-Stage Planar Stochastic Mensuration
O'Brien, Francis, Inventor; Jun. 2004; 39 pp.; In English
Patent Info.: Filed 1 Jun. 2004; US-Patent-Appl-SN-10863838
Report No.(s): AD-D020146; No Copyright; Avail: Defense Technical Information Center (DTIC)
The method comprises reading a data set comprising a sparse number of data points and applying multiple tests wherein the results are evaluated by a decision module to determine whether to classify the data as random or nonrandom. In one preferred embodiment, if any one test determines the data is nonrandom, then the data is labeled nonrandom. The data is labeled and stored prior to beginning the method once again for the next set of data.
DTIC
Patent Applications; Stochastic Processes

20040171067 Army Training and Doctrine Command, Fort Leavenworth, KS, USA
A Military Guide to Terrorism in the Twenty-First Century
Aug. 2003; 216 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426964; No Copyright; Avail: Defense Technical Information Center (DTIC)
This document is intended as a resource to inform U.S. military personnel of the nature and characteristics of the terrorist threat in the current operational environment. Its purpose is to provide unit leaders, planners and commanders with a tool for understanding the nature of the terrorism and identifying the threat of terrorism to their units. It provides information for leaders to conduct realistic evaluations of risk and vulnerability to their units, and details probable circumstances in which U.S. military units can expect terrorist operations against them and likely motivations for such operations. This document is not intended to be a counter-terrorism 'how-to' manual, or to replace current training and intelligence products dealing with terrorism.
DTIC
Handbooks; Terrorism

20040171166 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Data Assimilation Office (DAO) Operational Analyses and Reanalyses for Coordinated Enhanced Observing Period (CEOP)
Bosilovich, M.; [2003]; 1 pp.; In English; CEOP International Workshop, 2-4 Apr. 2003, Berlin, Germany; No Copyright; Avail: Other Sources; Abstract Only
The DAO operational assimilation system has produced and archived gridded data since 1998, and will continue through the CEOP period. However, major system upgrades and new assimilation variables will significantly affect the surface energy balance and data product. These changes will be discussed and the prospects for a CEOP reanalysis will be presented. W e will also review the data currently available and describe how to access the data.
Author
Surface Energy; Energy Budgets

20040171287 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Workshop Goals
Barth, Janet; [2004]; 3 pp.; In English; Workshop on Radiation Belt Models, 5-8 Oct. 2004, Greenbelt, MD, USA; No Copyright; Avail: CASI; A01, Hardcopy
The goals are: 1. Report and document recent progress on radiation belt model and plasma model development. Metrics for past and current programs. 2. Complete a roadmap for the development of new standard radiation belt and space plasma

models for spacecraft engineering: input to agencies for future investments, interagency cooperation.
Derived from text
Radiation Belts; Space Plasmas

20040171289 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Charge to Road Map Development Sessions
Barth, Janet; [2004]; 3 pp.; In English; Workshop on Radiation Belt Models, 5-8 Oct. 2004, Greenbelt, MD, USA; No Copyright; Avail: CASI; A01, Hardcopy

Develop a road map for new standard Model applications radiation belt models. Model applications: Spacecraft and instruments. Reduce risk. Reduce cost. Improve performance. Increase system lifetime. Reduce risk to astronauts.
Derived from text
Spacecraft Instruments; Radiation Belts; Risk; Applications Programs (Computers)

20040171290 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Living With a Star Program
Barth, Janet L.; [2004]; 20 pp.; In English; Space Technology Alliance's Space Environment and Effects Working Group Meeting, 2-4 Nov. 2004, Los Angeles, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy

The vision for exploration Moon, Mars and beyond are: Implement a sustained and affordable human and robotic program to explore the solar system and beyond. Extend human presence across the solar system, starting with human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations (enables). Develop the innovative technologies, knowledge, and infrastructure both to explore and support decisions about the destinations for human exploration. Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.
Derived from text
NASA Space Programs; Solar System; Economics

20040171311 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Machine Learning Techniques for Characterizing IEEE 802.11b Encrypted Data Streams
Henson, Michael J.; Mar. 2004; 92 pp.; In English; Original contains color illustrations
Report No.(s): AD-A426570; AFIT/GCS/ENG/04-08; No Copyright; Avail: Defense Technical Information Center (DTIC)

As wireless networks become an increasingly common part of the infrastructure in industrialized nations, the vulnerabilities of this technology need to be evaluated. Even though there have been major advancements in encryption technology, security protocols and packet header obfuscation techniques, other distinguishing characteristics do exist in wireless network traffic. These characteristics include packet size, signal strength, channel utilization and others. Using these characteristics, windows of size 11, 31, and 51 packets are collected and machine learning (ML) techniques are trained to classify applications accessing the 802.11b wireless channel. The four applications used for this study included E- Mail, FTP, HTTP, and Print. Using neural networks and decision trees, the overall success (correct identification of applications) of the ML systems ranged from a low average of 65.8% for neural networks to a high of 85.9% for decision trees. These averages are a result of all classification attempts including the case where only one application is accessing the medium and also the unique combinations of two and three different applications.
DTIC
Computer Programs; Data Flow Analysis; Machine Learning; Neural Nets

20040171318 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Solar System Exploration
2003; 73 pp.; In English
Report No.(s): JPL-400-1077-5/03; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: About the roadmap. Summary of key elements. Science objectives. Mission roadmap. Technology. Research and analysis. Education and public outreach. Appendix - Road map framework.
Derived from text
Space Exploration; Solar System

20040171338 Select Committee on Homeland Security (U.S. House), Washington, DC, USA

Keeping Terrorists Out of America by Unifying Terrorist Watch Lists: Ten Requirements for an Effective Terrorist Screening Center

Nov. 2003; 14 pp.; In English

Report No.(s): PB2005-101004; No Copyright; Avail: CASI; A03, Hardcopy

The lack of an integrated terrorist watch list has long been described as a critical shortfall in homeland security and the war against Al Qaeda and other terrorist groups. Unfortunately, in the two years following September 11, 2001, the Bush Administration has failed to demonstrate effective leadership in developing a unified terrorist watch list system that can be used across agencies and by local law enforcement and border control officers. Even before September 11, 2001, information on terrorist suspects was disorganized and poorly used. Two of the September 11 hijackers, Khalid al-Mihdhar and Nawaf al-Hazmi, should have been placed on watch lists on at least three occasions. The effective use and dissemination of accurate watch lists information would likely have allowed authorities to prevent these two from boarding American Airlines flight 77, which was flown into the Pentagon. Effective use of this important tool could have curtailed the destruction witnessed by the entire world on that terrible day.

NTIS

Information Dissemination; Terrorism

20040171350 Northwestern Univ., Evanston, IL, Northwestern Univ., Evanston, IL, USA

Infrastructure Management Decision-Making with Condition Data Generated by Remote Sensors: A Time Series Framework

Durango-Cohen, P. L.; Tadepalli, N.; Aug. 2004; 42 pp.; In English

Report No.(s): PB2005-100962; No Copyright; Avail: CASI; A03, Hardcopy

Recent developments in remote sensing and communications technologies allow agencies to install sensors within infrastructure facilities, such as pavement segments and bridges in order to collect condition-related data in real-time. In theory, such data can be processed, analyzed and displayed on-line as a key component for maintenance, and repair decision-making. The reality facing public works agencies that have adopted these technologies is that vast amounts of data related to the structural and functional condition of infrastructure are accumulated, but not used to address management needs. The research presented herein, therefore, is to develop methodological tools to support the management of transportation infrastructure systems given recent developments in facility-condition data collection technologies.

NTIS

Transportation; Time Series Analysis; Data Acquisition

20040171351 Advanced Technology Systems, Inc., Pittsburgh, PA, USA, Ohio Univ., Athens, OH, USA, Texas A&M Univ., Kingsville, TX, USA

Database and Analytical Tool Development for the Management of Data Derived from US DOE (NTEL) Funded Fine Particulate (PM(sub 2.5)) Research

Khosah, R. P.; Feb. 2004; 28 pp.; In English

Report No.(s): DE2004-822701; No Copyright; Avail: Department of Energy Information Bridge

Advanced Technology Systems, Inc. (ATS) was contracted by the U. S. Department of Energy's National Energy Technology Laboratory (DOE-NETL) to develop a state-of- the-art, scalable and robust web-accessible database application to manage the extensive data sets resulting from the DOE-NETL-sponsored ambient air monitoring programs in the upper Ohio River valley region. The data management system was designed to include a web-based user interface that will allow easy access to the data by the scientific community, policy- and decision-makers, and other interested stakeholders, while providing detailed information on sampling, analytical and quality control parameters. In addition, the system will provide graphical analytical tools for displaying, analyzing and interpreting the air quality data. The system will also provide multiple report generation capabilities and easy-to-understand visualization formats that can be utilized by the media and public outreach/educational institutions. The project is being conducted in two phases. Phase One includes the following tasks: (1) data inventory/benchmarking, including the establishment of an external stakeholder group; (2) development of a data management system; (3) population of the database; (4) development of a web-based data retrieval system, and (5) establishment of an internal quality assurance/quality control system on data management. Phase Two, which is currently underway, involves the development of a platform for on-line data analysis. Phase Two includes the following tasks: (1) development of a sponsor and stakeholder/user website with extensive online analytical tools; (2) development of a public website; (3) incorporation of an extensive online help system into each website; and (4) incorporation of a graphical

representation (mapping) system into each website. The project is now into its eighteenth month of development activities. NTIS

Data Bases; Energy Technology; Particulates; Air Pollution

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20040170453 Jacobs Sverdrup Technology, Inc., Huntsville, AL, USA

Marshall Space Flight Center In-House Earned Value System (EVS)

Smith, Donnie; October 15, 2004; 13 pp.; In English; Professional Development Day Symposium, 15 Oct. 2004, Huntsville, AL, USA

Contract(s)/Grant(s): NAS8-7000; No Copyright; Avail: CASI; A03, Hardcopy

The Earned Value System (EVS) is a project management budgeting and scheduling process for in-house project and institutional applications. This viewgraph presentation includes images of the system's computer interface.

CASI

Project Management; Value; Budgeting; Management Systems

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*.

20040171140 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Survey Of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers

Folta, David; Vaughn, Frank; [2004]; 20 pp.; In English; AIAA/Astrodynamics Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A03, Hardcopy

Cislunar space is a readily accessible region that may well develop into a prime staging area in the effort to colonize space near Earth or to colonize the Moon. While there have been statements made by various NASA programs regarding placement of resources in orbit about the Earth-Moon Lagrangian locations, there is no survey of the total cost associated with attaining and maintaining these unique orbits in an operational fashion. Transfer trajectories between these orbits required for assembly, servicing, and positioning of these resources have not been extensively investigated. These orbits are dynamically similar to those used for the Sun-Earth missions, but differences in governing gravitational ratios and perturbation sources result in unique characteristics. We implement numerical computations using high fidelity models and linear and nonlinear targeting techniques to compute the various maneuver (Delta)V and temporal costs associated with orbits about each of the Earth-Moon Lagrangian locations (L1, L2, L3, L4, and L5). From a dynamical system standpoint, we speak to the nature of these orbits and their stability. We address the cost of transfers between each pair of Lagrangian locations.

Author

Cislunar Space; Stationkeeping; Position (Location)

20040171585 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Living with a Star (LWS) Space Environment Testbeds (SET), Mission Carrier Overview and Capabilities

Patschke, Robert; Barth, Janet; Label, Ken; Mariano, Carolyn; Pham, Karen; Brewer, Dana; Cuviello, Michael; Kobe, David; Wu, Carl; Jarosz, Donald, et al.; [2004]; 11 pp.; In English; 18th Annual AIAA/USU Conference pn Small Satellites, Logan, UT, USA

Report No.(s): SSC04-VI-1; No Copyright; Avail: CASI; A03, Hardcopy

NASA has initiated the Living With a Star (LWS) Program to develop the scientific understanding to address the aspects of the Connected Sun-Earth system that affect life and society. A goal of the program is to bridge the gap between science, engineering, and user application communities. This will enable future science, operational, and commercial objectives in space and atmospheric environments by improving engineering approaches to the accommodation and/or mitigation of the effects of solar variability on technological systems. The three program elements of the LWS Program are Science Missions; Targeted Research and Technology; and Space Environment Testbeds (SETS). SET is an ideal platform for small experiments

performing research on space environment effects on technologies and on the mitigation of space weather effects. A short description of the LWS Program will be given, and the SET will be described in detail, giving the mission objectives, available carrier services, and upcoming flight opportunities.
Author
Aerospace Environments; Atmospheric Composition; Environment Effects; Solar Activity; Space Weather

20040171610 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Orbit Optimization For The Geospace Electrodynamics Connections (GEC) Mission
Mesarch, Michael A.; [2004]; 13 pp.; In English; AIAA/AAS Astrodynamics Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A03, Hardcopy

Part of NASA's Solar Terrestrial Probe line of missions, the Geospace Electrodynamics Connections (GEC) mission will deploy a formation of three spacecraft to perform in-situ atmospheric research in the low Ionosphere-Thermosphere region. These spacecraft will fly together in a %tring-of-pearls formation with variable spacings ranging from 10 seconds to one-quarter of an orbit at perigee. Over the course of its two-year mission, the three spacecraft will perform ten, 1-week dipping campaigns whereby they maneuver to lower their perigee to near 134 km. Using available launch vehicle performance data, an optimal parking orbit of 222 x 1525 km was found to maximize the dry mass available while providing enough propellant to perform the ten deep-dipping campaigns over its two-year mission. The results were used to create multi-variable contour plots containing the orbit perigee, the orbit apogee, spacecraft dry mass, propellant mass, and T500 (a science data collection figure of merit that tabulates the cumulative time spent below 500 km). These plots illustrate how the mission can trade off science return relative to the cost in dry mass and propellant. Other optimal solutions such as minimum propellant or maximum T500 were found to either limit the science data collection or to be dry mass limiting, respectively. Sensitivity analyses were performed to find new optimal (maximum dry mass) solutions if the number of campaigns changed, if the coefficient of drag (CD) were different, and if the propellant specific impulse were increased. A surprising result showed that the dry mass and T500 were both increased if the number of campaigns decreased. Changes in CD provided the expected results - raising CD lowered both the dry mass and T500 while lowering CD raised both the dry mass and T500. Increases in the propellant specific impulse had the expected outcome of raising the dry mass and lowering the propellant load but there was no change in the T500 figure of merit. The orbit optimization was performed parametrically using a Matlab(TradeMark) script and validated using FreeFlyer(TradeMark), a commercial orbit analysis tool. ,
Author
Electrodynamics; Trajectory Optimization; Orbital Maneuvers; Perigees; Apogees; Data Acquisition; Launch Vehicles

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20040161447 NASA Marshall Space Flight Center, Huntsville, AL, USA
Simultaneous Chandra X-ray, HST UV, and Ulysses Radio Observations of Jupiter's Aurora
R. Elsner; Bhardwaj, A.; Waite, H.; Lugaz, N.; Majeed, T.; Cravens, T.; Gladstone, G.; Ford, P.; Grodent, D.; MacDowell, R., et al.; [2004]; 1 pp.; In English; 2004 Meeting of the High Energy Astrophysics Division of the American Astronomical Society, 8-11 Sep. 2004, New Orleans, LA, USA; No Copyright; Avail: Other Sources; Abstract Only

Observations of Jupiter carried out by the Chandra ACIS-S instrument over 24-26 February, 2003, show that the auroral X-ray spectrum consists of line emission consistent with high-charge states of precipitating ions, and not a continuum as might be expected from remsstrahlung. The part of the spectrum due to oxygen peaks around 650 eV, which indicates a high fraction of fully-stripped oxygen in the precipitating ion flux. The OVIII emission lines at 653 eV and 774 eV, as well as the OVII emission lines at 561 eV and 666 eV, are clearly identified. There is also line emission at lower energies in the spectral region extending from 250 to 350 eV for which sulfur and carbon lines are possible candidates. The Jovian auroral spectra differ significantly from measured cometary X-ray spectra. The charge state distribution of the oxygen ion emission evident in the measured auroral spectra strongly suggests that, independent of the source of the energetic ions (magnetospheric or solar wind) the ions have undergone additional acceleration. For the magnetospheric case, acceleration to energies exceeding 10 MeV is apparently required. The ion acceleration also helps to explain the high intensities of the X-rays observed. The phase space densities of unaccelerated source populations of either solar wind or magnetospheric ions are orders of magnitude too small to explain the observed emissions. The Chandra X-ray observations were executed simultaneously with observations at

ultraviolet wavelengths by the Hubble Space Telescope and at radio wavelengths by the Ulysses spacecraft. These additional data sets provide interesting hints as to the location of the source region and the acceleration characteristics of the generation mechanism. The combined observations suggest that the source of the X rays is magnetospheric in origin, and that strong field-aligned electric fields are present which simultaneously create both the several-MeV energetic ion population and the relativistic electrons believed to be responsible for the generation of approximately 40 minute quasi-periodic radio outbursts. Author

Auroras; Hubble Space Telescope; Ultraviolet Radiation; Ulysses Mission; X Ray Astrophysics Facility; Jupiter (Planet); Radio Observation

20040161560 NASA Marshall Space Flight Center, Huntsville, AL, USA

GRACE Collaboration in the Swift Era

Kouveliotou, C.; [2004]; 1 pp.; In English; Meeting of the High Energy Astrophysics Division (HEAD) of the Astronomical Society, 8-11 Sep. 2004, New Orleans, LA, USA; No Copyright; Avail: Other Sources; Abstract Only

I will describe the structure and major discoveries of the Gamma-Ray Afterglow Collaboration at ESO, formed by several European Countries to perform GRB follow up observations using the European Southern Observatory (ESO) ground-based facilities in Chile. I represent the USA-UK node of GRACE. I will also describe a newly funded effort through the Swift GO program aiming at forming a Joint Afterglow NETwork (JANET) using members of the American Association of Variable Star Observers (AAVSO).

Author

Gamma Ray Astronomy; European Southern Observatory

20040161572 NASA Marshall Space Flight Center, Huntsville, AL, USA

A Deep Search with HST for Late Time Supernova Signatures in the Hosts of XRF 011030 and XRF 020427

Patel, Sandeep; Kouveliotou, Chryssa; Levan, Andrew; Fruchter, Andrew; Rol, Evert; Rhoads, James; Gorosabel, Javier; Ramirez-Ruiz, Enrico; Hjorth, Jens; Wijers, Ralph, et al.; January 2004; 1 pp.; In English

Contract(s)/Grant(s): NAS5-26555; Copyright; Avail: Other Sources; Abstract Only

X-ray Flashes (XRFs), are, like Gamma-Ray Bursts (GRBs) thought to signal the collapse of massive stars in distant galaxies. Many models posit that the isotropic equivalent energies of XRFs are lower than those for GRBs, such that they are visible hom a reduced range of distances when compared with GRBs. Here we present the results of two epoch Hubble Space Telescope imaging of two XRFs. These images taken approximately 45 and 200 days post bust reveal no evidence for an associated supernova in either case. Supernovae such as SN 1998bw would have been visible out to z approximately 1.5 in each case, while faint supernovae such as SN 2002ap would be visible to z approximately 1. At these distances the bursts would not fit the observed correlations between E(sub p) and E(sub iso) and would have required extremely luminous X-ray afterglows. We conclude that should these XRFs reside at low redshift, it is necessary either that their line of sight is heavily extinguished, or that XRFs, unlike GRBs do not have temporally coincident supernovae.

Author

Afterglows; Hubble Space Telescope; Supernovae; X Ray Astronomy

20040170755 Naval Observatory, Flaggstaff, AZ

Overlapping Open Clusters NGC 1750 and NGC 1758 Behind the Taurus Dark Clouds. II. CCD Photometry in the Vilnius System

Straizys, V.; Kazlauskas, A.; Cerniauskas, A.; Boyle, R. P.; Vrba, F. J.; Jan. 2003; 30 pp.; In English

Report No.(s): AD-A426828; No Copyright; Avail: CASI; A03, Hardcopy

Seven-color photometry in the Vilnius system has been obtained for 420 stars down to V=16 mag in the area containing the overlapping open clusters NGC 1750 and NGC 1758 in Taurus. Spectral and luminosity classes, color excesses, interstellar extinctions, and interstellar distances are given for 287 stars. The classification of stars is based on their reddening-free Q-parameters. Eighteen stars observed photoelectrically were used as standards. The extinction versus distance diagram exhibits the presence of one dust cloud at a distance of 175 pc, which almost coincides with the distance of other dust clouds in the Taurus complex. The clusters NGC 1750 and NGC 1758 are found to be at the same distance of approximately 760 pc and may penetrate each other. Their interstellar extinction A(V) is 1.06 mag, which corresponds to E(B-V) = 0.34 mag. (3 tables, 5 figures, 10 refs.)

DTIC

Charge Coupled Devices; Classifications; Color; Open Clusters; Photometry

20040170756 Naval Observatory, Flaggstaff, AZ

Large-Scale Errors in CCD Photometry of M 67

Laugalys, V.; Boyle, R. P.; Kazlauskas, A.; Vrba, F. J.; Davis Philip, A. G.; Nov. 14, 2003; 7 pp.; In English

Report No.(s): AD-A426829; No Copyright; Avail: CASI; A02, Hardcopy

The accuracy of new charge-coupled-device (CCD) photometry in the Vilnius system of the M67 cluster is analyzed. The observational material was obtained during six observing runs in 1994 to 2001 with the 1-meter telescope of the U.S. Naval Observatory Flagstaff Station. The main task was to establish CCD standards of high accuracy and to eliminate large-scale errors from their CCD photometry. The authors compare their results with the published CCD photometric data in other photometric systems. The comparison reveals considerable systematic errors in some datasets. (4 figures, 3 refs.)

DTIC

Charge Coupled Devices; Errors; Nebulae; Photometry

20040170813 Naval Observatory, Flaggstaff, AZ

A View Through Faraday's Fog 2: Parsec Scale Rotation Measures in 40 AGN

Zavala, R. T.; Taylor, G. B.; May 27, 2004; 72 pp.; In English

Report No.(s): AD-A426929; No Copyright; Avail: Defense Technical Information Center (DTIC)

Results from a survey of the parsec scale Faraday rotation measure properties for 40 quasars, radio galaxies and BL Lac objects are presented. Core rotation measures for quasars vary from approximately 500 to several thousand rad/sq m. Quasar jets have rotation measures which are typically 500 rad rad/sq m or less. The cores and jets of the BL Lac objects have rotation measures similar to those found in quasar jets. The jets of radio galaxies exhibit a range of rotation measures from a few hundred rad/sq m to almost 10,000 rad/sq m for the jet of M87. Radio galaxy cores are generally depolarized, and only one of four radio galaxies (3C 120) has a detectable rotation measure in the core. Several potential identities for the foreground Faraday screen are considered and we believe the most promising candidate for all the AGN types considered is a screen in close proximity to the jet. This constrains the path length to approximately 10 parsecs, and magnetic field strengths of approximately 1 micro Gauss can account for the observed rotation measures. For 27 out of 34 quasars and BL Lacs their optically thick cores have good agreement to a Wavelength (exp 2) law. This requires the different tau = 1 surfaces to have the same intrinsic polarization angle independent of frequency and distance from the black hole.

DTIC

Faraday Effect; Fog; Galaxies; Quasars; Radio Sources (Astronomy); Rotation

20040171126 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Burst and Transient Source Experiment (BATSE) Earth Occultation Catalog of Low-Energy Gamma-Ray Sources

Harmon, B. A.; Wilson, C. A.; Fishman, G. J.; Connaughton, V.; Henze, W.; Paciesas, W. S.; Finger, M. H.; McCollough, M. L.; Sahi, M.; Peterson, B., et al.; The Astrophysical Journal Supplement Series; October 2004; Volume 154, pp. 585-622; In English; Copyright; Avail: Other Sources

The Burst and Transient Source Experiment (BATSE), aboard the Compton Gamma Ray Observatory (CGRO), provided a record of the low-energy gamma-ray sky (approx. 20-1000 keV) between 1991 April and 2000 May (9.1 yr). BATSE monitored the high-energy sky using the Earth occultation technique (EOT) for point sources whose emission extended for times on the order of the CGRO orbital period (approx. 92 min) or greater. Using the EOT to extract flux information, a catalog of sources using data from the BATSE Large Area Detectors has been prepared. The first part of the catalog consists of results from the all-sky monitoring of 58 sources, mostly Galactic, with intrinsic variability on timescales of hours to years. For these sources, we have included tables of flux and spectral data, and outburst times for transients. Light curves (or flux histories) have been placed on the World Wide Web. We then performed a deep sampling of these 58 objects, plus a selection of 121 more objects, combining data from the entire 9.1 yr BATSE data set. Source types considered were primarily accreting binaries, but a small number of representative active galaxies, X-ray-emitting stars, and supernova remnants were also included. The sample represents a compilation of sources monitored and/or discovered with BATSE and other high-energy instruments between 1991 and 2000, known sources taken from the HEAO 1 A-4 and Macomb & Gehrels catalogs. The deep sample results include definite detections of 83 objects and possible detections of 36 additional objects. The definite detections spanned three classes of sources: accreting black hole and neutron star binaries, active galaxies, and Supernova remnants. The average fluxes measured for the fourth class, the X-ray emitting stars, were below the confidence limit for definite detection. Author (revised)

Gamma Ray Astronomy; Astronomical Catalogs; Gamma Ray Sources (Astronomy); X Ray Astronomy; Sky Surveys (Astronomy)

20040171178 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Role of Integrated Modeling in the Design and Verification of the James Webb Space Telescope

Mosler, Gary E.; Howard, Joseph M.; Johnston, John D.; Hyde, T. Tupper; McGinnis, Mark A.; Bluth, A. Marcel; Kim, Kevin; Ha, Kong Q.; [2004]; 26 pp.; In English; SPIE Conference on Space Systems Optomechanics and Dynamics, 2-6 Aug. 2004; Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the architecture of the James Webb Space Telescope, and explains how integrated modeling is useful for analyzing wavefront, thermal distortion, subsystems, and image motion/jitter for the telescope design.

CASI

James Webb Space Telescope; Spacecraft Design; Models

20040171193 NASA Marshall Space Flight Center, Huntsville, AL, USA

A Different Point of View towards GRB 031203

Ramirez-Ruiz, E.; Granot, J.; Kouveliotou, C.; Woosley, S. E.; Patel, S. K.; Mazzali, P. A.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

One of the most fundamental characteristics of any explosion is its energy, yet despite lively debates, the gamma-ray burst (GRB) community has still to reach a consensus on whether GRBs are standard bombs with a total energy in their relativistic ejecta approximately 10(exp 51) ergs, or a broad range of phenomena with energies varying by many orders of magnitude. While low energy GRBs may well exist, we show here that observations of GRB 031203, do not require a sub-energetic nature for that event. In fact, contrary to previous claims, the data are more consistent with a typical, powerful GRB seen at an angle of about twice the opening angle of the central jet.

Author

Gamma Ray Bursts; Energy Spectra; Supernovae

20040171199 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Arrays of Bolometers for Far-infrared and Submillimeter Astronomy

Chuss, D. T.; Allen, C. A.; Babu, S.; Casey, S.; Dotson, J. L.; Dowell, C. D.; Jhabvala, M.; Harper, D. A.; Moseley, S. H.; Silverberg, R. F., et al.; [2004]; 2 pp.; In English; 15th International Symposium on Space Terahertz Technology, 27-29 Apr. 2004, Northampton, MA, USA; No Copyright; Avail: Other Sources; Abstract Only

We describe 12 x 32 arrays of semiconducting cryogenic bolometers designed for use in far-infrared and submillimeter cameras. These 12 x 32 arrays are constructed from 1 x 32 monolithic pop-up detectors developed at NASA Goddard Space Flight Center. The pop-up technology allows the construction of large arrays with high filling factors that provide efficient use of space in the focal planes of far-infrared and submillimeter astronomical instruments. This directly leads to a significant decrease in observing time. The prototype array is currently operating in SHARC II, a facility instrument in use at the Caltech Submillimeter Observatory (CSO). The elements of this array employ a bismuth absorber coating and quarter wave backshort to optimize the bolometer absorption for a passband centered at 350 microns. However, this resonant structure also provides good bolometer performance at 450 and 850 microns, the two additional SHARC II passbands. A second array is to be installed in the High-resolution Airborne Widebandwidth Camera (HAWC), a far-infrared imaging camera for the Stratospheric Observatory for Infrared Astronomy (SOFIA). This array is currently in the final stage of construction, and its completion is expected in early 2004. HAWC is scheduled for commissioning in 2005. The HAWC array employs titanium-gold absorbers and is optimized for uniform absorption from 40 to 300 microns to accommodate all four of its far-infrared passbands. We describe the details of the array construction including the mechanical design and electrical characterization of the constituent linear arrays, comparing the SHARC II and HAWC cases. We also summarize the overall characteristics of the final two-dimensional arrays. Finally, we show examples of array performance in the form of images obtained with SHARC II.

Author

Astronomy; Bolometers; Submillimeter Waves; Far Infrared Radiation; Cryogenics; Linear Arrays

20040171255 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Waiting in the Wings: Reflected X-ray Emission from the Homunculus Nebula

Corcoran, M. F.; Hamaguchi, K.; Gull, T.; Davidson, K.; Petre, R.; Hillier, D. J.; Smith, N.; Damineli, A.; Morse, J. A.; Walborn, N. R., et al.; [2004]; 17 pp.; In English

Contract(s)/Grant(s): SAO-GO3-4008A; No Copyright; Avail: CASI; A03, Hardcopy

We report the first detection of X-ray emission associated with the Homunculus Nebula which surrounds the supermassive

star eta Carinae. The emission is characterized by a temperature in excess of 100 MK, and is consistent with scattering of the time-delayed X-ray flux associated with the star. The nebular emission is bright in the northwestern lobe and near the central regions of the Homunculus, and fainter in the southeastern lobe. We also report the detection of an unusually broad Fe K fluorescent line, which may indicate fluorescent scattering off the wind of a companion star or some other high velocity outflow. The X-ray Homunculus is the nearest member of the small class of Galactic X-ray reflection nebulae, and the only one in which both the emitting and reflecting sources are distinguishable.
Author
X Rays; Emission; Scattering; Reflection Nebulae

20040171404 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Terrestrial Planet Finder
Smith, Andrew; January 2004; 1 pp.; In English; JPL Talk, 7-10 Jun. 2004, Pasadena, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Integrating and testing the proposed Terrestrial Planet Finder imposes constraints on the design. Some of these will be discussed including the dimensions of existing test facilities, the effects of gravity, ambient vibrations and the size of GSE optics.
Author
Terrestrial Planets; Exploration; Astronomy

20040171431 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The ULX Population in the Starburst Galaxy NGC 253
Weaver, K. A.; Heckman, T. M.; Strickland, D. K.; [2004]; 1 pp.; In English; AAS Conference, 30 May - 3 Jun. 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

Optimism is mounting for the existence of intermediate mass black holes (IMBH), which occupy the mass spectrum somewhere between the stellar-mass and supermassive varieties. IMBH are naturally predicted by theoretical stellar and black hole evolution models, but the strong attention to them began only recently with the discovery of ultraluminous x-ray sources (ULX). If isotropic and accreting normally, ULX have luminosities tens to thousands of times greater than the Eddington luminosity of a neutron star or stellar-mass black hole. A standard interpretation of their x-ray flux implies that they are powered by IMBH. On the other hand, they may be stellar-mass black holes that are beamed or emit anisotropically. Therefore, the exact nature of ULX is highly controversial. ULX are common in starburst galaxies. At a distance of only 3 Mpc, NGC 253 is bright, nearby, and one of the best-studied starburst galaxies. Approximately 50 distinct x-ray point sources are detected in or near the plane of the galaxy. At least six of these are ULX, with luminosities greater than 10 times that expected for a stellar-mass, accreting compact object. We present new Chandra data from an 80 ksec observation of NGC 253 obtained in 2003 that provides high quality spectra of these sources. Comparing the 1999 and 2003 Chandra observations, the sources have varied significantly over the course of four years, with one of the ULX disappearing completely. The ULX spectra are similar to black-hole XRBs and at least one appears to possess an iron K line. We will discuss what insight these data provide for the nature of ULX in NGC 253 .
Author
Black Holes (Astronomy); Starburst Galaxies; Stellar Mass; Mass Spectra; X Ray Sources; A Stars; Neutron Stars

20040171440 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Curious Behavior of PSR JO537-6910
Marshall, Francis E.; [2004]; 1 pp.; In English; AAS HEAD Meeting, 8-11 Sep. 2004, New Orleans, LA, USA; No Copyright; Avail: Other Sources; Abstract Only

We report results from an extensive timing monitoring campaign of PSR JO537-6910, the 16-ms pulsar in the Large Magellanic Cloud, The source has been monitored using the Rossi X-ray Timing Explorer since January, 1999, and at least 18 glitches in its rotation rate have been seen. Despite this extreme activity, phase-connected timing solutions are maintained between the glitches. In addition to its high rotation rate and frequent large glitches, the pulsar has other unusual characteristics. First, a precursor is sometimes seen before the large glitches in which a large phase error is detected several days before the glitch. with no measurable change in pulsar frequency. Second, the size of a glitch is correlated with the time since the previous glitch. Third, phases measured during observations for several weeks after a glitch are often slightly below the extrapolation of best-fit model for the subsequent post-glitch data. It appears that a small fraction of the sudden increase

in frequency decays with an e-folding time scale of about a week. We discuss the implications of these phenomena.
Author
Magellanic Clouds; Pulsars; X Ray Astronomy; Stellar Rotation

20040171442 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Green Bank Telescope Observations of Interstellar Glycolaldehyde: Low Temperature Sugar
Hollis, J. M.; Jewell, P. R.; Lovas, F. J.; Remijan, A.; [2004]; 11 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Interstellar glycolaldehyde (CH20HCHO) has been detected with the 100-m Green Bank Telescope (GBT) toward the star-forming region Sagittarius B2(N) by means of the 1(sub 10)-1(sub 01),2(sub 11)-2(sub 02),3(sub 12)-3(sub 0), and 4(sub 13)-4(sub 04) rotational transitions at 13.48, 15.18, 17.98, and 22.14 GHz, respectively. An analysis of these four high signal-to-noise rotational transitions yields a glycolaldehyde state temperature of ~8 K. Previously reported emission line detections of glycolaldehyde with the NRAO 12-m telescope at mm-wavelengths (71 GHz to 103 GHz) are characterized by a state temperature of -50 K. By comparison the GBT detections are surprisingly strong and seen in emission at 13.48 GHz, emission and absorption at 15.18 GHz, and absorption at 17.98 GHz and 22.14 GHz. We attribute the strong absorption observed by the GBT at the higher frequencies to the correspondingly smaller GBT beams coupling better to the continuum source(s) in Sagittarius B2(N). A possible model for the two-temperature regions of glycolaldehyde is discussed.
Author
Interstellar Chemistry; Glycols; Aldehydes; Sagittarius Constellation

20040171443 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NIEL Calculations for High Energy Heavy Ions
Xapsos, M. A.; Burke, Edward A.; Badavi, F. F.; Townsend, L. W.; Wilson, J. W.; [2004]; 5 pp.; In English; International Nuclear and Space Radiation Effects Conference, 19-23 Jul. 2004, Atlanta, GA, USA; Copyright; Avail: CASI; A01, Hardcopy

Calculations of NIEL are reported for heavy ions prominent in the space environment for energies ranging from 200 MeV per nucleon to 2 GeV per nucleon.
Author
Aerospace Environments; Heavy Ions; Nucleons

20040171454 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Discovery of Extremely Embedded X-ray Sources in the R Coronae Australis Star Forming Core
Hamaguchi, Ken-Ji; Corcoran, Michael F.; Petre, Rob; White, Nicholas E.; Stelzer, Beate; Nedachi, Ko; Kobayashi, Naoto; [2004]; 27 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

We detected three extremely embedded X-ray sources in the R Corona Australis (R CrA) star forming core, IRS 7 region. Two weak X-ray sources are associated with the VLA centimeter radio sources 10E & W, whereas the third brightest source detected in the two XMM-Newton observations on March 2003 has no counterpart at any wavelengths. The large K-band upper-limit (19.4m) measured with the University of Hawaii 88-inch Telescope and strong absorption derived in X-rays (N(sub H) approx. 2.8 x 10(exp 23)/sq cm equivalent to A(sub v) approx. 180 m) indicate that the source is younger than typical Class I protostars, i.e. a Class 0 protostar or an intermittent phase between Class 0 and Class I protostars. The X-ray luminosity was less than one thirtieth (log L(sub x) less than or approx. equals 29.3 ergs/s) in the former Chandra observation in October 2000, which suggests that the X-ray activity, probably generated by magnetic activity, is triggered by an intermittent mass accretion episode such as FU Ori type outbursts. Because the source was detected at high significance in the XMM-Newton observations (approx. 2,000 cnts), X-ray properties of such young protostars can be well investigated for the first time. The light curves were constant in the 1st observation and increased linearly by a factor of two during 30 ksec in the 2nd observation. Both spectra showed iron K lines originated in hot thin-thermal plasma and fluorescence by cold gas. They can be reproduced by an absorbed thin-thermal plasma model with a Gaussian component at 6.4 keV (kT approx. 3-4 keV, L(sub x) approx. 7-20 x 10(exp 30) ergs/s). The rising timescale of the light curves in the 2nd observation was too slow for magnetically generated X-ray flares, whereas large equivalent width of the fluorescence iron K line in the 1st observation (approx. 810 eV) requires strong partial covering of the X-ray source. These results suggest that a confined hot (perhaps accretion) spot on the protostellar core was behind the star in the 1st observation and just appeared in the 2nd observation due to the core rotation with period of greater than or approx. 22.8 days, which is much slower than the break-up velocity previously assumed for young protostars. This means that the source had quiescent X-ray activity during the observations with an order of magnitude stronger level than Class I (older) protostars. We also consider whether the X-ray source associated with

10E could be shock heated plasma by a collision of a jet emanating from the tentative Class 0 object.
Author
X Ray Sources; Embedding; Coronas; Pre-Main Sequence Stars; Magnetic Variations; High Temperature Plasmas

20040171456 NASA Goddard Space Flight Center, Greenbelt, MD, USA
G65.2+5.7: A Thermal Composite Supernova Remnant with a Cool Shell
Shelton, R. L.; Kuntz, K. D.; Petre, R.; [2004]; 15 pp.; In English
Contract(s)/Grant(s): NAG5-10807; Copyright; Avail: CASI; A03, Hardcopy

This paper presents archival ROSAT PSPC observations of the G65.2+5.7 supernova remnant (also known as G65.3+5.7). Little material obscures this remnant and so it was well observed, even at the softest end of ROSATs bandpass (approx. 0.11 to 0.28 keV). These soft X-ray images reveal the remnant s centrally-filled morphology which, in combination with existing radio frequency observations, places G65.2+5.7 in the thermal composite (mixed morphology) class of supernova remnants. Not only might G65.2+5.7 be the oldest known thermal composite supernova remnant, but owing to its optically revealed cool, dense shell, this remnant supports the proposal that thermal composite supernova remnants lack X-ray bright shells because they have evolved beyond the adiabatic phase. These observations also reveal a slightly extended point source centered on RA = l9(sup h) 36(sup m) 46(sup s). dec = 30 deg.40 min.07 sec.and extending 6.5 arc min in radius in the band 67 map. The source of this emission has yet to be discovered, as there is no known pulsar at this location.
Author
Position (Location); Pulsars; Supernova Remnants; X Rays

20040171495 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Is M82 X-1 Really an Intermediate-Mass Black Hole? X-Ray Spectral and Timing Evidence
Fiorito, Ralph; Titarchuk, Lev; [20 October 2004]; 4 pp.; In English; Copyright; Avail: Other Sources

Ultraluminous X-ray sources (ULXs) with apparent luminosities up to hundreds of times the Eddington luminosity for a neutron star have been discovered in external galaxies. The existence of intermediate-mass black holes has been proposed to explain these sources. We present evidence for an intermediate-mass black hole in the ULX M82 X-1 based on the spectral features and timing (quasi-periodic oscillation [QPO]) properties of the X-radiation from this source. We revisited XMM-Newton and Rossi X-Ray Timing Explorer (RXTE) data for M82 X-1 obtained in 2001 and 1997 for XMM and RXTE, respectively. We show for these observations that the source is either in transition or in a high/soft state with photon spectral indices 2.1 and 2.7, respectively. We confirm the early determination of the QPO frequency nu approx. = 55 mHz in this source by Strohmayer & Mushotzky and identify this as the low-frequency QPO for the source. We apply a new method to determine the black hole mass of M82 X-1. The method uses the index-QPO low-frequency correlation that has been recently established in Galactic black hole candidates GRS 1915+105, XTE JI550-564, 4U 1630-47, and others. Using scaling arguments and the correlation derived from the consideration of Galactic black holes, we conclude that M82 X-1 is an intermediate black hole with a mass of the order of 1000 solar mass,.
Author
Accretion Disks; Black Holes (Astronomy); X Rays; Spectra; Time Measurement

20040171497 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Future Mission Data Environment: Virtualizing Access to Solar Physics Data
Gurman, Joseph; [2004]; 1 pp.; In English; SOHO-15, 5-9 Sep. 2004, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

Several virtual observatory efforts, currently in development, have the potential to change the way we identify and access the data we use to solve problems in solar physics. The Virtual Solar Observatory (VSO) seeks to simplify the identification and access processes in as 'light-weight' a way as possible, in order to provide such services to solar physicists, their data assimilation models, and their colleagues in related fields. We describe the design of the VSO, the data services currently available, and concepts of the solar-terrestrial data environment five years in the future.
Author
Data Acquisition; Solar Observatories; Design Analysis

20040171515 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Multiplicity of Wolf-Rayet Stars
Wallace, Debra J.; [2004]; 1 pp.; In English; Massive Stars in Interacting Binaries, 16-20 Aug. 2004, Quebec, Canada; No Copyright; Avail: Other Sources; Abstract Only

The most massive stars drastically reconfigure their surroundings via their strong stellar winds and powerful ionizing radiation. With this mass fueling their large luminosities, these stars are frequently used as standard candles in distance determination, and as tracers of stellar evolution in different regions and epochs. In their dieing burst, some of the once massive stars will enter a Wolf-Rayet (WR) phase lasting approx.10% of the stellar lifetime. This phase is particularly useful for study because these stars have strong spectroscopic signatures that allow them to be easily identified at great distances. But how accurate are these identifications? Increasingly, the relatively nearby stars we once assumed to be single are revealing themselves to be binary or multiple. New techniques, such as high-resolution imaging and interferometry, are changing our knowledge of these objects. I will discuss recent results in the literature and how this affects the binary distribution of WR stars. I will also discuss the implications of binary vs. single star evolution on evolution through the WR phase. Finally, I will discuss the implications of these revised numbers on both massive stellar evolution itself, and the impact that this has on the role of WR stars as calibrators.
Author
Ionizing Radiation; Binary Stars; Wolf-Rayet Stars; Stellar Evolution; Luminosity; Interferometry

20040171531 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A SAFIR Mission Concept
Benford, Dominic J.; [2005]; 1 pp.; In English; New Perspectives for Post-Herschel Far Infrared Astronomy from Space, Sep. 2005, Madrid, Spain; No Copyright; Avail: Other Sources; Abstract Only

The development of a large far-infrared telescope in space has taken on a new urgency with the recognition of the fundamental importance of the far-infrared spectral region to questions ranging from cosmology to our own Solar System. The Single Aperture Far-InfraRed (SAFIR) Observatory is a l0m-class far-infrared observatory that would begin development later in this decade to answer these questions. SAFIR's science goals are driven by the fact that youngest stages of almost all phenomena in the universe are shrouded in absorption by and emission from cool dust that emits strongly in the far- infrared, 20 microns - 1 millimeter. Its operating temperature of 4 K and its capable instrument complement would be optimized to reach the natural sky background limit in the far-infrared with diffraction-limited performance down to around 40 microns. This would provide a point source sensitivity improvement of several orders of magnitude over that of SIRTF. Based on a broad set of science requirements, we have developed a conceptual design for the SAFIR observatory using design heritage from the James Webb Space Telescope. Several enabling technologies requiring development have been identified, including lightweight deployable optics, cryogenic cooling of optical elements and instruments, and large arrays of sensitive detectors.
Author
Space Infrared Telescope Facility; Observatories; Space Missions

20040171534 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High Resolution Temporal and Spectral Monitoring of Eta Carinae's X-Ray Emission the June Eclipse
Corcoran, M. F.; Hamaguchi, K.; Henley, D.; Pittard, J. M.; Gull, T. R.; Davidson, K.; Swank, J. H.; Petre, R.; Ishibashi, K.; [2004]; 1 pp.; In English; American Astronomical Society Meeting, 4-8 Jan. 2004, Atlanta, GA, USA; Copyright; Avail: Other Sources; Abstract Only

The supermassive and luminous star Eta Carinae undergoes strong X-ray variations every 5.5 years when its 2-10 keV X-ray emission brightens rapidly with wild fluctuations before dropping by a factor of 100 to a minimum lasting 3 months. The most recent X-ray 'eclipse' began in June 2003 and during this time Eta Carinae was intensely observed throughout the electromagnetic spectrum. Here we report the first results of frequent monitoring of the 2-10 keV band X-ray emission by the Rossi X-ray Timing Explorer along wit high resolution X-ray spectra obtained with the transmission gratings on the Chandra X-ray Observatory. We compare these observations to those results obtained during the previous X-ray eclipse in 1998, and interpret the variations in the X-ray brightness, in the amount of absorption, in the X-ray emission measure and in the K-shell emission lines in terms of a colliding wind binary model.
Author
Supermassive Stars; Brightness; Eclipses; Electromagnetic Spectra; Emission Spectra

20040171536 NASA Goddard Space Flight Center, Greenbelt, MD, USA
XMM-Newton Observations of the 2003 X-Ray Minimum of Eta Carinae
Hamaguchi, K.; Corcoran, M. F.; White, N. E.; Damineli, A.; Davidson, K.; Gull, T. R.; [2004]; 1 pp.; In English; American Astronomical Society Meeting, 4-8 Jan. 2004, Atlanta, GA, USA; Copyright; Avail: Other Sources; Abstract Only

The XMM-Newton X-ray observatory took part in the multi-wavelength observing campaign of the massive, evolved star

Eta Carinae in 2003 during its recent X-ray minimum in June 2003. This paper reports on the first results of these observations, which were performed (1) before the minimum (five times in January, 2003), (2) near the X-ray maximum just before the minimum (two times in June) and (3) during the minimum (four times in July-August). Hard X-ray emission from the point source of Eta Carinae was detected even during the minimum. The observed flux above 3 keV was approx. 3x10(exp -12) ergs cm(exp -2)/s, which is about one percent of the flux before the minimum. Light curves from the individual observations show no time variability on the scale of a few kilo-seconds. Changes in the spectral shape occurred, but these changes were smaller than expected if the minimum is produced solely by an increase of hydrogen column density. Fits of the hard X-Ray source by an absorbed 1T model show a constant plasma temperature at around 5 keV and an increase of column density from 5x10(exp 22) cm(exp -2) to 2x10(exp 23) cm(exp -2). The spectra below 6 keV significantly deviate from the models that fit the higher energy emission. The X-ray minimum seems to be dominated by an apparent decrease of the emission measure, suggesting that the brightest part of the X-ray emitting region is completely obscured during the minimum in the form of an eclipse. Partial covering plasma emission models might be considered for the spectral variation. The spectra also showed strong iron K line emission from both hot and cold gases, and weak line emission from Ni, Ca, Ar, S and Si.
Author
Emission Spectra; Massive Stars; XMM-Newton Telescope; X Ray Astronomy

20040171537 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The UV Scattering Halo of the Central Source Associated with Eta Carinae
Hillier, D. J.; Davidson, K.; Gull, T. R.; Humphreys, R. M.; Iping, R.; Sonneborn, G.; [2004]; 1 pp.; In English; American Astronomical Society Meeting
Contract(s)/Grant(s): STScI-09083; STScI-09420; NAG5-10378; Copyright; Avail: Other Sources; Abstract Only

Eta Carinae is one of the most massive and luminous stars within our galaxy. It consists of a compact central source which suffers circumstellar and interstellar extinction, local dense knots which emit strong narrow nebular-like emission lines, and an outer dusty nebula called the Homunculus. The optical spectrum of the central star, first observed directly and without obvious nebular contamination by the HST, can be modeled successfully using a hot star with a radius (at the wind sonic point) of 60\,R\odot. The central star is losing mass, via a dense stellar wind, at the prodigious rate of 10(exp -3)\,M\odot/yr. Its effective temperature is low (\h 10,000\,K), and is determined entirely by the wind properties. Until now the UV spectrum has not been explained. We show that HST UV spectrum, and the FUSE FUV spectrum, can both be understood using the same underlying model that explains the optical spectrum. To do so, however, it is necessary to take into account the occultation of the central source by dust. It is also important to realize that in the UV, the HST is partially resolving the central source. Due to strong mass loss, the wind is optically thick in UV resonance lines even at large radii. The UV resonance lines are responsible for the UV halo seen around Eta Carinae, and provide a partial explanation of why Eta Carinae can even be seen at UV wavelengths.
Author
Peculiar Stars; Ultraviolet Astronomy; Electromagnetic Scattering

20040171569 NASA Goddard Space Flight Center, Greenbelt, MD, USA
UV Spectral Diagnostics of Galaxy Evolution
Heap, Sara R.; [2003]; 1 pp.; In English; Workshop on Multiwavelength Mapping of Galaxy Formation and Evolution, 13-16 Oct. 2003, Venice, Italy; No Copyright; Avail: Other Sources; Abstract Only

New instrumentation now enable deep spectral surveys of galaxies at younger ages. At a redshift, z=1, all galaxies are less than 6 Gyr old and hence, have not yet formed horizontal-branch stars. Also, at z=1, the restframe-UV comes into view, and with it, a new set of spectral diagnostics. UV spectral features are especially important because most of the UV flux comes from stars at the main-sequence turnoff (MSTO). Hence, UV spectral diagnostics enable the most recent star formation episode of high-redshift galaxies to be estimated directly from MSTO stars. In preparation for these high-redshift spectral surveys, we are developing UV spectral templates for stellar populations younger than 6 Gyr using UV-optical spectra of stars observed by HST/STIS. We are also starting to supplement these observations with theoretical spectral grids of stars of various metallicities. In this paper, we present a progress report on UV spectral templates and spectral diagnostics.
Author
Galactic Evolution; Ultraviolet Spectra; Astronomy

20040171578 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Eta Carinae and the 2003.5 Minimum: Ultraviolet Changes of the Central Source and the Very Nearby Ejecta

Gull, T. R.; Nielsen, K. E.; Vieira, G. L.; Hillier, D. J.; Walborn, N.; Davidson, K.; [2004]; 1 pp.; In English; American Astronomical Society Meeting, 4-8 Jan. 2004

Contract(s)/Grant(s): STScl-9420; STScl-9973; Copyright; Avail: Other Sources; Abstract Only

We utilized the high spatial and high spectral resolution of the HST/STIS MAMA echelle modes in the ultraviolet (0.025 sec spatial resolution and 30,000 to 120,000 spectral resolving power) to view changes in and around Eta Carinae before and after the X-Ray drop which occurred on June 29, 2003. Major changes in the spectra of the Central Source and nearby nebulosities occurred between June 22 and July 5. Visibility of the Central Source dropped, especially between 1175 and 1350 A, but not uniformly through the UV. This fading is likely due to multiple line absorptions both in the source and in the intervening ejecta. Nebular emission of Si III and Fe III, located 0.09 sec to the west, disappeared. By July 29, a bright feature extending up to 0.07 sec east of the Central Source became prominent in broad emission lines near 2500 A, but was not noticeable longward of 2900 A. ACS/HRC imagery and STIS CCD spectra taken concurrently are being examined for larger scale changes. Numerous narrow velocity components between -146 and -585 km/s were identified in spectra before the minimum. New components appeared primarily in Fe II absorption lines with velocities between -170 and -380 km/s. While the lines of the -513 km/s component did not change, most lines of the -146 km/s component changed considerably. Lines originating from high energy levels diminished or disappeared, while lines originating from lower energy levels strengthened. Strong absorption lines of Ti II, not present before the X-Ray drop, appeared within seven days, but disappeared by July 29. Further analysis of these unprecedented data will provide significant new information about the structure of Eta Carinae and its periodic variations.

Author (revised)

Ultraviolet Astronomy; Peculiar Stars; Ultraviolet Spectroscopy; Ejecta

20040171580 NASA Goddard Space Flight Center, Greenbelt, MD, USA

James Webb Space Telescope (JWST) Optical Telescope Element (OTE) Development Status

Feinberg, Lee D.; June 22, 2004; 16 pp.; In English

Report No.(s): SPIE Paper 5487-30; No Copyright; Avail: CASI; A03, Hardcopy

The James Webb Space Telescope (JWST) Optical Telescope Element (OTE) is a segmented, cryogenic telescope scheduled for launch in 2011. In September of 2002, NASA selected prime contractor Northrop Grumman Space Technology (NGST) to build the observatory including management of the OTE. NGST is teamed with subcontractors Ball Aerospace, Alliant Techsystems (ATK). and Kodak. The team has completed several significant design, technology, architecture definition, and manufacturing milestones in the past year that are summarized in this paper.

Author

James Webb Space Telescope; Aerospace Engineering; Cryogenics; Observatories

20040171581 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Taking the Measure of the Universe

Bennett, Charles L.; Hinshaw, Gary; [2003]; 1 pp.; In English; Physics/Astronomy Colloquium, 9-12 Oct. 2003, Cleveland, OH, USA; No Copyright; Avail: Other Sources; Abstract Only

The first findings from a year of operations by the Wilkinson Microwave Anisotropy Probe (WMAP) satellite provide the first detailed full sky picture of the afterglow of the Big Bang. The patterns in this picture encode a wealth of cosmological information, including the age of the universe, the epoch when the first stars formed, and the overall composition of normal matter, dark matter, and dark energy. The results have tantalizing implications for the period of inflationary expansion in the very first moments of time. These and other aspects of the mission will be discussed. The WMAP satellite was built in a close partnership between Princeton University and the Goddard Space Flight Center.

Author

Microwave Anisotropy Probe; Universe; Astronomy; Big Bang Cosmology

20040171584 NASA Goddard Space Flight Center, Greenbelt, MD, USA

TPF Minimum Mission Review

Smith, Andrew M.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

The Terrestrial Planet Finder (TPF) is a complex astronomical observatory requiring unprecedented optical accuracies and

stabilities. I will present a preliminary outline of tests that will be required to establish the capability of TPF to detect terrestrial planets.
Author
Astronomical Observatories; Terrestrial Planets

20040171589 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Changes in the Far UV Spectrum of Eta Carinae Near the 2003 Minimum
Iping, R. C.; Gull, T. R.; Sonneborn, G.; Massa, D.; Vieira, G. L.; Nielsen, K. E.; [2004]; 1 pp.; In English; American Astronomical Society Meeting, 4-8 Jan. 2004, Atlanta, GA, USA
Contract(s)/Grant(s): NAG5-11137; No Copyright; Avail: Other Sources; Abstract Only

High resolution 905-1180 spectra of \eta Carinae have been obtained with the Far Ultraviolet Spectroscopic Explorer (FUSE) satellite at nine epochs between February 2000 and June 2003 . This period of time extends from the broad maximum up to the very beginning of the minimum of the 5.52-year period initially discovered by A. Damineli. The flux levels were unchanged between February 2000 through February 2003 with minor spectral differences. The X-Ray minimum started on June 29, 2003 . Three observations were accomplished on June 10, June 17 and June 27 leading up to the minimum. Substantial changes were present in the June 10 and June 17 spectra, but a very significant change occurred by June 27, 2003. Longward of 1100A, the overall flux dropped 10 to 30 %. Shortward of 1100A, there are spectral intervals with NO decrease in flux even down to the shortest wavelengths (920--950). This indicates that dust absorption has a negligible role in the observed spectral changes and that line absorptions play a major role. Throughout the spectrum there are intervals ranging in width of 3-10A with strong increased absorption. Significant absorptions may be associated with the red portion of the following stellar wind lines: C III 977, O VI 1031,1037, P V 1117, while other absorption features are much broader, more extended and not clearly associated with well-known spectral transitions. Given the complexity of the STIS echelle spectra taken in this period of time, many of these absorption features are likely due to multiple absorption lines
Author
Line Spectra; Massive Stars; Absorption Spectra

20040171591 NASA Goddard Space Flight Center, Greenbelt, MD, USA
UV Spectral Diagnostics
Heap, Sara R.; [2003]; 1 pp.; In English; Stellar Populations Conference, 6-10 Oct. 2003, Garching, Germany; No Copyright; Avail: Other Sources; Abstract Only

New instrumentation now enable deep spectral surveys of galaxies at younger ages. At a redshift, z=l, all galaxies are less than 6 Gyr old and hence, have not yet formed horizontal-branch stars. Also, at z=1, the restframe-UV comes into view, and with it, a new set of spectral diagnostics. UV spectral features are especially important because most of the UV flux comes from stars at the main-sequence turnoff (MSTO). Hence, UV spectral diagnostics enable the most recent star formation episode of high-redshift galaxies to be estimated directly from MSTO stars. In preparation for these high-redshift spectral surveys, we are developing UV spectral templates for stellar populations younger than 6 Gyr using UV-optical spectra of stars observed by HST/STIS. We are also starting to supplement these observations with theoretical spectral grids of stars of various metallicities. In this paper, we present a progress report on UV spectral templates and spectral diagnostics.
Author
Ultraviolet Spectra; Galactic Evolution

20040171606 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Rigorous Attempt to Verify Interstellar Glycine
Snyder, L. E.; Lovas, F. J.; Hollis, J. M.; Friedel, D. N.; Jewell, P. R.; Remijan, A.; Ilyushin, V. V.; Alekseev, E. A.; Dyubko, S. F.; [2004]; 34 pp.; In English
Contract(s)/Grant(s): STCU-2132; NSF AST-99-81363; NSF AST-02-28953; RTOP 188-02-02-01; Copyright; Avail: CASI; A03, Hardcopy

In 2003, Kuan, Charnley, and co-workers reported the detection of interstellar glycine (NH2CH2COOH) based on observations of 27 lines in 19 different spectral bands in one or more of the sources Sgr BP(N-LMH), Orion KL, and W51 e1/e2. They supported their detection report with rotational temperature diagrams for all three sources. In this paper, we present essential criteria which can be used in a straightforward analysis technique to confirm the identity of an interstellar asymmetric rotor such as glycine. We use new laboratory measurements of glycine as a basis for applying this analysis technique, both to our previously unpublished 12 m telescope data and to the previously published SEST data of Nummelin

and colleagues. We conclude that key lines necessary for an interstellar glycine identification have not yet been found. We identify several common molecular candidates that should be examined further as more likely carriers of the lines reported as glycine. Finally, we illustrate that rotational temperature diagrams used without the support of correct spectroscopic assignments are not a reliable tool for the identification of interstellar molecules. Subject headings: ISM: abundances - ISM: clouds - ISM: individual (Sagittarius B2[N-
Author
Interstellar Matter; Glycine; Spectral Bands; Identities; Sagittarius Constellation

20040171618 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The HST Treasury Project on Eta Carinae
Davidson, K.; Ishibashi, K.; Gull, T. R.; Martin, J. C.; Humphreys, R. M.; Daminell, A.; Weis, K.; Stahl, O.; Hillier, D. J.; Corcoran, M., et al.; [2004]; 1 pp.; In English; American Astronomical Society Meeting, 4-8 Jan. 2004, Atlanta, GA, USA Contract(s)/Grant(s): STScI-GO-9420; Copyright; Avail: Other Sources; Abstract Only

This program is valuable for a broad range of stellar and nebular astrophysics, as well as data processing techniques and instrument characteristics. While observing this object's mysterious 5.5-year cycle, we obtained data on several distinct, complex, unfamiliar classes of spectra which cannot be observed well elsewhere. The stellar wind parameters lie outside normal experience, the Weigeit ejecta produce narrow-line spectra, unlike any other known object, and the other spectra re also unusual. Altogether our results pertain to stellar instabilities close to the Eddington limit, extreme stellar winds, unexplored nebular/atomic excitation processes, nebular gas dynamics, and instrument performance.
Derived from text
Stellar Winds; Line Spectra; Gas Dynamics; Astrophysics; Data Processing; Stars

20040171632 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Measurement of Gravitational Spin-Orbit Coupling in a Binary Pulsar System
Stairs, I. H.; Thorsett. S. E.; Arzoumanian, Z.; [2004]; 4 pp.; In English; Copyright; Avail: CASI; A01, Hardcopy

In relativistic gravity, a spinning pulsar will precess as it orbits a compact companion star. We have measured the effect of such precession on the average shape and polarization of the radiation from PSR B1534+12. We have also detected, with limited precision, special-relativistic aberration of the revolving pulsar beam due to orbital motion. Our observations fix the system geometry, including the misalignment between the spin and orbital angular momenta, and yield a measurement of the precession timescale consistent with the predictions of General Relativity.
Author
Gravitation; Spin-Orbit Interactions; Pulsars; X Ray Binaries; Mathematical Models; Coupling

20040171639 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy
Bowers, Charles W.; Woodgate, Bruce E.; Lyon, Richard G.; [2003]; 15 pp.; In English; Technologies and Instrumentation for Detection of Exo-Planets, 2003; No Copyright; Avail: CASI; A03, Hardcopy

Detection of extra-solar, and especially terrestrial-like planets, using coronagraphy requires an extremely high level of wavefront correction. For example, the study of Woodruff et al. (2002) has shown that phase uniformity of order 10(exp -4)lambda(rms) must be achieved over the critical range of spatial frequencies to produce the approx. 10(exp 10) contrast needed for the Terrestrial Planet Finder (TPF) mission. Correction of wavefront phase errors to this level may be accomplished by using a very high precision deformable mirror (DM). However, not only phase but also amplitude uniformity of the same scale (approx. 10(exp -4)) and over the same spatial frequency range must be simultaneously obtained to remove all residual speckle in the image plane. We present a design for producing simultaneous wavefront phase and amplitude uniformity to high levels from an input wavefront of lower quality. The design uses a dual Michelson interferometer arrangement incorporating two DM and a single, fixed mirror (all at pupils) and two beamsplitters: one with unequal (asymmetric) beam splitting and one with symmetric beam splitting. This design allows high precision correction of both phase and amplitude using DM with relatively coarse steps and permits a simple correction algorithm.
Author
Terrestrial Planets; Extrasolar Planets; Planet Detection; Coronagraphs; Wave Fronts; Phase Error

20040171640 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The James Webb Space Telescope
Mather, John; [2003]; 1 pp.; In English; Optical Society of America Meeting, 5-9 Oct. 2003, Tucson, AZ, USA; No Copyright; Avail: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) will extend the discoveries of the Hubble Space Telescope by deploying a large cooled infrared telescope at the Sun-Earth Lagrange point L2. It will have a 6 m aperture and three instruments covering the wavelength range from 0.6 to 28 microns.
Author
Infrared Telescopes; James Webb Space Telescope

20040171647 NASA Goddard Space Flight Center, Greenbelt, MD, USA
X-ray Observations of the Bright Old Nova V603 Aquilae
Mukai, K.; Orio, M.; [2004]; 29 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

We report on our Chandra and RXTE observations of the bright old nova, V603 Aql, performed in 2001 April, supplemented by our analysis of archival X-ray data on this object. We find that the RXTE data are contaminated by the Galactic Ridge X-ray emission. After accounting for this effect, we find a high level of aperiodic variability in the RXTE data, at a level consistent with the uncontaminated Chandra data. The Chandra HETG spectrum clearly originates in a multi-temperature plasma. We constrain the possible emission measure distribution of the plasma through a combination of global and local fits. The X-ray luminosity and the spectral shape of V603 Aql resemble those of SS Cyg in transition between quiescence and outburst. The fact that the X-ray flux variability is only weakly energy dependent can be interpreted by supposing that the variability is due to changes in the maximum temperature of the plasma. The plasma density is likely to be high, and the emission region is likely to be compact. Finally, the apparent overabundance of Ne is consistent with V603 Aql being a young system.
Author
X Ray Timing Explorer; Cataclysmic Variables; X Ray Astrophysics Facility

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20040161574 NASA Marshall Space Flight Center, Huntsville, AL, USA
GLAST Burst Monitor Trigger Classification Algorithm
Perrin, D. J.; Sidman, E. D.; Meegan, C. A.; Briggs, M. S.; Connaughton, V.; [2004]; 1 pp.; In English; Meeting of the High Energy Astrophysics Division of the American Astronomical Society, 8-11 Sep. 2004, New Orleans, LA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Gamma Ray Large Area Space Telescope (GLAST), currently set for launch in the first quarter of 2007, will consist of two instruments, the GLAST Burst Monitor (GBM) and the Large Area Telescope (LAT). One of the goals of the GBM is to identify and locate gamma-ray bursts using on-board software. The GLAST observatory can then be re-oriented to allow observations by the LAT. A Bayesian analysis will be used to distinguish gamma-ray bursts from other triggering events, such as solar flares, magnetospheric particle precipitation, soft gamma repeaters (SGRs), and Cygnus X-1 flaring. The trigger parameters used in the analysis are the burst celestial coordinates, angle from the Earth's horizon, spectral hardness, and the spacecraft geomagnetic latitude. The algorithm will be described and the results of testing will be presented.
Author
Gamma Rays; Telescopes; Algorithms

20040161578 NASA Marshall Space Flight Center, Huntsville, AL, USA
GRO J2058+42 Observations with Chandra and Detection of a Likely Optical Counterpart
Wilson, Colleen A.; Coe, M. J.; Finger, M. H.; Weisskopf, M. C.; Greiner, J. C.; Reig, P.; [2004]; 1 pp.; In English; Meeting of the High Energy Astrophysical Division of the American Astronomical Society, 8-11 Sep. 2004, New Orleans, LA, USA; Copyright; Avail: Other Sources; Abstract Only

GRO J2058+42 is a 195-s transient X-ray pulsar discovered in 1995 with BATSE. In 1996, RXTE located GRO J2058+42 to a 90% confidence error circle with a 4-arcminute radius. On 20 February 2004, the region including the error circle was observed with Chandra ACIS-I. No X-ray sources were detected within the error circle, however, 2 faint sources were detected in the ACIS-I field-of-view. We obtained follow-up optical observations of the brightest object, that had about 64 X-ray counts and was just 0.3 arcmin outside the error circle. The optical spectrum contained a strong H-alpha line and corresponds to an infrared object in the 2MASS catalog, indicating a Be/X-ray system. Although X-ray pulsations were undetectable due to the

low count rate, this object is most likely the optical counterpart to GRO J2058+42. We present results from the Chandra observation and from the optical observations.
Author
Pulsars; X Rays; X Ray Astrophysics Facility; Gamma Ray Bursts

20040161579 NASA Marshall Space Flight Center, Huntsville, AL, USA
Particle Acceleration and Magnetic Field Generation in Electron-Positron Relativistic Shocks
Nishikawa, K.-I.; Hardee, P.; Richardson, G.; Preece, R.; Sol, H.; Fishman, G. J.; [2004]; 2 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Shock acceleration is an ubiquitous phenomenon in astrophysical plasmas. Plasma waves and their associated instabilities (e.g., Buneman, Weibel and other two-stream instabilities) created in collisionless shocks are responsible for particle (electron, positron, and ion) acceleration. Using a 3-D relativistic electromagnetic particle (REMP) code, we have investigated particle acceleration associated with a relativistic electron-positron jet front propagating into an ambient electron-positron plasma with and without initial magnetic fields. We find small differences in the results for no ambient and modest ambient magnetic fields. Simulations show that the Weibel instability created in the collisionless shock front accelerates jet and ambient particles both perpendicular and parallel to the jet propagation direction. The non-linear fluctuation amplitudes of densities, currents, electric, and magnetic fields in the electron-positron shock are larger than those found in the electron-ion shock studied in a previous paper. This comes from the fact that both electrons and positrons contribute to generation of the Weibel instability. Additionally, we have performed simulations with different electron skin depths. We find that growth times scale inversely with the plasma frequency, and the sizes of structures created by the Weibel instability scale proportional to the electron skin depth. This is the expected result and indicates that the simulations have sufficient grid resolution. While some Fermi acceleration may occur at the jet front, the majority of electron and positron acceleration takes place behind the jet front and cannot be characterized as Fermi acceleration. The simulation results show that the Weibel instability is responsible for generating and amplifying nonuniform, small-scale magnetic fields which contribute to the electron's (positron's) transverse deflection behind the jet head. This small scale magnetic field structure is appropriate to the generation of 'jitter' radiation from deflected electrons (positrons) as opposed to synchrotron radiation. The jitter radiation has different properties than synchrotron radiation calculated assuming a a uniform magnetic field. The jitter radiation resulting from small scale magnetic field structures may be important for understanding the complex time structure and spectral evolution observed in gamma-ray bursts or other astrophysical sources containing relativistic jets and relativistic collisionless shocks.
Author
Particle Acceleration; Electrons; Positrons; Relativistic Particles; Shock Fronts; Magnetic Fields; Space Plasmas

20040170421 Catholic Univ. of America, Washington, DC, USA
Double Discontinuities in Space Plasma
Whang, Y. C.; 2004; 12 pp.; In English
Report No.(s): DE2004-823765; No Copyright; Avail: Department of Energy Information Bridge

This research used high-resolution magnetic field data to examine the interior structures of MHD shocks in interplanetary space and in the magnetotail; we discovered that a slow- mode shock is often followed by an adjoining rotational discontinuity layer on the postshock side. The thickness of each layer is of the order of a few ion inertial lengths. Such a compound structure is known as a double discontinuity. When the magnetic field rotates by several degrees per ion inertial length inside a thin layer, the Hall current term becomes important in the generalized Ohm's law. Steady state solutions based on the Hall-MHD theory have been obtained to show the merging of a rotational layer and a slow shock layer to form a compound structure like the observed double dis continuities.
NTIS
Magnetic Fields; Interplanetary Space; Magnetotails; Plasmas (Physics)

20040170667 Naval Observatory, Flaggstaff, AZ
An X-Ray Outburst from the Rapidly Accreting Young Star that Illuminates McNeil's Nebula
Kastner, J. H.; Richmond, M.; Grosso, N.; Weintraub, D. A.; Simon, T.; Jul. 22, 2004; 4 pp.; In English
Report No.(s): AD-A426581; No Copyright; Avail: Defense Technical Information Center (DTIC)

Young, low-mass stars are luminous X-ray sources whose powerful X-ray flares may exert a profound influence over the process of planet formation. The origin of the X-ray emission is uncertain. Although many (or perhaps most) recently formed, low-mass stars emit X-rays as a consequence of solar-like coronal activity, it also has been suggested that X-ray emission may

be a direct result of mass accretion onto the forming star. The authors report on X-ray imaging spectroscopy observations that reveal a factor ^50 increase in the X-ray flux from a young star that is at present undergoing a spectacular optical/ infrared outburst (this star illuminates McNeil's nebula). The outburst seems to be due to the sudden onset of a phase of rapid accretion. The coincidence of a surge in X-ray brightness with the optical/infrared eruption demonstrates that strongly enhanced high-energy emission from young stars can occur as a consequence of high accretion rates. The authors suggest that such accretion-enhanced X-ray emission from erupting young stars may be short-lived, because intense star disk magnetospheric interactions are quenched rapidly by the subsequent flood of new material onto the star. (1 table, 3 figures, 30 refs.)
DTIC
Nebulae; Photometry; X Ray Optics; X Ray Spectra; X Rays

20040170675 Naval Observatory, Flaggstaff, AZ
Dynamical Mass Constraints on Low-Mass Pre-Main- Sequence Stellar Evolutionary Tracks: An Eclipsing Binary in Orion With a 1.0 M Primary and a 0.7 M Secondary
Stassun, Keivan G.; Mathieu, Robert D.; Vaz, Luiz P.; Stroud, Nicholas; Vrba, Frederick J.; Dec. 30, 2003; 30 pp.; In English
Report No.(s): AD-A426602; No Copyright; Avail: Defense Technical Information Center (DTIC)

We report the discovery of a double-lined, spectroscopic, eclipsing binary in the Orion star-forming region. We analyze the system spectroscopically and photometrically to empirically determine precise, distance- independent masses, radii, effective temperatures, and luminosities for both components. The measured masses for the primary and secondary, accurate to approximately 1%, are 1.01 and 0.73 M , respectively; thus, the primary is a definitive pre main-sequence solar analog, and the secondary is the lowest-mass star yet discovered among pre mainsequence eclipsing binary systems. We use these fundamental measurements to test the predictions of pre mainsequence stellar evolutionary tracks. None of the models we examined correctly predict the masses of the two components simultaneously, and we implicate differences between the theoretical and empirical effective temperature scales for this failing. All of the models predict the observed slope of the mass-radius relationship reasonably well, though the observations tend to favor models with low convection efficiencies. Indeed, considering our newly determined mass measurements together with other dynamical mass measurements of pre main-sequence stars in the literature, as well as measurements of Li abundances in these stars, we show that the data strongly favor evolutionary models with inefficient convection in the stellar interior, even though such models cannot reproduce the properties of the present-day Sun.
DTIC
Binary Stars; Eclipsing Binary Stars; Mass; Pre-Main Sequence Stars; Stars

20040171104 Freiburg Univ., Germany
First Upper Limits from LIGO on Gravitational Wave Bursts
Abbott, B.; Abbott, R.; Jan. 06, 2004; In English
Report No.(s): DE2004-821884; No Copyright; Avail: National Technical Information Service (NTIS)

We report on a search for gravitational wave bursts using data from the first science run of the LIGO detectors. Our search focuses on bursts with durations ranging from 4 ms to 100 ms, and with significant power in the LIGO sensitivity band of 150 to 3000 Hz. We bound the rate for such detected bursts at less than 1. 6 events per day at 90% confidence level. This result is interpreted in terms of the detection efficiency for ad hoc waveforms (Gaussians and sine-Gaussians) as a function of their root-sum-square strain h(sub rss); typical sensitivities lie in the range h(sub rss)(approx) 10(sup -19) - 10(sup -17) strain/(radical)Hz, depending on waveform. We discuss improvements in the search method that will be applied to future science data from LIGO and other gravitational wave detectors
NTIS
Astrophysics; Stellar Activity

20040171130 NASA Marshall Space Flight Center, Huntsville, AL, USA
Non-Thermal Hard X-Ray Emission in Galaxy Clusters Observed with the BeppoSAX PDS
Nevalainen, J.; Oosterbrock, T.; Bonamente, M.; Colafrancesco, S.; The Astrophysical Journal; January 2004; Volume 608, pp. 166-178; In English
Contract(s)/Grant(s): NAG5-9945; Copyright; Avail: Other Sources

We study the X-ray emission in a sample of galaxy clusters using the BeppoSAX PDS instrument in the 20-80 keV energy band. We estimate the nonthermal hard X-ray (HXR) cluster emission by modeling the thermal contribution from the cluster gas and the nonthermal contamination from the unobscured active galactic nuclei (AGNs) in the clusters. We also evaluate

the systematic uncertainties due to the background fluctuations. Assuming negligible contamination from the obscured AGNs, the resulting nonthermal component is detected at a 2 sigma level in approx. 50% of the nonsignificantly AGN-contaminated clusters: A2142, A2199, A2256, A3376, Coma, Ophiuchus, and Virgo. The data are consistent with a scenario whereby relaxed clusters have no hard X-ray component of nonthermal origin, whereas merger clusters do, with a 20-80 keV luminosity of approx. 10(exp 43)-10(exp 44) h(sup -2 sub 50) ergs/s. The co-added spectrum of the above clusters indicates a power-law spectrum for the HXR emission with a photon index of 2.8(sup +0.3 sub -0.4) in the 12-115 keV band, and we find indication that it has extended distribution. These indications argue against significant contamination from obscured AGNs, which have harder spectra and a centrally concentrated distribution. These results are supportive of the assumption of the merger shock acceleration of electrons in clusters, which has been proposed as a possible origin of the nonthermal hard X-ray emission models. Assuming that the cosmic microwave background photons experience inverse Compton scattering from the merger-accelerated relativistic electrons and thus produce the observed HXR, the measured hard X-ray slope corresponds to a differential momentum spectra of the relativistic electrons with a slope of mu = 3.8-5.0. In presence of cluster magnetic fields this relativistic electron population produces synchrotron emission with a spectral index of 1.4-2.1, consistent with radio halo observations of merger clusters. Thus both hard X-ray and radio observations of merger clusters are consistent with the inverse Compton model.
Author (revised)
X Ray Astronomy; Galactic Clusters; X Ray Spectra; Emission Spectra

20040171191 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Active Galactic Nuclei
Mushotzky, Richard; [2004]; 1 pp.; In English; Exploring the X-ray Universe, 22-24 Jun. 2004, UK; No Copyright; Avail: Other Sources; Abstract Only

In the last 5 years the first high quality moderate resolution spectra of AGN in the x-ray band have become available thanks to the gratings on Chandra and XMM. Next year this type of data will be extended to E \g 3 keV with the launch of Astro-E2. I will summarize some of the outstanding results from these new data and what we may expect from Astro-E2.
Author
Active Galactic Nuclei; X Ray Astronomy

20040171196 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Winds From Hot Star Disks
Kallman, Timothy; [2004]; 1 pp.; In English; Disks Around Hot Stars, 8-9 Jul. 2004, Johnson City, TN, USA; No Copyright; Avail: Other Sources; Abstract Only

In this talk I will briefly review the observational motivation and evidence for mass loss from disks around hot stars. Direct evidence for these outflows comes from line profiles in, eg. young stellar objects. Indirect evidence comes from the implied mass loss rates and wind speeds, along with dynamical models which can account for these properties. Mechanisms for disk wind driving include thermal, radiation pressure, and MHD. These will be reviewed and discussed, as will the relation to non-disk winds, and to disk winds in other contexts.
Author
Hot Stars; Stellar Winds; Disk Galaxies; Astrophysics

20040171198 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Rotational Sweepback of Magnetic Field Lines in Geometrical Models of Pulsar Radio Emission
Dyks, J.; Harding, Alice K.; [2004]; 29 pp.; In English
Contract(s)/Grant(s): PBZ-KBN-054/P03/2001; No Copyright; Avail: CASI; A03, Hardcopy

We study the rotational distortions of the vacuum dipole magnetic field in the context of geometrical models of the radio emission from pulsars. We find that at low altitudes the rotation deflects the local direction of the magnetic field by at most an angle of the order of r(sup 2 sub n), where r(sub n) = r/R(sub lc), r is the radial distance and R(sub lc) is the light cylinder radius. To the lowest (i.e. second) order in r(sub n) this distortion is symmetrical with respect to the plane containing the dipole axis and the rotation axis ((Omega, mu) plane). The lowest order distortion which is asymmetrical with respect to the (Omega, mu) plane is third order in r(sub n). These results confirm the common assumption that the rotational sweepback has negligible effect on the position angle (PA) curve. We show, however, that the influence of the sweep back on the outer boundary of the open field line region (open volume) is a much larger effect, of the order of r(sup 1/2 sub n). The open volume is shifted backwards with respect to the rotation direction by an angle delta(sub o nu) approx. 0.2 sin alpha r(sup 1/2 sub n) where alpha

is the dipole inclination with respect to the rotation axis. The associated phase shift of the pulse profile Delta phi(sub o nu) approx. 0.2 r(sup 1/2 sub n) can easily exceed the shift due to combined effects of aberration and propagation time delays (approx. 2r(sub n)). This strongly affects the misalignment of the center of the PA curve and the center of the pulse profile, thereby modifying the delay radius relation. Contrary to intuition, the effect of sweepback dominates over other effects when emission occurs at low altitudes. For r(sub n) \h or approx. 3 x 10(exp -3) the shift becomes negative, i.e. the center of the position angle curve precedes the profile center. With the sweepback effect included, the modified delay-radius relation predicts larger emission radii and is in much better agreement with the other methods of determining r(sub n).
Author
Pulsar Magnetospheres; Stellar Rotation; Radio Emission; Radio Astronomy; Pulsars

20040171267 Fermi National Accelerator Lab., Batavia, IL, USA
Theoretical Astrophysics at Fermilab
[2004]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-10842; No Copyright; Avail: CASI; A01, Hardcopy

The Theoretical Astrophysics Group works on a broad range of topics ranging from string theory to data analysis in the Sloan Digital Sky Survey. The group is motivated by the belief that a deep understanding of fundamental physics is necessary to explain a wide variety of phenomena in the universe. During the three years 2001-2003 of our previous NASA grant, over 120 papers were written; ten of our postdocs went on to faculty positions; and we hosted or organized many workshops and conferences. Kolb and collaborators focused on the early universe, in particular and models and ramifications of the theory of inflation. They also studied models with extra dimensions, new types of dark matter, and the second order effects of super-horizon perturbations. S tebbins, Frieman, Hui, and Dodelson worked on phenomenological cosmology, extracting cosmological constraints from surveys such as the Sloan Digital Sky Survey. They also worked on theoretical topics such as weak lensing, reionization, and dark energy. This work has proved important to a number of experimental groups [including those at Fermilab] planning future observations. In general, the work of the Theoretical Astrophysics Group has served as a catalyst for experimental projects at Fennilab. An example of this is the Joint Dark Energy Mission. Fennilab is now a member of SNAP, and much of the work done here is by people formerly working on the accelerator. We have created an environment where many of these people made transition from physics to astronomy. We also worked on many other topics related to NASA s focus: cosmic rays, dark matter, the Sunyaev-Zel dovich effect, the galaxy distribution in the universe, and the Lyman alpha forest. The group organized and hosted a number of conferences and workshop over the years covered by the grant. Among them were:
Author
Astrophysics; String Theory; Sky Surveys (Astronomy); Lyman Alpha Radiation; Cosmic Rays

20040171295 NASA, Washington, DC, USA
Quick Draw
Morring, Frank, Jr.; Aviation Week and Space Technology; November 08, 2004; Volume 161, No. 18, pp. 33; In English; Copyright; Avail: Other Sources

A NASA spacecraft set for launch Nov. 17 is designed to help scientists determine the origin of gamma-ray bursts by pinpointing their sources in the sky and quickly focusing optical/ultraviolet and X-ray telescopes on them.
Derived from text
X Ray Telescopes; Gamma Ray Bursts

20040171316 Iowa Univ., Iowa City, IA, USA
Polar Plasma Wave Investigation Data Analysis in the Extended Mission
Gurnett, Donald A.; [2004]; 6 pp.; In English
Contract(s)/Grant(s): NAG5-11942; No Copyright; Avail: CASI; A02, Hardcopy

The low latitude boundary layer (LLBL) is a region where solar wind momentum and energy is transferred to the magnetosphere. Enhanced 'broadband' electric plasma waves from less than 5 Hz to 10(exp 5) Hz and magnetic waves from less than 5 Hz to the electron cyclotron frequency are characteristic of the LLBL. Analyses of Polar plasma waves show that these 'broadband' waves are actually discrete electrostatic and electromagnetic modes as well as solitary bipolar pulses (electron holes). It is noted that all wave modes can be generated by approx. 100 eV to approx. 10 keV auroral electrons and protons. We will review wave-particle interactions, with focus on cross-diffusion rates and the contributions of such interactions toward the formation of the boundary layer. In summary, we will present a scenario where the global solar

wind-magnetosphere interaction is responsible for the auroral zone particle beams, and hence for the generation of plasma waves and the formation of the boundary layer. It is speculated that all planetary magnetospheres will have boundary layers and they will be characterized by similar currents and plasma wave modes.
Author
Plasma Waves; Polar Caps; Wave-Particle Interactions; Data Processing

20040171321 Space Science Inst., Baltimore, MD, USA
Physical Studies of Brown Dwarfs and Extrasolar Planets
Noll, Keith; November 16, 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-13127; No Copyright; Avail: CASI; A01, Hardcopy

The main purpose of this grant proposal was to fund the ongoing work on brown dwarfs by Denise Stephens during her tenure at STScI as a postdoctoral researcher. We have completed approximately half of the three-year grant period. Dr. Stephens has now assumed to role of senior research associate at Johns Hopkins University and in this position is eligible to be PI of grants. Because the bulk of the work and funds under this grant have been and will continue to be for the purposes of supporting Dr. Stephens, we are transferring control of the grant to her at JHU. This closeout is a formality to allow that transfer. The largest project was the completion of a major work on the infrared photometry of L and T dwarfs. The paper was published in January 2004.
Author
Brown Dwarf Stars; Physical Properties; Dwarf Stars

20040171341 Stockholm Univ., Sweden, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Spectroscopic Observations and Analysis of the Peculiar SN 1999aa
Garavini, G.; Folatelli, G.; Goobar, A.; Nobili, S.; Aldering, G.; Apr. 20, 2004; 50 pp.; In English
Report No.(s): PB2005-100985; No Copyright; Avail: CASI; A03, Hardcopy

We present an extensive new time-series of spectroscopic data of the peculiar SN 1999aa in NGC 2595. Our data set includes 25 optical spectra between -11 and +58 days with respect to B-band maximum light, providing an unusually complete time history.
NTIS
Supernovae; Spectroscopic Analysis

20040171429 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GUST LAT Multiwavelength Planning
Thompson, D. J.; [2004]; 1 pp.; In English; High Energy Astrophysics Meeting, 7-11 Sep. 2004, New Orleans, LA, USA; No Copyright; Avail: Other Sources; Abstract Only

Because gamma-ray astrophysics profits in powerful ways from multi-wavelength studies, the GLAST Large Area Telescope (LAT) Collaboration has started multiwavelength planning well before the scheduled 2007 launch. Many aspects of this program are of direct interest to observers using VERITAS and other atmospheric Cerenkov telescopes, whose capabilities complement those of GLAST. This talk with describe some of the current developmental concepts for GLAST LAT multiwavelength work, including release of data for transient sources, nearly-continuous monitoring of selected time-variable sources, pulsar timing, follow-on observations for source identification, coordinated blazar campaigns, and cross-calibration with other high-energy telescopes. Although few details are firm at this stage of preparation for GLAST, the LAT Collaboration looks forward to cooperation with a broad cross-section of the multiwave-length community. The GLAST Large Area Telescope is an international effort, with U.S. funding provided by the Department of Energy and NASA.
Author
Astrophysics; Gamma Rays; Cross Correlation; Telescopes; Time Measurement; Cerenkov Counters

20040171439 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Chandra Observations and Models of the Mixed Morphology Supernova Remnant W44: Global Trends
Shelton, R. L.; Kuntz, K. D.; Petre, R.; [2004]; 45 pp.; In English
Contract(s)/Grant(s): GO1-2057A; Copyright; Avail: CASI; A03, Hardcopy

We report on the Chandra observations of the archetypical mixed morphology (or thermal composite) supernova remnant, W44. As with other mixed morphology remnants, W44's projected center is bright in thermal X-rays. It has an obvious radio shell, but no discernable X-ray shell. In addition, X-ray bright knots dot W44's image. The spectral analysis of the Chandra

data show that the remnant s hot, bright projected center is metal-rich and that the bright knots are regions of comparatively elevated elemental abundances. Neon is among the affected elements, suggesting that ejecta contributes to the abundance trends. Furthermore, some of the emitting iron atoms appear to be underionized with respect to the other ions, providing the first potential X-ray evidence for dust destruction in a supernova remnant. We use the Chandra data to test the following explanations for W44's X-ray bright center: 1.) entropy mixing due to bulk mixing or thermal conduction, 2.) evaporation of swept up clouds, and 3.) a metallicity gradient, possibly due to dust destruction and ejecta enrichment. In these tests, we assume that the remnant has evolved beyond the adiabatic evolutionary stage, which explains the X-ray dimness of the shell. The entropy mixed model spectrum was tested against the Chandra spectrum for the remnant's projected center and found to be a good match. The evaporating clouds model was constrained by the finding that the ionization parameters of the bright knots are similar to those of the surrounding regions. While both the entropy mixed and the evaporating clouds models are known to predict centrally bright X-ray morphologies, their predictions fall short of the observed brightness gradient. The resulting brightness gap can be largely filled in by emission from the extra metals in and near the remnant's projected center. The preponderance of evidence (including that drawn from other studies) suggests that W44's remarkable morphology can be attributed to dust destruction and ejecta enrichment within an entropy mixed, adiabatic phase supernova remnant. The Chandra data prompts a new question - by what astrophysical mechanisms are the metals distributed so inhomogeneously in the supernova remnant.
Author
Morphology; Supernova Remnants; X Ray Astrophysics Facility; Stellar Models

20040171457 NASA Goddard Space Flight Center, Greenbelt, MD, USA
CHANDRA Observations of V407 Vul: Confirmation of the Spin-up
Strohmayer, T.; March 30, 2004; 21 pp.; In English
Report No.(s): astro-ph/0403675v1; No Copyright; Avail: CASI; A03, Hardcopy

V407 Vu1 (RX J1914.4+2456) is a candidate double-degenerate binary with a putative 1.756 mHz (9.5 min) orbital frequency. In a previous timing study using archival ROSAT and ASCA data we reported evidence for an increase of this frequency at a rate consistent with expectations for gravitational radiation from a detached ultracompact binary system. Here we report the results of new Chandra timing observations which confirm the previous indications of spin-up of the X-ray frequency, and provide much tighter constraints on the frequency derivative, nu (raised dot). We obtained with Chandra a total of 90 ksec of exposure in two epochs separated in time by 11.5 months. The total time span of the archival ROSAT, ASCA and new Chandra data is now approximately equal to 10.5 years. This more than doubles the interval spanned by the ROSAT and ASCA data alone, providing much greater sensitivity to a frequency derivative. With the addition of the Chandra data an increasing frequency is unavoidable, and the mean nu (raised dot) is 7.0 plus or minus 0.8 x l0(exp -18) Hz per second. Although a long-term spin-up trend is confirmed, there is excess variance in the phase timing residuals, perhaps indicative of shorter timescale torque fluctuations or phase instability associated with the source of the X-ray flux. Power spectral searches for periods longward of the 9.5 minute period do not find any significant modulations, however, the sensitivity of searches in this frequency range are somewhat compromised by the dithering of the Chandra attitude. The observed spin-up is of a magnitude consistent with that expected from gravitational radiation decay, however, the factor of approximately equal to 3 variations in flux combined with the timing noise could conceivably result from accretion-induced spin-up of a white dwarf. Continued monitoring to explore correlations of torque with X-ray flux could provide a further test of this hypothesis.
Author
X Ray Astrophysics Facility; Binary Stars; Frequency Measurement; X Ray Spectra

20040171468 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Swift Gamma-Ray Burst Explorer
Parsons, Ann; [2004]; 1 pp.; In English; Chicago 2004 NASA Space Sciences Workshop, 27-29 Jun. 2004, Chicago, IL, USA; No Copyright; Avail: Other Sources; Abstract Only

At this workshop, I intend to show the broader community the many Swift program. Since all of the Swift GRB data will be made immediately available to the entire astrophysics community, collaborations can form through the analysis of Swift data or through the operation of ground-based telescope systems to do follow-up measurements of GRB afterglow emission.
Derived from text
Gamma Ray Bursts; Gamma Ray Observatory; Data Acquisition

20040171471 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Discovery of a Transient Magnetar: XTE J1810-197

Ibrahim, Alaa I.; Markwardt, Craig B.; Swank, Jean H.; Ransom, Scott; Roberts, Mallory; Kaspi, Victoria; Woods, Peter M.; Safi-Harb, Samar; Balman, Solen; Parke, William C., et al.; [1 July 2004]; 4 pp.; In English

Contract(s)/Grant(s): JPL-958056; NAG5-13186; NAG5-13740; NCG5-356; NAG5-11608; Copyright; Avail: CASI; A01, Hardcopy

We report the discovery of a new X-ray pulsar, XTE J1810-197, that was serendipitously discovered on 2003 July 15 by the Rossi X-Ray Timing Explorer (RXTE) while observing the soft gamma repeater SGR 1806-20. The pulsar has a 5.54 s spin period, a soft X-ray spectrum (with a photon index of approx. = 4). and is detectable in earlier RXTE observations back to 2003 January but not before. These show that a transient outburst began between 2002 November 17 and 2003 January 23 and that the source's persistent X-ray flux has been declining since then. The pulsar exhibits a high spin-down rate P approx.= l0(exp -11) s/s with no evidence of Doppler shifts due to a binary companion. The rapid spin-down rate and slow spin period imply a supercritical characteristic magnetic field B approx. = 3 x l0(exp 14) G and a young age tau less than or = 7600 yr. Follow-up Chandra observations provided an accurate position of the source. Within its error radius, the 1.5 m Russian-Turkish Optical Telescope found a limiting magnitude R(sub c) = 21.5. All such properties are strikingly similar to those of anomalous X-ray pulsars ad soft gamma repeaters, providing strong evidence that the source is a new magnetar. However, archival ASCA and ROSAT observations found the source nearly 2 orders of magnitude fainter. This transient behavior and the observed long-term flux variability of the source in absence of an observed SGR-like burst activity make it the first confirmed transient magnetar and suggest that other neutron stars that share the properties of XTE 51810- 197 during its inactive phase may be unidentified transient magnetars awaiting detection via a similar activity. This implies a larger population of magnetars than previously surmised and a possible evolutionary connection between magnetars and other neutron star families. Subject headings: pulsars: general -pulsars: individual (XTE 51810- 197) - stars: magnetic fields - Author

Pulsars; X Rays; Magnetars; Magnetic Fields

20040171557 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Survey of Coronal Dimmings and EIT Wave Transients

Thompson, Barbara J.; [2003]; 1 pp.; In English; AGU 2003 Fall Meeting, 6-12 Dec. 2003, USA; No Copyright; Avail: Other Sources; Abstract Only

We present the results of a comprehensive catalog of EIT wave transients and coronal dimmings. We will compiled a set of more than 170 events, and we present strong evidence for the association of the co-development of coronal dimmings and EIT waves. Both limb and disk events are included in this study. We also include the speeds, locations, and associated flare timing in this study.

Author

Catalogs (Publications); Surveys; Planetary Waves

20040171573 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Taking the Measure of the Universe: Cosmology from the WMAP Mission

Hinshaw, Gary; Bennett, Charles; Wollack, Edward; Kogut, Alan; [2003]; 1 pp.; In English; Physics/Astronomy Colloquium, 22-23 Oct. 2003, Bloomington, IN, USA; No Copyright; Avail: Other Sources; Abstract Only

The data from the first year of operation of the Wilkinson Microwave Anisotropy Probe (WMAP) satellite provide the first detailed full sky map of the cosmic microwave background radiation. The anisotropy in the radiation temperature provides a wealth of cosmological information, including the age of the universe, the epoch when the first stars formed, and the overall composition of baryonic matter, dark matter, and dark energy. The results also provide constraints on the period of inflationary expansion in the very first moments of time. These and other aspects of the mission will be discussed. The WMAP satellite was built in a close partnership between Princeton University and the Goddard Space Flight Center.

Author

Cosmic Microwave Background Radiation; Microwave Anisotropy Probe; Universe; Space Missions; Cosmology

20040171637 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Evidence for Magnetic Reconnection in Three Homologous Solar Flares Observed by RHESSI

Sui, Lin-Hui; Holman, Gordon D.; Dennis, Brian R.; [2004]; 28 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

We present RHESSI observF5oss of three homologous flares, which occurred between April 14 and 16, 2002. We find

that the RHESSI images of all three flares at energies between 6 and 25 keV had some common features: (1) A. separate coronal source up to approx. 30 deg. above the flare loop appeared in the early impulsive phase and stayed stationary for several minutes. (2) Before the flare loop moved upward; previously reported by others, the flare loop-top centroid moved downward for 2-4 minutes during the early impulsive phase of the Ears: falling by 13 - 30% of its initial height with a speed between 8 and 23 km/s. We conclude that these features are associated with the formation and development of a current sheet between the loop-top and the coronal source. In the April 14-15 flare, we find that the hard X-ray flux (greater than 25 keV) is correlated with the rate at which the flare loop moves upward, indicating that the faster the loop grows, the faster the reconnection rate, and therefore, the greater the flux of accelerated electrons. Subject headings: Sun: L'iaies-Sun: X-1-ay-s - Author

Magnetic Field Reconnection; Solar Flares; Coronas

20040171649 NASA Goddard Space Flight Center, Greenbelt, MD, USA

High Energy Astrophysics Tests of Lorentz Invariance Violation

Stecker, F. W.; [2004]; 4 pp.; In English

Contract(s)/Grant(s): ATP03-0000-0057; No Copyright; Avail: CASI; A01, Hardcopy

Observations of the multi-TeV spectra of the Mkn 501 and other nearby BL Lac objects exhibit the high energy cutoffs predicted to be the result of intergalactic annihilation interactions, primarily with IR photons having a flux level as determined by various astronomical observations. After correcting for such intergalactic absorption, these spectra can be explained within the framework of synchrotron self-Compton emission models. Stecker and Glashow have shown that the existence of this annihilation via electron-positron pair production puts strong constraints on Lorentz invariance violation. Such constraints have important implications for some quantum gravity and large extra dimension models. A much smaller amount of Lorentz invariance violation has potential implications for understanding the spectra of ultrahigh energy cosmic rays.

Author

Cosmic Rays; Gravitation; Bl Lacertae Objects; Annihilation Reactions; Electron-Positron Pairs; Synchrotron Radiation

20040171670 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Neutral Mass Spectrometry for Venus Atmosphere and Surface

Mahaffy, Paul; [2004]; 1 pp.; In English; 2nd International Planetary Probe Workshop, 23-27 Aug. 2004, Moffett Field, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The nature of the divergent evolution of the terrestrial planets Venus, Earth, and Mars is a fundamental problem in planetary science that is most relevant to understanding the characteristics of small planets we are likely to discover in extrasolar systems and the number of such systems that may support habitable environments. For this reason, the National Research Council's Decadal Survey gives Venus exploration high priority. That report was the basis of the NASA selection of Venus as one of four prime mission targets for the recently initiated New Frontiers Program. If the Decadal Survey priorities are to be realized, in situ Venus exploration must remain a high priority. Remote sensing orbital and in situ atmospheric measurements from entry probe or balloon platforms might be realized under the low cost Discovery missions while both atmospheric and landed surface measurements are envisioned with the intermediate class missions of the New Frontiers Program.

Author

Mass Spectroscopy; Planetary Evolution; Terrestrial Planets

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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*.

20040165027 Mount Holyoke Coll., South Hadley, MA, USA

Hydrogen and Ferric Iron in Mars Materials

Dyar, Melinda D.; [2004]; 12 pp.; In English

Contract(s)/Grant(s): NAG5-12848; No Copyright; Avail: CASI; A03, Hardcopy

Knowledge of oxygen and hydrogen fugacity is of paramount importance in constraining phase equilibria and crystallization processes of melts, as well as understanding the partitioning of elements between the cope and silicate portions of terrestrial planets. H and Fe(3+) must both be analyzed in order to reconstruct hydrogen and oxygen fugacities on Mars.

To date, SIMS data have elucidated D/H and H contents of hydrous phases in SNC meteorites, but until now anhydrous martian minerals have not been systematically examined for trace hydrogen. Ferric iron has been quantified using XANES in many martian phases, but integrated studies of both Fe(3+) and H on the same spots are really needed to address the H budget. Finally, the effects of shock on both Fe(3+) and H in hydrous and anhydrous phases must be quantified. Thus, the overall goal of this research was to understand the oxygen and hydrogen fugacities under which martian samples crystallized. In this research one-year project, we approached this problem by 1) characterizing Fe(3+) and H contents of SNC meteorites using both bulk (Mossbauer spectroscopy and uranium extraction, respectively) and microscale (synchrotron micro-XANES and SIMS) methods; 2) relating Fe(3+) and H contents of martian minerals to their oxygen and hydrogen fugacities through analysis of experimentally equilibrated phases (for pyroxene) and through study of volcanic rocks in which the oxygen and hydrogen fugacities can be independently constrained (for feldspar); and 3) studying the effects of shock processes on Fe(3+) and H contents of the phases of interest. Results have been used to assess quantitatively the distribution of H and Fe(3+) among phases in the martian interior, which will better constrain the geodynamic processes of the interior, as well as the overall hydrogen and water budgets on Mars. There were no inventions funded by this research.
Author
Hydrogen; Iron; Oxygen; Mineralogy; Mars Surface; SNC Meteorites

20040170456 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Impact Constraints on the Age and Origin of the Crustal Dichotomy on Mars
Frey, Herbert V.; [2004]; 2 pp.; In English; Workshop on Hemispheres Apart: The Origin and Modification of the Martian Crustal Dichotomy, 30 Sep. - 1 Oct. 2004, Houston, TX, USA; No Copyright; Avail: CASI; A01, Hardcopy

MOLA data have revealed a large population of 'Quasi-Circular Depressions' (QCDs) with little or no visible expression in image data. These likely buried impact basins have important implications for the age of the lowland crust, how that compares with original highland crust, and when and how the crustal dichotomy may have formed. The buried lowlands are of Early Noachian age, likely slightly younger than the buried highlands but older than the exposed (visible) highland surface. A depopulation of large visible basins at diameters 800 to 1300 km suggests some global scale event early in martian history, maybe related to the formation of the lowlands and/or the development of Tharsis. A suggested early disappearance of the global magnetic field can be placed within a temporal sequence of formation of the very largest impact basins. The global field appears to have disappeared at about the time the lowlands formed. It seems likely the topographic crustal dichotomy was produced very early in martian history by processes which operated very quickly. This and the preservation of large relic impact basins in the northern hemisphere, which themselves can account for the lowland topography, suggest that large impacts played the major role in the origin Mars fundamental crustal feature.
Author
Mars Craters; Planetary Crusts; Geochronology; Planetary Geology

20040171127 NASA Marshall Space Flight Center, Huntsville, AL, USA
Saturn/Titan Rendezvous: A Solar-Sail Aerocapture Mission
Matloff, Gregory L.; Taylor, Travis; Powell, Conley; July 29, 2004; 9 pp.; In English; International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada
Contract(s)/Grant(s): NASA Order H-351191-D; No Copyright; Avail: CASI; A02, Hardcopy

A low-mass Titan orbiter is proposed that uses conservative or optimistic solar sails for all post-Earth-escape propulsion. After accelerating the probe onto a trans-Saturn trajectory, the sail is used parachute style for Saturn capture during a pass through Saturn's outer atmosphere. If the apoapsis of the Saturn-capture orbit is appropriate, the aerocapture maneuver can later be repeated at Titan so that the spacecraft becomes a satellite of Titan. An isodensity-atmosphere model is applied to screen aerocapture trajectories. Huygens/Cassini should greatly reduce uncertainties regarding the upper atmospheres of Saturn and Titan.
Author
Space Probes; Solar Sails; Aerocapture; Saturn (Planet); Titan; Rendezvous Trajectories; Spacecraft Trajectories

20040171128 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Robotic Ann Camera (RAC) for the 2007 Phoenix Mars Scout Lander
Bos, Brent J.; [2004]; 22 pp.; In English; Mars Society Conference, August 2004, Chicago, IL, USA; No Copyright; Avail: CASI; A03, Hardcopy

The slide presentation examines background, mission overview, the robotic arm camera (RAC), and ongoing work in preparation for the Phoenix Mars Scout Lander mission.
CASI
CCD Cameras; Mars Missions; Robot Arms; Robotics; Water; Samplers

20040171133 Mount Holyoke Coll., South Hadley, MA, USA
Synchrotron Characterization of Hydrogen and Ferric Iron in Martian Meteorites
Dyar, Melinda D.; [2003]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-10424; No Copyright; Avail: CASI; A01, Hardcopy

The hydrogen budget of the Martian interior is distributed among several phases: melts, hydrous minerals, and nominally anhydrous minerals like olivine, pyroxene, and garnet. All these phases are vulnerable to loss of hydrogen during shock, excavation and transport via the mechanism of dehydrogenation, in which the charge on the H protons is left behind as polarons on Fe atoms. Thus, both H and F(3x) must be analyzed in order to reconstruct hydrogen and oxygen fugacities on Mars. To date, SIMS data have elucidated D/H and H contents of hydrous phases in SNC meteorites, but anhydrous martian minerals have not been systematically examined for trace hydrogen. Ferric iron has been quantified using XANES in many marital phases, but integrated studies of both Fe(3x) and H on the same spots are really needed to address the H budget. Here, we measure and profile H and Fe(3x) abundances in and across individual grains of glass and silicates in Martian meteorites. We use the new technology of synchrotron microFI'lR spectroscopy to measure the hydrogen contents of hydrous and nominally anhydrous minerals in martian meteorites on 30-100 microns thick, doubly polished thin sections on spots down to 3 x 3 microns. Synchrotron microXANES was used to analyze Fe(3x) on the same scale, and complementary SIMS D/H data will be collected where possible, though at a slightly larger scale. Development of this combination of techniques is critical because future sample return missions will generate only microscopic samples for study. Results have been used to quantitatively assess the distribution of hydrogen and ferric iron among phases in the martian interior, which will better constrain the geodynamic processes of the interior, as well as the overall hydrogen and water budgets on Mars.
Author
Iron Meteorites; Mars Surface; Synchrotrons; Hydrogen; Oxygen

20040171184 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Overview of Lunar Calibration and Characterization for the EOS Terra and Aqua MODIS
Xiong, X.; Salomonson, V. V.; Sun, J.; Chiang, K.; Xiong, S.; Humphries, S.; Barnes, W.; Guenther, B.; [2004]; 1 pp.; In English; CALCON (Conference on Characterization and Radiometric Calibration for Remote Sensing), 23-26 Aug. 2004, Logan, UT, USA; Copyright; Avail: Other Sources; Abstract Only

The Moon can be used as a stable source for Earth-observing sensors on-orbit radiometric and spatial stability monitoring in the VIS and NIR spectral regions. It can also serve as a calibration transfer vehicle among multiple sensors. Nearly identical copies of the Moderate Resolution Imaging Spectroradiometer (MODE) have been operating on-board the NASA's Earth Observing System (EOS) Terra and Aqua satellites since their launches in December 1999 and May 2002, respectively. Terra and Aqua MODIS each make observations in 36 spectral bands covering the spectral range from 0.41 to 14.5 microns and are calibrated on-orbit by a set of on-board calibrations (OBCs) including: 1) a solar diffuser (SD), 2) a solar diffuser stability monitor (SDSM), 3) a blackbody (BB), and 4) a spectro-radiometric calibration assembly (SRCA). In addition to fully utilizing the OBCs, the Moon has been used extensively by both Terra and Aqua MODIS to support their on-orbit calibration and characterization. A 4 This paper provides an overview of applications of lunar calibration and characterization from the MODIS perspective, including monitoring radiometric calibration stability for the reflective solar bands (RSBs), tracking changes of the sensors response versus scan-angle (RVS), examining the sensors spatial performance , and characterizing optical leaks and electronic crosstalk among different spectral bands and detectors. On-orbit calibration consistency between the two MODIS instruments is also addressed. Based on the existing on-orbit time series of the Terra and Aqua MODIS lunar observations, the radiometric difference between the two sensors is less than +/-1% for the RSBs. This method provides a powerful means of performing calibration comparisons among Earth-observing sensors and assures consistent data and science products for the long-term studies of climate and environmental changes.
Author
Earth Observing System (EOS); MODIS (Radiometry); Moon; Imaging Spectrometers; Time Series Analysis

20040171209 Boston Univ., Boston, MA, USA
Ionospheric Variability and Storms on Mars
Mendillo, Michael; November 02, 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-11077; No Copyright; Avail: CASI; A01, Hardcopy

The goal of this grant was to conduct the first-ever study of ionospheric variability on Mars. To do so, we used data from the Radio Science (RS) experiment onboard the Mars Global Surveyor (MGS) satellite. Dr. David Hinson of the RS team at Stanford University was a most helpful and valuable colleague throughout the studies we conducted. For the initial RS datasets available from the MGS mission, there were no severe storms caused by solar wind activity, so we concentrated on day-to-day effects. This turned out to be a wise approach since understanding 'normal variability' had to be done before any claim could be made about 'space weather' effects. Our approach was three-fold: (1) select a good dataset for characterization of ionosphere variability at Mars, one for which excellent terrestrial data were also available. This turned out to be the period 9-27 March 1999; (2) once the variability at Mars was described, develop and use a new photochemical model of the martian ionosphere to find the extent to which solar variability on those days caused or contributed to the observed patterns; (3) use the results from the above, together with additional datasets from the MGS/RS experiment, to describe some practical consequences that the martian ionosphere would have upon NASA s proposed navigation and communications systems for Mars. The results of these studies showed that: (a) solar variability is the dominant source of ionospheric variability at Mars (during periods of quiet solar wind), (b) that current models do a good job in portraying such effects at the height of the ionospheric peak electron density, and (c) that ionospheric structure on Mars can affect attempts at precise position-fixing at Mars should relatively high (GPS-like) frequencies not be used in a Mars communications and navigation system.
Author
Variability; Mars Atmosphere; Ionospheric Storms; Solar Activity

20040171218 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Saturn's Rings, the Yarkovsky Effects, and the Ring of Fire
Rubincam, David; [2004]; 1 pp.; In English; DPS Meeting, 8 Nov. 2004, Louisville, KY, USA; No Copyright; Avail: Other Sources; Abstract Only

Saturn's icy ring particles, with their low thermal conductivity, are almost ideal for the operation of the Yarkovsky effects. The dimensions of Saturn's A and B rings may be determined by a near balancing of the seasonal Yarkovsky effect with the Yarkovsky- Schach effect. The two effects, which are photon thrust due to temperature gradients, may confine the A and B rings to within their observed dimensions. The C ring may be sparsely populated with icy particles because Yarkovsky drag has pulled them into Saturn, leaving the more slowly orbitally decaying rocky particles. Icy ring particles ejected from the B ring and passing through the C ring, as well as some of the slower rocky particles, should fall on Saturn's equator, where they may create a luminous 'Ring of Fire' around Saturn's equator. This predicted Ring of Fire may be visible to Cassini's camera. Curiously, the speed of outwards Yarkovsky orbital evolution appears to peak near the Cassini Division. The connection between the two is not clear. D. Nesvorny has speculated that the resonance at the outer edge of the B ring may impede particles from evolving via Yarkovsky across the Division. If supply from the B ring is largely cut off, then Yarkovsky may push icy particles outward, away from the inner edge of the A ring, leaving only the rocky ones in the Division. The above scenarios depend delicately on the properties of the icy particles.
Author
Saturn Rings; Ice; Thermal Conductivity; Schach Effect

20040171249 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A 3D Convective Model for the Jovian Wind Bands
Mayr, H. G.; Chan, K. L.; [2004]; 1 pp.; In English; 38th Meeting of the American Astronomical Society Division of Planetary Science, 8-12 Nov. 2004, Louisville, KY, USA; No Copyright; Avail: Other Sources; Abstract Only

In an earlier paper, we proposed that Jupiter's alternating wind bands are a manifestation of the global interaction between rotation and convection in a shallow layer. The model, however, was obtained from linearization of the 2D equations of motions. At HKUST/Hong Kong, we are now trying to study this problem by rigorous numerical simulation. Using a three-dimensional spectral numerical code, we compute models for the outermost layer of Jupiter's convective envelope. Two cases have been studied. In one the atmospheric pressure varies from 1 to 23 bar, and in the other from 1 to 115 bar. The physical parameters (internal energy flux, rotation rate) are chosen to be close to those expected, but solar heating, chemistry, as well as dynamical influences from deeper layers are ignored. The models generate wind field patterns that contain alternating jet streams with resemblance to the Jovian bands. Instantaneous values of the mean zonal flow at the equator reach 80 m/sec. Yet the mean meridional flows are less than 1% of such value. The meridional temperature profile at the cloud top level also shows a double hump structure of a few degrees (as observed) in the subtropics. Though there is not complete quantitative agreement (caused perhaps by neglected effects like solar radiation), these models demonstrate, in principle, the

feasibility of generating a Jovian type wind pattern through the interaction of fast rotation and convection in a thin shell.
Author
Jupiter (Planet); Convection; Rotation; Atmospheric Pressure; Three Dimensional Models; Atmospheric Circulation

20040171279 Proxemy Research, Inc., Laytonsville, MD, USA
Applications of MGS MOC and MOM Data to Lava flows: Investigations of Rheology, Topographic Influences and Tectonic Effects
Glaze, Lori S.; November 09, 2004; 7 pp.; In English
Contract(s)/Grant(s): NAG5-11170; No Copyright; Avail: CASI; A02, Hardcopy

Proxemy Research had a grant from NASA to perform scientific research using Mars Global Surveyor (MGS) data to study lava flows on Mars. Here we summarize the scientific progress and accomplishments of this grant. Scientific publications and abstracts of presentations are indicated in the final section.
Author
Fluid Flow; Lava; Rheology; Mars Craters

20040171293 Dornheim (Michael A.), Los Angeles, CA, USA
Martian Sand Traps
Dornheim, Michael A.; Aviation Week and Space Technology; November 15, 2004; Volume 161, No. 19, pp. 74-76; In English; Copyright; Avail: Other Sources

Mars rover officials have had to abandon an enticing target after formerly predictable terrain proved to have nasty traps. Scientists working with the Opportunity rover wanted to go to the base of a small cliff inside the rim of Endurance Crater because of promising stratified formations there. but if the rover were to slip off the narrow path it might never get out of the crater. The attempt was canceled last week. Opportunity had already been spinning its wheels in the area. barely able to climb slopes that were readily mountable elsewhere because what appeared to be big rock plates were actually easily-dislodged
Author
Mars Surface; Roving Vehicles; Terrain; Sands; Traps

20040171296 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
A Program to Detect and Characterize Extra-Solar Giant Planets
Lindstrim, David, Technical Monitor; Noyes, Robert W.; November 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG5-10854; No Copyright; Avail: CASI; A01, Hardcopy

The upgrade to the AFOE spectrograph at the 1.5-m Tillinghast telescope at FLWO Observatory, described in detail in the previous progress report, was completed. Work included installing a new CCD detector (using SA0 internal funds) to replace the previous detector, which had failed after many thermal cyclings during the previous nearly ten years of operation. The new detector (a back-illuminated Marconi 2K x 2K detector) shows excellent quantum efficiency, and employs dual readout channels to keep the readout time as short as 20 seconds. Tests of the attainable radial velocity precision of the upgraded spectrograph with the new detector show an improvement in radial velocity detection efficiency by a factor of about 10 over the previous AFOE configuration, allowing us to push the photon-noise-limited doppler precision of 7 m/s to correspondingly fainter stars. This work was carried out by Co-investigator Sylvain Korzennik, along with the late Peter Nisenson.
Derived from text
Charge Coupled Devices; Telescopes; Detection; Solar System; Planet Detection

20040171394 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Search for Cosmological Antimatter
Streitmatter, Robert E.; [2004]; 1 pp.; In English; SLAC Summer Institute Meeting, 9-13 Aug. 2004, Stanford, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

For more than 40 years, experimentalists have searched in the cosmic radiation for evidence of antimatter which may have been created in the early Universe. The experimental evidence for cosmologically significant amounts of antimatter in the Universe is reviewed. There is no compelling evidence, either theoretical of experimental. However, the possibility is not completely ruled out.
Author
Antimatter; Cosmology; Universe

20040171411 NASA Marshall Space Flight Center, Huntsville, AL, USA

Meteoroid Engineering Model (MEM): A Meteoroid Model for the Inner Solar System

McNamara, Heather A.; Jones, Jim; Kauffman, Billy; Suggs, Robert; Cooke, William; Smith, Steven; [2004]; 8 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

In an attempt to overcome some of the deficiencies of existing meteoroid models, NASA's Space Environments and Effects (SEE) Program sponsored a three year research effort at the University of Western Ontario. The resulting understanding of the sporadic meteoroid environment - particularly the nature and distribution of the sporadic sources - were then incorporated into a new Meteoroid Engineering Model (MEM) by members of the Space Environments Team at NASA s Marshall Space Flight Center. This paper discusses some of the revolutionary aspects of MEM which include a) identification of the sporadic radiants with real sources of meteoroids, such as comets, b) a physics-based approach which yields accurate fluxes and directionality for interplanetary spacecraft anywhere from 0.2 astronomical units (AU) to 2 AU, and c) velocity distributions obtained from theory and validated against observation. Use of the model, which gives penetrating fluxes and average impact speeds on the surfaces of a cube-like structure, is also described along with its current limitations and plans for future improvements.

Author

Meteoroid Concentration; Comets; Velocity Distribution; Sporadic Meteoroids

20040171496 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Science Goals of NASA's Exploration Initiative

Gardner, Jonathan P.; Grunsfeld, John; [2004]; 1 pp.; In English; AAS Conference, May/June 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

Vision for U. S. Space Exploration, seeks to advance the U. S. scientific, security and economic interest through a program of space exploration which will robotically explore the solar system and extend human presence to the Moon, Mars and beyond. NASA's implementation of this vision will be guided by compelling questions of scientific and societal importance, including the origin of our Solar System and the search for life beyond Earth. The Exploration Roadmap identifies four key targets: the Moon, Mars, the outer Solar System, and extra-solar planets. First, a lunar investigation will set up exploration test beds, search for resources, and study the geological record of the early Solar System. Human missions to the Moon will serve as precursors for human missions to Mars and other destinations, but will also be driven by their support for furthering science. The second key target is the search for past and present water and life on Mars. Following on from discoveries by Spirit and Opportunity, by the end of the decade there will have been an additional rover, a lander and two orbiters studying Mars. These will set the stage for a sample return mission in 2013, increasingly complex robotic investigations, and an eventual human landing. The third key target is the study of underground oceans, biological chemistry, and their potential for life in the outer Solar System. Beginning with the arrival of Cassini at Saturn in July 2004 and a landing on Titan in 2006, the next decade will see an extended investigation of the Jupiter icy moons by a mission making use of Project Prometheus, a program to develop space nuclear power and nuclear-electric propulsion. Finally, the search for Earth-like planets and life includes a series of telescopic missions designed to find and characterize extra-solar planets and search them for evidence of life. These missions include HST and Spitzer, operating now; Kepler, SIM, JWST, and TPF, currently under development; and the vision missions, Life Finder and Planet Imager, which will possibly be constructed in space by astronauts.

Author

Solar System; Robotics; Space Exploration; Gas Giant Planets; Extrasolar Planets; Extraterrestrial Life

20040171516 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Magnetic Fields of the Earth and Mars a Comparison and Discussion

Taylor, Patrick T.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

In several aspects the magnetic fields of the Earth and Mars are similar but also different. In the past both bodies had planetary magnetic fields but while they Earth's field remains today the Martian ceased to operate, at some unknown time in the past, leaving this planet without a main or core field. This fact resulted in the interaction between the solar and interplanetary magnetic fields with the surfaces of these planets being very different. In addition, Mars has large crustal magnetic anomalies, nearly ten times larger than those on the Earth. Since crustal magnetic anomalies are the product of the thickness of the layer of magnetization, both the magnetizing material and the thickness of the layer of this material must be very different on Mars than Earth. Furthermore, the martian anomalies can only be produced by remanent or fossil magnetization, in contrast with the Earth where both induced and remanent magnetization are producing these anomalies. Crustal magnetic anomalies on the Earth are mainly produced by single-domain, irontitanium oxides, in the form of magnetite being the most common on Mars the main magnetic mineral(s) are unknown. The thickness of the martian magnetized layer

in comparison with the Earth remains a major area for research. Determining the paleopole position for the Earth has been done by some of the earliest paleomagnetic researchers. Since we do not have oriented martian rock samples determining the paleopoles for Mars has been done by fitting a magnetization vector to individual magnetic anomalies. Several groups have worked on this problem with somewhat differing results.
Author
Planetary Magnetic Fields; Geomagnetism; Mars (Planet)

20040171558 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Cassini-Huygens Mission: Exo/Astro/Cosmobiological Perspectives
Raulin, F.; Niemann, H.; Israel, Guy; Atreya, S.; Benilan, Y.; Bernard, J.-M.; Cabane, M.; Coll, P.; Cottin, H.; Coscia, D., et al.; [2004]; 2 pp.; In English; 35th COSPAR Scientific Assembly, 17-25 Jul. 2004, Paris, France; No Copyright; Avail: Other Sources; Abstract Only

One of the main objectives of the Cassini-Huygens mission is to explore Titan in great detail and to study in particular the many exobiological aspects of Titan, this exotic world which presents so many analogies with our planet. The Cassini orbiter and the Huygens probe, in a complementary way, will systematically study the many chemical and physical aspects of the different parts of what can be called the 'geofluid' of Titan. Many of the twelve instruments of the Cassini orbiter and most of the six instruments of the Huygens probe will provide much information of crucial importance for our knowledge of the complexity of Titan's organic chemistry. This is particularly the case with the GC-M4S and ACP experiments which will provide the first in situ chemical (including isotopic and molecular) analyses of the gas and aerosol phases of Titan's atmosphere. Indeed, because of the presence of a dense atmosphere, mainly made of N2 with noticeable fraction of CH4, and of an environment very rich in organics, and of many couplings involved in the various parts of its geofluid, in spite of low temperatures and the absence of liquid water, Titan is a reference for studying prebiotic chemistry on a planetary scale. Many programs have recently been developed to study in detail Titan's chemistry, in direct connection with the Cassini-Huygens mission. They include new observations, development of photochemical models, laboratory determination of IR and UV spectra of organics of interest for Titan's atmosphere, and experimental studies, such as laboratory simulation of Titan's gas and aerosol organic chemistry. The paper will review the exobiological aspects of Titan. It will also present some of the new data concerning Titan s organic chemistry that have been obtained through the several possible approaches and discuss the exobiological implication of the potential scientific return of the Cassini-Huygens mission.
Author
Titan; Cassini Mission; Huygens Probe; Satellite Atmospheres; Aerosols; Vapor Phases; Organic Chemistry; Extraterrestrial Life

20040171615 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Saturn's Rings, the Yarkovsky Effects, and the Ring of Fire
Rubincam, David Parry; [2004]; 13 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The dimensions of Saturn's A and B rings may be determined by the seasonal Yarkovsky effect and the Yarkovsky-Schach effect; the two effects confine the rings between approximately 1.68 and approximately 2.23 Saturn radii, in reasonable agreement with the observed values of 1.525 and 2.267. The C ring may be sparsely populated because its particles are transients on their way to Saturn; the infall may create a luminous Ring of Fire around Saturn's equator. The ring system may be young: in the past heat flow from Saturn's interior much above its present value would not permit rings to exist.
Author
Saturn Rings; Schach Effect; Saturn (Planet)

20040171657 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Preliminary Interpretation of Ambient Pickup Ions at Titan Observed by the Cassini Plasma Spectrometer
Hartle, R. E.; Sittler, E. C.; Johnson, R. E.; [2004]; 1 pp.; In English; AGU Fall Session, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Cassini Plasma Spectrometer (CAPS) instrument is scheduled to observe the plasma environment at Titan October 26,2004 from the Cassini Orbiter. Preliminary CAPS ion measurements from this encounter will be compared with measurements made by the Voyager I Plasma Science Instrument (PSI). The comparison will be used to evaluate previous interpretations and predictions of the Titan plasma environment that have been made using PSI measurements. The comparisons will focus on the composition and nature of the ambient plasma and pickup ions. Using the CAPS ion measurements, some of the questions to be addressed, as stimulated by the previous interpretations and predictions made

evaluating PSI data, are the following: A) Are H+ and N+ the major ion components of Saturn's rotating magnetosphere in the vicinity of Titan? B) Are other ambient ions present? C) Are finite gyroradius effects apparent in ambient N+ as the result of its interaction with Titans atmosphere? D) Are the principal pickup ions composed of H+, H2+, N+, N2+ and CH4+? E) Is the dominant pickup ion closest to Titan's ionopause N2+? F) Is there evidence of slowing down of the ambient plasma due to pickup ion mass loading? F) If so, does the ambient plasma slow down rapidly, as the ionopause is approached and heavier pickup ions like N2+ are added? During the Voyager I flyby, Titan was in Saturn's magnetosphere. If Titan is in Saturn's magnetosheath or the solar wind at the encounter, questions similar to the above will be addressed as appropriate. Author

Cassini Mission; Ionopause; Ions; Hydrogen; Nitrogen; Methane; Plasmas (Physics); Titan; Satellite Atmospheres

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20040170451 NASA Marshall Space Flight Center, Huntsville, AL, USA

X-ray and EUV Observations of CME Eruption Onset

Sterling, A. C.; [2004]; 1 pp.; In English; International Astronomical Meeting Symposium 226: Coronal and Stellar Mass Ejections, 13-17 Sep. 2004, Beijing, China; No Copyright; Avail: Other Sources; Abstract Only

Why Coronal Mass Ejections (CMEs) erupt is a major outstanding puzzle of solar physics. Signatures observable at the earliest stages of eruption onset may hold precious clues about the onset mechanism. We present observations from SOHO/EIT and from TRACE in EUV, and from Yohkoh/SXT in soft X-rays of the pre-eruption and eruption phases of CME expulsion, along with the eruption's magnetic setting found from SOHO/MDI magnetograms. Most of our events involve clearly-observable filament eruptions and multiple neutral lines, and we use the magnetic settings and motions of the filaments to help infer the geometry and behavior of the associated erupting magnetic fields. Pre-eruption and early-eruption signatures include a relatively slow filament rise prior to eruption, and intensity 'dimmings' and brightenings, both in the immediate neighborhood of the 'core' (location of greatest magnetic shear) of the erupting fields and at locations remote from the core. These signatures and their relative timings place observational constraints on eruption mechanisms; our recent work has focused on implications for the so-called 'tether cutting' and 'breakout' models, but the same observational constraints are applicable to any model.
Author

X Rays; Magnetic Signatures; Extreme Ultraviolet Radiation; Noble Metals; Coronal Mass Ejection

20040171182 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Model for Solar Proton Risk Assessment

Xapsos, M. A.; Stauffer, C.; Gee, G. B.; Barth, J. L.; Stassinopoulos, E. G.; McGuire, R. E.; [2004]; 5 pp.; In English; International Nuclear and Space Radiation Conference, 19-23 Jul. 2004, Atlanta, GA, USA; No Copyright; Avail: CASI; A01, Hardcopy

A statistical model for cumulative solar proton event fluences and for worst-case flux during space missions is presented. New features include the solar minimum time period and proton energy spectra that extend to higher energies.
Author

Mathematical Models; Solar Activity Effects; Proton Energy

20040171186 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Role of Theory and Modeling in the International Living with a Star Program

Hesse, M.; January 2004; 1 pp.; In English; 35th COSPAR Scientific Assembly Meeting, 18-25 Jul. 2004, Paris, France; No Copyright; Avail: Other Sources; Abstract Only

Today, theory and modeling play a critical role in our quest to understand the connection between solar eruptive phenomena, and their impacts in interplanetary space and in the near-Earth space environment. This new role is based on two developments, one related to the goal of basic physical understanding, and the other to space weather-related applications. When targeting physical our focus is shifting away from investigations aiming at basic discoveries, to missions and studies that address our basic understanding of processes we know to be important. For these studies, theory and models provide physical explanations that need to be verified or falsified by empirical evidence. Within this paradigm, a much more tight integration between theory modeling, and space flight mission design and execution is not only beneficial, but essential. One

of the prime objectives of space weather research, on the other hand, is the prediction of space environmental conditions for the benefit of humans and their assets in near-Earth space and on the ground, as well as on solar system bodies like Mars that are of interest to exploration by humans. By its very nature, prediction requires modeling, which, in turn, requires understanding. We will present an overview of the role of theory and modeling within the International Living With a Star program. Specifically, we will focus on an assessment of present-day and future capabilities, as well as on strategies for tight integration of theory and modeling in space science investigations.
Author
Interplanetary Space; Aerospace Environments; Solar Activity; Space Weather; Measure and Integration

20040171195 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Identification of Interplanetary Coronal Mass Ejections at 1 AU Using Multiple Solar Wind Plasma Composition Anomalies
Richardson, I. G.; Cane, H. V.; [2004]; ISSN 0148-0227; 24 pp.; In English
Contract(s)/Grant(s): NCC5-180; No Copyright; Avail: CASI; A03, Hardcopy

We investigate the use of multiple simultaneous solar wind plasma compositional anomalies, relative to the composition of the ambient solar wind, for identifying interplanetary coronal mass ejection (ICME) plasma. We first summarize the characteristics of several solar wind plasma composition signatures (O(+7)/O(+6), Mg/O, Ne/O, Fe charge states, He/p) observed by the ACE and WIND spacecraft within the ICMEs during 1996 - 2002 identsed by Cane and Richardson. We then develop a set of simple criteria that may be used to identify such compositional anomalies, and hence potential ICMEs. To distinguish these anomalies from the normal variations seen in ambient solar wind composition, which depend on the wind speed, we compare observed compositional signatures with those 'expected' in ambient solar wind with the same solar wind speed. This method identifies anomalies more effectively than the use of fixed thresholds. The occurrence rates of individual composition anomalies within ICMEs range from approx. 70% for enhanced iron and oxygen charge states to approx. 30% for enhanced He/p (\g 0.06) and Ne/O, and are generally higher in magnetic clouds than other ICMEs. Intervals of multiple anomalies are usually associated with ICMEs, and provide a basis for the identification of the majority of ICMEs. We estimate that Cane and Richardson, who did not refer to composition data, probably identitied approx. 90% of the ICMEs present. However, around 10% of their ICMEs have weak compositional anomalies, suggesting that the presence of such signatures does not provide a necessary requirement for an ICME. We note a remarkably similar correlation between the Mg/O and O(7)/O(6) ratios in hourly-averaged data both within ICMEs and the ambient solar wind. This 'universal' relationship suggests that a similar process (such as minor ion heating by waves inside coronal magnetic field loops) produces the first-ionization potential bias and ion freezing-in temperatures in the source regions of both ICMEs and the ambient solar wind.
Author
Coronal Mass Ejection; Solar Wind; Plasma Composition

20040171393 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Fraction of Interplanetary Coronal Mass Ejections That Are Magnetic Clouds: Evidence for a Solar Cycle Variation
Richardson, I. G.; Cane, H. V.; [2004]; ISSN 0094-8276; 7 pp.; In English
Contract(s)/Grant(s): NCC5-180; Copyright; Avail: CASI; A02, Hardcopy

'Magnetic clouds' (MCs) are a subset of interplanetary coronal mass ejections (ICMEs) characterized by enhanced magnetic fields with an organized rotation in direction, and low plasma beta. Though intensely studied, MCs only constitute a fraction of all the ICMEs that are detected in the solar wind. A comprehensive survey of ICMEs in the near- Earth solar wind during the ascending, maximum and early declining phases of solar cycle 23 in 1996 - 2003 shows that the MC fraction varies with the phase of the solar cycle, from approximately 100% (though with low statistics) at solar minimum to approximately 15% at solar maximum. A similar trend is evident in near-Earth observations during solar cycles 20 - 21, while Helios 1/2 spacecraft observations at 0.3 - 1.0 AU show a weaker trend and larger MC fraction.
Author
Coronal Mass Ejection; Solar Cycles; Magnetic Clouds; Interplanetary Medium

20040171421 NASA Marshall Space Flight Center, Huntsville, AL, USA
External and Internal Reconnection in Two Filament-Carrying Magnetic Cavity Solar Eruptions
Sterling, Alphonse C.; Moore, Ronald L.; The Astrophysical Journal; 1 October 2004; Volume 613, pp. 1221-1232; In English; Copyright; Avail: Other Sources; Abstract Only

We observe two near-limb solar filament eruptions. one of 2000 February 26 and the other of 2002 January 4. For both we use 195 A Fe XII images from the Extreme-Ultraviolet Imaging Telescope (EIT) and magnetograms from the Michelson Doppler Imager (MDI). both of which are on the Solar and Heliospheric Observatory. (SOHO). For the earlier event we also use soft X-ray telescope (SXT). hard X-ray telescope (HXT). and Bragg Crystal Spectrometer (BCS) data from the Yohkoh satellite. and hard X-ray data from the BATSE experiment on the Compton Gamma Ray Observatory. (CGRO). Both events occur in quadrupolar magnetic regions. and both have coronal features that we infer belong to the same magnetic cavity structures as the filaments. In both cases. the cavity and filament first rise slowly at approx. 10 km/s prior to eruption and then accelerate to approx. 100 km/s during the eruption. although the slow-rise movement for the higher altitude cavity elements is clearer in the later event. We estimate that both filaments and both cavities contain masses of approx. 10(exp14) - 1 0(exp 15) and approx. l0(exp 15) - l0(exp 16) g. respectively. We consider whether two specific magnetic reconnection-based models for eruption onset. the 'tether cutting' and the 'breakout' models. are consistent with our observations. In the earlier event, soft X-rays from SXT show an intensity increase during the 12 minute interval over which fast eruption begins. which is consistent with tether- cutting-model predictions. Substantial hard X-ray. however. do not occur until after fast eruption is underway. and so this is a constraint the tether-cutting model must satisfy. During the same 12 minute interval over which fast eruption begins, there are brightenings and topological changes in the corona indicative of high-altitude reconnection early in the eruption. and this is consistent with breakout predictions. In both eruptions. the state of the overlying loops at the time of onset of the fast-rise phase of the corresponding filament can be compared with expectations from the breakout model. thereby setting constraints that the breakout model must meet. Our findings are consistent with both runaway tether-cutting-type reconnection and fast breakout-type reconnection. occurring early in the fast phase of the February eruption and with both types of reconnection being important in unleashing the explosion, but we are not able to say which. if either, type of reconnection actually triggered the fast phase. In any case. we have found specific constraints that either model. or any other model. must satisfy if correct.

Author

Solar Activity; Magnetic Signatures; Magnetic Fields; Gamma Ray Bursts; Coronal Mass Ejection

20040171437 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Tutorial on Solar Energetic-Particle Events

vonRosenvinge, Tycho T.; [2004]; 1 pp.; In English; Chapman Conference, 2-6 Aug. 2004, Turku, Finland; No Copyright; Avail: Other Sources; Abstract Only

Particles from the Sun at energies above approx. 1 MeV/nucleon have been studied in space for over 35 years. There have been major advances in instrumentation for studying elemental and isotopic composition, kinetic energy, charge states, time intensity histories, and anisotropies of energetic particles. There have also been extensive improvements in the observations of solar phenomena, including radio bursts, Coronal Mass Ejections (CMEs), and solar photons from soft X-ray to gamma-ray energies. Despite these advances, there is a lack of agreement as to the acceleration processes responsible for the particles seen in space shortly after the solar event. In particular, the relative importance of solar flares and CME-driven shocks is disputed for events of moderate to larger size. The reasons for this will be reviewed, and the prospects for resolving this issue will be evaluated.

Author

Energetic Particles; Kinetic Energy; Isotopes; Anisotropy; Coronal Mass Ejection; Photons; Solar Radio Bursts; Solar X-Rays; Nucleons

20040171438 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The October-November, 2003 Solar Activity and its Relationship to the 'approx. 155 day' Solar Periodicity

Richardson, I. G.; Cane, H. V.; [2004]; ISSN 0094-8276; 4 pp.; In English

Contract(s)/Grant(s): NCC5-180; Copyright; Avail: CASI; A01, Hardcopy

Periodicities of approx. 155 days in various solar and interplanetary phenomena were first discovered during solar cycle 21 and have been shown to be intermittently present in other solar cycles. In the current solar cycle (23), they have been reported in solar energetic particle events and interplanetary coronal mass ejections. We assess whether the 'unexpected' October - November 2003 burst of solar activity during the late declining phase of the cycle may have been a manifestation of such a periodic behavior, and hence might have been to some extent 'predictable'. If the pattern were to continue, episodes of enhanced activity might be expected around April - May and October, 2004. There was a modest increase activity increase in mid-April, 2004 which may conform to this pattern.

Author

Solar Cycles; Solar Corpuscular Radiation; Energetic Particles; Periodic Variations; Coronal Mass Ejection

20040171441 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Analysis of He I 1083 nm Imaging Spectroscopy Using a Spectral Standard
Malanushenko, Elena V.; Jones, Harrison P.; [20 February 2004]; 18 pp.; In English
Contract(s)/Grant(s): 344-12-51-14; No Copyright; Avail: CASI; A03, Hardcopy

We develop a technique. for the analysis of He I 1083 nanometer spectra which addresses several difficulties through determination of a continuum background by comparison with a well calibrated standard and through removal of nearby solar and telluric blends by differential comparison to an average spectrum. The method is compared with earlier analysis of imaging spectroscopy obtained at the National Solar Observatory/Kitt Peak Vacuum Telescope (NSO/KPVT) with the NASA/NSO Spectromagnetograph (SPM). We examine distributions of Doppler velocity and line width as a function of central intensity for an active region, filament, quiet Sun, and coronal hole. For our example, we find that line widths and central intensity are oppositely correlated in a coronal hole and quiet Sun. Line widths are comparable to the quiet sun in the active region, are systematically lower in the filament, and extend to higher values in the coronal hole. Outward velocities of approximately equal to 2 to 4 kilometers per second are typically observed in the coronal hole. The sensitivity of these results to analysis technique is discussed.
Author
Coronal Holes; Spectroscopy; Imaging Techniques; Helium; Line Spectra

20040171460 NASA Goddard Space Flight Center, Greenbelt, MD, USA
In-Situ Solar Wind and Magnetic Field Signatures of Interplanetary Coronal Mass Ejections
Zurbuchen, Thomas H.; Richardson, Ian G.; [2004]; 21 pp.; In English
Contract(s)/Grant(s): NCC5-180; Copyright; Avail: Other Sources

The heliospheric counterparts of coronal mass ejections (CMEs) at the Sun, interplanetary coronal mass ejections (ICMEs), can be identified in-situ based on a number of magnetic field, plasma, compositional and energetic particle signatures, as well as combinations thereof. Although many of these signatures have been recognized since the early space era, recent observations from improved instrumentation on spacecraft such as Ulysses, Wind, and ACE, in conjunction with solar observations from SOHO, have advanced our understanding of the characteristics of ICMEs and their solar counterparts. We summarize these signatures and their implications for understanding the nature of these structures and the physical properties of coronal mass ejections. We conclude that our understanding of ICMEs is far from complete, and formulate several challenges that, if addressed, would substantially improve our knowledge of the relationship between CMEs at the Sun and in the heliosphere.
Author
Coronal Mass Ejection; Energetic Particles; Solar Wind; Velocity Distribution; Wind Velocity

20040171498 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Living With a Star Program and International Collaboration
Thompson, Barbara J.; [2004]; 1 pp.; In English; 2004 International Astronomical Union Meeting, 11-20 Jun. 2004, Russia; No Copyright; Avail: Other Sources; Abstract Only

International cooperation has long been a vital element in the scientific investigation of solar variability and its impact on Earth and the space environment. Recently a new international cooperative initiative in solar-terrestrial physics has been established by the major space agencies of the world, called the International Living With a Star (ILWS) program. ILWS is a follow-on to the highly successful International Solar Terrestrial Physics (ISTP) program, which derived its success from the ,cooperation of a number of international partners. ISTP, with its steady flow of discoveries and new knowledge in solar-terrestrial physics, has laid the foundation for the coordinated study of the Sun-Earth system as a connected stellar-planetary system and as humanity's home. The first step in establishing ILWS was taken in the fall of 2000 when funding was approved for the NASA's LWS program whose goal is to 'develop the scientific understanding necessary to effectively address those aspects of the connected Sun-Earth system that directly affect life and society'
Derived from text
International Cooperation; Solar Physics; Solar Activity

20040171508 NASA Goddard Space Flight Center, Greenbelt, MD, USA
From Simple Plane-Parallel to Complex Monte Carlo Calculations of Solar Fluxes and Radiances for Cloudy Atmospheres
Marshak, Alexander; [2004]; 1 pp.; In English; Computational Methods Workshop, 11-16 Sep. 2004, Lake Tahoe, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

In my presentation, I will describe several approximation methods with different level of complexity; they will be gradually applied to simple examples of horizontally inhomogeneous clouds. Understanding of photon horizontal transport and radiative smoothing can help to improve accuracy of the methods The accuracy of the methods will be compared with the full Monte Carlo calculations. The specifics of Monte Carlo in cloudy atmospheres will be also discussed. A special emphasis will be put on the strong forward scattering peak in the phase functions.
Author
Solar Activity; Photons; Monte Carlo Method; Solar Flux

20040171527 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Properties of Moving UV Features in Prominences
Kucera, Therese A.; [2003]; 1 pp.; In English; PROM Workshop, 28 Sep. - 2 Oct. 2003, Bozeman, MT, USA; No Copyright; Avail: Other Sources; Abstract Only

Multi-thermal features with speeds of 5-70 kilometers per second perpendicular to the line of sight are common in the prominences which showed traceable motions. These speeds are noticeably higher than the typical speeds of 5-20 kilometers per second observed in H-alpha data from 'quiet' prominences and are more typical of 'activated' prominences in which H-alpha blob speeds of up to 40 kilometers per second have been reported. In order to make a more quantitative determination of the thermal properties of the moving features seen in the UV, we use the SOHO instruments SUMER and CDS to take a time series of exposures from a single pointing position, providing a measurement of spectral line properties as a function of time and position along the slit. The resulting observations in lines spectral lines in a range of 'transition region' temperatures allow us to analyze the thermal properties of the moving prominence sources as a function of time.
Author
Solar Prominences; Thermodynamic Properties; Ultraviolet Radiation

20040171541 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Virtual Observatories: Are We Virtually There Yet?
Gurman, J. B.; [2004]; 1 pp.; In English; American Astronautical Society Meeting, 30 May - 3 Jun. 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

Virtual observatories are tools for simplifying access to and use of astronomical data from an increasing number of data sources of rapidly growing volume. Now that a variety of virtual observatory development efforts are under way around the world, a cursory review of the efforts outside solar physics, and an only slightly more detailed consideration of those within, demonstrates a commonality of conceptual model if not of approach or application. The linkages among virtual observatories optimized for different scientific communities present an interesting challenge to the designers: should virtual observatories be designed for the most expert users? For the least? For everyone? It is too early to provide definitive answers, but examination of current efforts does offer some clues.
Author
Virtual Reality; Solar Physics; Astronomy; Observatories

20040171565 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Properties of Prominence Motions as Observed in the UV
Kucera, T.; Landi, E.; [2003]; 1 pp.; In English; Fall AGU Conference, December 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The mechanisms by which solar prominences are filled with plasma are still undetermined. In this study we perform a quantitative analysis of the thermal properties of moving features in prominences in order to put constraints on models of prominence formation and dynamics. In order to make such measurements of quickly moving features seen in prominences in the UV we use the SOHO instruments SUMER and CDS to take a time series of exposures at a single pointing position, providing a measurement of spectral line properties as a function of time and position along the slit. The resulting observations in spectral lines in a range of 'transition region' temperatures allow us to analyze the thermal properties of the moving prominence sources as a function of time.
Author
Solar Prominences; Thermodynamic Properties; Ultraviolet Astronomy

20040171571 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Can SOHO SWAN detect CMEs?
St.Cyr, O. C.; Malayeri, M. L.; Yashiro, S.; Quernerais, E.; Bertaux, Jean-Loup; Howard, Russ; [2003]; 1 pp.; In English; Fall AGU Conference, Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We have investigated the possibility that the Solar Wind Anisotropies (SWAN) remote sensing instrument on SOHO may be able to detect coronal mass ejections (CMEs) in neutral Hydrogen Lyman-? emission. We have identified CMEs near the Sun in observations by the SOHO LASCO white-light coronagraphs and in extreme ultraviolet emissions using SOHO E n . There are very few methods of tracking CMEs after they leave the coronagraph's field-of-view, so this is an important topic to study. The primary science goal of the SWAN investigation is the measurement of large-scale structures in the solar wind, and these are obtained by detecting intensity fluctuations in Lyman-?. SWAN consists of a pair of Sensors on opposite panels of SOHO. The instantaneous field-of-view of each sensor unit is a So x So square, divided into lo pixels. A gimbaled periscope system allows each sensor to map the intensity distribution of Lyman-?, and the entire sky can be scanned in less than one day. This is the typical mode of operation for this instrument.
Author
Coronal Mass Ejection; Ultraviolet Emission; Coronagraphs; Solar Observatories; Telescopes

20040171612 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Solar Flare 4: 10 keV X-ray Spectrum
Phillips, K. J. H.; [2004]; 40 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The 4-10 keV solar flare spectrum includes highly excited lines of stripped Ca, Fe, and Ni ions as well as a continuum steeply falling with energy. Groups of lines at approximately 7 keV and approximately 8 keV, observed during flares by the broad-band RHESSI spectrometer and called here the Fe-line and Fe/Ni-line features, are formed mostly of Fe lines but with Ni lines contributing to the approximately 8 keV feature. Possible temperature indicators of these line features are discussed - the peak or centroid energies of the Fe-line feature, the line ratio of the Fe-line to the Fe/Ni-line features, and the equivalent width of the Fe-line feature. The equivalent width is by far the most sensitive to temperature. However, results will be confused if, as is commonly believed, the abundance of Fe varies from flare to flare, even during the course of a single flare. With temperature determined from the thermal continuum, the Fe-line feature becomes a diagnostic of the Fe abundance in flare plasmas. These results are of interest for other hot plasmas in coronal ionization equilibrium such as stellar flare plasmas, hot gas in galaxies, and older supernova remnants.
Author
Solar Flares; X Ray Spectra; Gamma Rays; Line Spectra

20040171630 Massachusetts Inst. of Tech., Cambridge, MA, USA
Wave-Particle Interactions As a Driving Mechanism for the Solar Wind
Wagner, William J.; November 08, 2004; 14 pp.; In English
Contract(s)/Grant(s): NAG5-12859; No Copyright; Avail: CASI; A03, Hardcopy

Our research has been focusing on a highly experimentally relevant issue: intermittency of the fluctuating fields in outflowing plasmas. We have contributed to both the theoretical and experimental research of the topic. In particular, we have developed a theoretical model and data analyzing programs to examine the issue of intermittency in space plasma outflows, including the solar wind. As fluctuating electric fields in the solar wind are likely to provide a heating and acceleration mechanism for the ions, our studies of the intermittency in turbulence in space plasma outflows help us toward achieving the goal of comparing major physical mechanisms that contribute to the driving of the fast solar wind. Our new theoretical model extends the utilities of our global hybrid model, which has allowed us to follow the kinetic evolution of the particle distributions along an inhomogeneous field line while the particles are subjected to various physical mechanisms. The physical effects that were considered in the global hybrid model included wave-particle interactions, an ambipolar electric field that was consistent with the particle distributions themselves, and Coulomb collisions. With an earlier version of the global hybrid model, we examined the overall impact on the solar wind flow due to the combination of these physical effects. In particular, we studied the combined effects of two major mechanisms that had been proposed as the drivers of the fast solar wind: (1) velocity filtration effect due to suprathermal electrons; (2) ion cyclotron resonance. Since the approval of this research grant, we have updated the model such that the effects due to these two driving mechanisms can be examined separately, thereby allowing us to compare their contributions to the acceleration of the solar wind. In the next section, we shall demonstrate that the velocity filtration effect is rather insignificant in comparison with that due to ion cyclotron resonance.
Derived from text
Wave-Particle Interactions; Solar Wind; Space Plasmas; Mathematical Models; Data Processing

20040171653 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Zonal Flows Below the Sun's Convection: Analytic Approximation
Wolff, Charles L.; Mayr, Hans G.; [2004]; 14 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

We have derived a simple analytic solution showing how the Sun's global oscillations (g-modes) can drive east-west flows at low latitude deep inside the Sun. This flow is analogous to the Quasi Biennial Oscillation in the Earth s upper atmosphere. It has an observed period of 1.3 years in the solar case but its cause was not known until we published an explanation in a Letter to the Editor a few months ago. Now we give full details of the model and show how it can be used to limit the range of g-modes that can be actively driving the reversing flows. A nonlinear feedback feature of the model is that the flow itself creates the turbulent dissipation that extracts momentum from the g-modes that, in turn, drives the flow.
Author
Analysis (Mathematics); Upper Atmosphere; Quasi-Biennial Oscillation; Solar Activity

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20040171163 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Comparison of Measured Galactic Background Radiation at L-Band with Model
LeVine, David M.; Abraham, Saji; Kerr, Yann H.; Wilson, William J.; Skou, Niels; Sobjaerg, Sten; [2004]; 3 pp.; In English; IGARSS 2004, 20-24 Sep. 2004, Anchorage, AK, USA; Copyright; Avail: CASI; A01, Hardcopy

Radiation from the celestial sky in the spectral window at 1.413 GHz is strong and an accurate accounting of this background radiation is needed for calibration and retrieval algorithms. Modern radio astronomy measurements in this window have been converted into a brightness temperature map of the celestial sky at L-band suitable for such applications. This paper presents a comparison of the background predicted by this map with the measurements of several modern L-band remote sensing radiometer Keywords-Galactic background, microwave radiometry; remote sensing;
Author
Galactic Radiation; Algorithms; Microwave Radiometers; Ultrahigh Frequencies; Celestial Bodies

20040171273 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Near-Earth Space Radiation for Electronics Environment
Stassinopoulos, E. G.; LaBel, K. A.; [2004]; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

The earth's space radiation environment is described in terms of: a) charged particles as relevant to effects on spacecraft electronics, b) the nature and distribution of trapped and transiting radiation, and c) their effect on electronic components.
Author
Aerospace Environments; Radiation Trapping; Radiation Protection; Electronic Equipment

20040171414 NASA Marshall Space Flight Center, Huntsville, AL, USA
Determine Important Nuclear Fragmentation Processes for Space Radiation Protection in Human Space Explorations
Lin, Zi-Wei; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NCC8-200; Copyright; Avail: Other Sources; Abstract Only

Space radiation from cosmic ray particles is one of the main challenges for long-term human space explorations such as a permanent moon base or a trip to Mars. Material shielding may provide significant radiation protection to astronauts, and models have been developed in order to evaluate the effectiveness of different shielding materials and to predict radiation environment inside the spacecraft. In this study we determine the nuclear fragmentation cross sections which will most affect the radiation risk behind typical radiation shielding materials. These cross sections thus need more theoretical studies and accurate experimental measurements in order for us to more precisely predict the radiation risk in human space explorations.
Author
Cross Sections; Cosmic Rays; Radiation Shielding

20040171458 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Performance of the High-Energy Single-Event Effects Test Facility (SEETF) at Michigan State University's National Superconducting Cyclotron Laboratory (NSCL)
Ladbury, R.; Reed, R. A.; Marshall, P. W.; LaBel, K. A.; Anantaraman, R.; Fox, R.; Sanderson, D. P.; Stolz, A.; Yurkon, J.; Zeller, A. F.; Stetson, J. W., et al.; [2004]; 5 pp.; In English; 2004 IEEEE Nuclear and Space Radiation Effects Conference, 19-23 Jul. 2004, Atlanta, GA, USA
Contract(s)/Grant(s): DTRA-IACRO-03-40351; Copyright; Avail: CASI; A01, Hardcopy

The performance of Michigan State University's Single-Event Effects Test Facility (SEETF) during its inaugural runs is evaluated. Beam profiles and other diagnostics are presented, and prospects for future development and testing are discussed. Author

Cyclotrons; Superconductivity; Test Facilities; Single Event Upsets

20040171504 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Measurement of the Abundance of Radioactive Be-10 and Other Light Isotopes in Cosmic Radiation Up to 2 GeV /Nucleon with the Balloon-Borne Instrument Isomax

Hams, T.; Barbier, L. M.; Bremerich, M.; Christian, E. R.; deNolfo, G. A.; Geier, S.; Goebel, H.; Gupta, S. K.; Hof, M.; Menn, W., et al.; [20 August 2004]; 14 pp.; In English

Contract(s)/Grant(s): NAG5-5227; DFG-Si-290/8; RTOP 353-87-02; Copyright; Avail: Other Sources

The Isotope Magnet Experiment (ISOMAX), a balloon-borne superconducting magnet spectrometer, was designed to measure the isotopic composition of the light isotopes (3 les than or = Z less than or = 8) of cosmic radiation up to 4 GeV/nucleon with a mass resolution of better than 0.25 amu by using the velocity versus rigidity technique. To achieve this stringent mass resolution, ISOMAX was composed of three major detector systems: a magnetic rigidity spectrometer with a precision drift chamber tracker in conjunction with a three-layer time-of-flight system, and two silica-aerogel Cerenkov counters for velocity determination. A special emphasis of the ISOMAX program was the accurate measurement of radioactive Be-10 with respect to its stable neighbor isotope Be-9, which provides important constraints on the age of cosmic rays in the Galaxy. ISOMAX had its first balloon flight on 1998 August 4-5 from Lynn Lake, Manitoba, Canada. Thirteen hours of data were recorded during this flight at a residual atmosphere of less than 5 g/sq cm. The isotopic ratio at the top of the atmosphere for Be-10/Be-9 was measured to be 0.195 +/- 0.036 (statistical) +/- 0.039 (systematic) between 0.26 and 1.03 GeV/nucleon and 0.317 +/- 0.109(statistical) +/- 0.042(systematic) between 1.13 and 2.03 GeV/nucleon. This is the first measurement of its kind above l GeV/nucleon. ISOMAX results tend to be higher than predictions from current propagation models. In addition to the beryllium results, we report the isotopic ratios of neighboring lithium and boron in the energy range of the time-of-flight system (up to approx. 1 GeV/nucleon). The lithium and boron ratios agree well with existing data and model predictions at similar energies.

Author

Cosmic Rays; Radioactivity; Balloon-Borne Instruments; Beryllium Isotopes

20040171608 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Advances in Inner Magnetosphere Passive and Active Wave Research

Green, James L.; Fung, Shing F.; [22 Jun. 2004]; 55 pp.; In English; No Copyright; Avail: CASI; A04, Hardcopy

This review identifies a number of the principal research advancements that have occurred over the last five years in the study of electromagnetic (EM) waves in the Earth's inner magnetosphere. The observations used in this study are from the plasma wave instruments and radio sounders on Cluster, IMAGE, Geotail, Wind, Polar, Interball, and others. The data from passive plasma wave instruments have led to a number of advances such as: determining the origin and importance of whistler mode waves in the plasmasphere, discovery of the source of kilometric continuum radiation, mapping AKR source regions with 'pinpoint' accuracy, and correlating the AKR source location with dipole tilt angle. Active magnetospheric wave experiments have shown that long range ducted and direct echoes can be used to obtain the density distribution of electrons in the polar cap and along plasmaspheric field lines, providing key information on plasmaspheric filling rates and polar cap outflows.

Author

Electromagnetic Radiation; Earth Magnetosphere; Geomagnetic Tail; Inner Radiation Belt; Plasmasphere; Continuous Spectra

20040171614 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Source and Propagation Characteristics of Kilometric Continuum Observed with Multiple Satellites

Hashimoto, K.; Anderson, R. R.; Green, J. L.; Matsumoto, H.; [August 2004]; 17 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Kilometric continuum radiation was first identified with the GEOTAIL Plasma Wave Instrument (PWI) as the high frequency extension of escaping continuum emissions in the frequency range from 100 kHz to 800 kHz. It consists of from a few to many narrow-band emissions. It was observed mainly near the magnetic equator, and its source was expected to be inside of the plasmapause and the topside equatorial region. Recently, data from the IMAGE Radio Plasma Imager (RPI) and

Extreme ultraviolet (EUV) experiments have been used to show that kilometric continuum is generated at the plasmapause, in or near the magnetic equator, within a notch region, and have confirmed the expectation. Data from the CRRES PWI have also identified other sources from the equatorial density irregularities. An example of CRRES observations reveals a possibility that kilometric continuum has been radiated as a wide beam emission. The IMAGE and GEOTAIL simultaneous observations are not like the previous observations since they show it has been observed to have a very broad emission cone. It could also be the highest frequency continuum enhancement so far observed since it is associated with a high energy electron injection event.
Author
Continuums; Extreme Ultraviolet Radiation; Plasma Waves; Narrowband; Continuous Spectra

20040171648 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Ultrahigh Energy Cosmic Rays: Old Physics or New Physics?
Stecker, F. W.; [2004]; 16 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

We consider the advantages of and the problems associated with hypotheses to explain the origin of ultrahigh energy cosmic rays (UHECR: E greater than 10 EeV) and the 'trans-GZK' cosmic rays (TGZK: E greater than 100 EeV) both through 'old physics' (acceleration in cosmic sources) and 'new physics' (new particles, topological defects, fat neutrino cross sections, Lorentz invariance violation).
Author
Energy Spectra; Cosmic Rays; Hypotheses

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