NSSDC news

NASA's National Space Science Data Center

Vol. 7, No. 2, Summer 1991

Operations Professionals Play Key Role in Success of NASA's Climate Data System (NCDS)

NCDS staff members, from left to right, are Bruce Vollmer, Ke Jun Sun, Hank Griffioen, Jim Closs, John Vanderpool, Frank Corprew, Joe Brown, and Lola Olsen (task ATR).

The key to a truly valuable data system is in the data that are offered and the ease with which these data can be accessed for research. The quality of a system cannot rest solely on its appearance. The real task behind providing total system functionality lies in data management, which is often a forgotten partner in data system development.

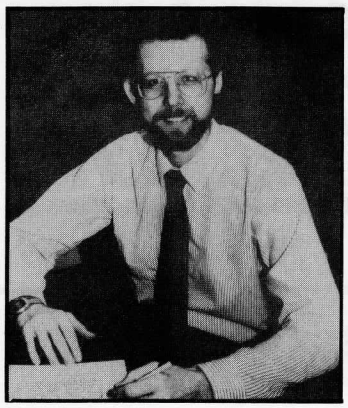
Most data management activities are transparent within the NASA Climate Data System (NCDS). These operational or maintenance tasks have grown in volume and scope over the years as data volumes increase and reprocessed data replace older versions.

In a typical month NCDS staff will process over 700 9-track tapes; provide information, instruction, or data to over 90 researchers; update catalogs as new products are made available or as changes are made to the status and quality of data sets; prepare usage statistics, system documentation and various papers for professional meetings; perform data base modifications and updates; provide programming support for developing capabilities to support additional data sets; evaluate the usefulness, quality, and applicability of a given data set to the NCDS research community and recommend the level of support to be provided for that data set; establish new user accounts; provide scientific-level support for validation of the incorporated metadata; support the inclusion and implementation of data sets; and communi-

see Operations Professionals, *p. 4*

inside:

Dedicated to providing multidisciplinary data and information for the worldwide science community

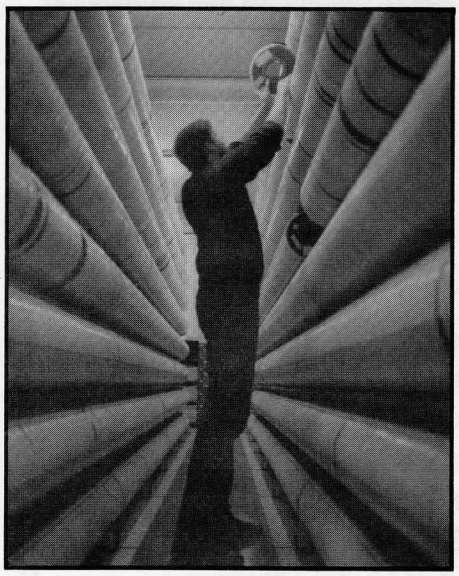


Director's Message:

NSSDC as a World Data Center

In this message, I want to briefly discuss the World Data Center (WDC) system and its relationship to the NSSDC, highlighting several key activities that the data center performs for the international science community. The WDC system dates back to 1957 when it was determined that international access to observational data resulting from the "International Geophysical Year" (IGY) needed to be formally established. The WDC system has continued to this day and has grown to over 35 data centers.

The International Commission of Scientific Unions (ICSU) is the responsible body for the uniform operation and establishment of all World Data Centers. The key WDC principles established by ICSU are to acquire and store data from national and international sources, to exchange data between WDCs, to make data accessible to all scientists (from request or by visits), and to support international programs to the extent possible.



An employee at NSSDC is surrounded by collections of data about Earth and many of the far reaches of our galaxy.

In the United States, there are nine WDCs designated as WDC-As. The Committee for Geophysical Data (CGD) is the organization that oversees the operations of all the WDC-As and reports to the National Academy of Sciences and to ICSU. The World Data Centers cover a broad range of physical science including glaciology, geophysics, meteorology, oceanography, seismology, and solar-terrestrial physics. In addition, coordination centers have been established that gather various aspects of information about rockets and satellites to help facilitate international scientific research.

The World Data Center-A for Rockets and Satellites (WDC-A R&S) is operated by NSSDC. The subcenters for rockets and satellites do not hold any data, in contrast to the role of other discipline subcenters in the World Data Center System. However, all data and services of NSSDC are available to professionals outside the U.S. through WDC-A R&S. Approximately 25 percent of all requests for NSSDC data and services is from the international science community through requests to the WDC-A R&S.

NSSDC publishes information catalogs and data inventories for the entire archive that it manages. Many NSSDC publications are issued jointly with the WDC-A-R&S. Examples include detailed catalogs and spacecraft listings, such as the Report on Active and Planned Spacecraft and Experiments (RAPSE), which lists satellites currently operating in space or planned for future launch, with details of orbits, instruments, and project scientists.

The major publication that the WDC-A-R&S produces is the monthly *SPACEWARN Bulletin*. This bulletin, with a worldwide subscription of approximately 650, contains timely information about satellite launches. *SPACEWARN Bulletin* is now available on line, and a copy can easily be networked to the remote user. Since that service became available in December 1990, about 50 users each month have received the publication electronically.

The NSSDC/WDC-A R&S participates in several international scientific programs. NSSDC now supports the U.S. Solar-Terrestrial Energy Program

see Director's Message, *p. 3*

Director's Message, *from p. 2*

(STEP) through an on-line interactive system called the STEP Bulletin Board. In addition, NSSDC provides various support services to the U.S. STEP Coordination Office in the publishing and distribution of the *U.S. STEP Newsletter*, which is sent to nearly 4,000 scientists worldwide. For more information about STEP, please refer to the article by Michael Teague in this issue; more details about accessing the STEP Bulletin Board and the *U.S. STEP Newsletter* can be obtained by contacting NSSDC's request service. (See the back page of this newsletter.)

NSSDC's Master Directory (MD) has been adopted by the Interagency Working Group on Data Management for Global Change (IWGDMGC) as a centralized directory to facilitate global change research. This effort is part of the U.S. program in global change. The MD is also a prototype directory for the Committee on Earth Observation Satellites (CEOS) and has nodes, in addition to NSSDC, at the Earthnet Program Office in Frascati, Italy, and at the National Aeronautics and Space Development Agency (NASDA) in Japan.

The Satellite Situation Center (SSC) at NSSDC provides extensive support for several international programs, such as STEP, SOLTIP (Solar Connection to Transient Interplanetary Processes), and the IACG (Inter-Agency Consultative Group). The SSC is a software system and user support office that is designed to serve the planning needs of investigators for coordination of data acquisition from multi-spacecraft and ground-based instruments.

NSSDC supports the Coordinated Data Analysis Workshop 9 (CDAW 9), which began in May 1989 and is still continuing. Several CDAWs have been hosted at local and remote sites (including Japan) to allow rapid access, manipulation, and comparison of exciting solar-terrestrial data. The CDAW activity supported at NSSDC is open to the international community of scientists. With one third of its participants coming from outside the United States, CDAW 9 has involved nearly 150 scientists.

Over the last several years the NSSDC/WDC-A R&S and the WDC-B2 for Solar-Terrestrial Physics (in the U.S.S.R.) have begun to exchange data. Most of the data sets involved are in the area of solar-terrestrial and interplanetary physics.

This exchange of data has benefited both data centers and their associated scientists. The Soviet data is used in NSSDC's OMNI data, which are hourly solar wind field/plasma compilation. The OMNI data are used extensively by the international community of scientists. In addition to the exchange of spacecraft instrument data, geophysical software models are also being shared.

This overview makes apparent the fact that NSSDC's World Data Center activities encompass everything from data exchange among WDCs to support of a variety of international programs.

The NSSDC/World Data Center is open to visitors from all countries during normal working hours; however, advance notification is recommended. In 1989, the NSSDC had 18 foreign visitors, and in 1990,16 foreign visitors. In addition, visitors from the WDC-B2 and WDC-D (China) delegations visited the NSSDC/WDC-A R&S during the past year. These visits are extremely productive and informative, giving the staff insight as to how other World Data Centers operate and support the international scientific community.

James L. Green

NSSDC Will Accept VISA and MasterCard Payment for Data and Services

Effective September 30, 1991, orders for NSSDC data and services may be charged to a MasterCard or VISA card. When ordering, please include your account number, expiration date, telephone number, and your signature on the order form/letter. Checks or money orders, in U.S. dollars only and made payable to ST Systems Corporation, will continue to be accepted as payment. At a later date yet to be announced, charges to an American Express card may be acceptable. Please direct inquiries to the Coordinated Request and User Support Office, (301) 286-6695. Full mailing and electronic addresses as well as a FAX number are specified on the back page of this newsletter.

Heliospheric Trajectory Document Issued

NSSDC has issued a new document that contains graphical and numeric information on the trajectories of the fleet of spacecraft now exploring the vast reaches of the heliosphere. Spacecraft included are Ulysses, Galileo, Pioneers 10 and 11, Voyagers 1 and 2, ICE, Suisei, Sakigake, Giotto, Pioneer Venus, and the geocentric IMP 8. Trajectory information is given through 1999.

The document was created by R. Parthasarathy (ST Systems Corporation) and J. King. Please refer to the back page of this newsletter for ordering information.

An Overview of the NASA Climate Data System

The NCDS transitioned to an operational system in late 1988. It is an interactive, scientific information management system for locating, obtaining, manipulating, and displaying climate and oceanographic research data.

The NCDS consists of two major subsystems: Data Access and Common Data Format (CDF) Data Applications. The Data Access subsystem provides data descriptive information and access to both off-line and on-line data. The CDF Data Applications subsystem provides access to in-house tools for listing and subsetting CDFs, to the Interactive Data Language statistical package, and to the National Space Science Data Center's Graphics System.

More than 126 data sets are now offered to NCDS users through the Data Access subsystem. In addition, metadata are available for these data sets. NCDS directly supports the International Satellite Cloud Climatology Project (ISCCP) and serves as the First ISCCP Regional Experiment's (FIRE) Central Archive. The NCDS has recently incorporated a CD-ROM premastering facility. Currently, it is integrating the use of various media through its data management system.

Operations Professionals, *from p. 1*

cate within the scientific community to keep abreast of available scientific products and advanced technologies.

These and other activities are foundational to a data system. Without them the final product would not be available or would soon be obsolete. While software development is labor intensive, the on-going maintenance of a data system overshadows development costs.

Operational activities have more bearing on how the data system is perceived by the user community than is usually acknowledged. For example, the speed of service on requests, responsiveness to the data producers and various agencies, proper oversight of the data base, and effective quality assurance of data to be ingested—all of these factors affect the functionality of the system.

In the development and evolution of NCDS, much effort has been spent on interface designs, software development, hardware decisions, and associated technical or scientific problems. However, the NCDS staff also have stressed the importance of the less dramatic considerations of actually managing data, including their media, location, accessibility, and quality.

One of the greatest challenges is to allocate resources effectively to keep pace with the generation and reprocessing of these data. The tasks associated with efficient ingest and distribution of data are numerous and time-consuming. A unique skill mix is required for the operations professional. These skills require a thorough understanding of the entire system and its data, and problem-solving and communication skills that are not associated with the traditional operations or production employee.

Staffing decisions are crucial. Selecting qualified people who are willing to work in relative anonymity and who are committed to performing those nonglorious tasks that hold the data system together is no easy feat. Discarding presuppositions and carefully analyzing the role of the operations professional has resulted in better data management within the NCDS.

How NCDS physically archives data impacts its ability to service the user community. The media used to store data require careful analyses. Will the data be reprocessed? Will the volume of data remain constant? At what rate will the data volume grow? How can users best access the data? How long will the data remain valuable to researchers? Will the researcher want the data in native format? Should the data be located and formatted to allow the user to employ graphical and statistical tools to produce value-added climatologies? With so many options available—CD-ROM; optical disks; the wide variety of 9-track, cartridge, 8-mm, and digital audio tapes; electronic transfer of data; and other emerging technologies such as mass storage devices—the best choices are not always obvious. The archiving and distribution costs, both in dollars and work hours, associated with each medium need to be identified and examined.

The success and usefulness of a system can be measured by its ability to meet the needs of its user community. Good data management will enable the system to be flexible enough to change, grow, and fulfill those needs.

For more information about NCDS, please call the authors at (301) 286-3847, FTS 888-3847, or via Internet JOEB@NSSDCA.GSFC.NASA.GOV.

Joe Brown and Lola Olsen

Prototype for International Ultraviolet Explorer Query Expert System Undergoes Continual Enhancement

A prototype query system for the International Ultraviolet Explorer (IUE) catalog was developed in 1989 as a research project by the Intelligent Data Management (IDM) group.

This domain-independent expert system demonstrated the possibilities of two new techniques in spatial data management—first, the employment of spatial search techniques to generate a list of primary keys that fall within the spatial constraints of a query prior to invoking the Data Base Management System (DBMS); and second, the use of an expert system to map a broad set of queries into a smaller subset that can be handled by a commercial natural language processing system produced by Natural Language, Inc. (NLI).

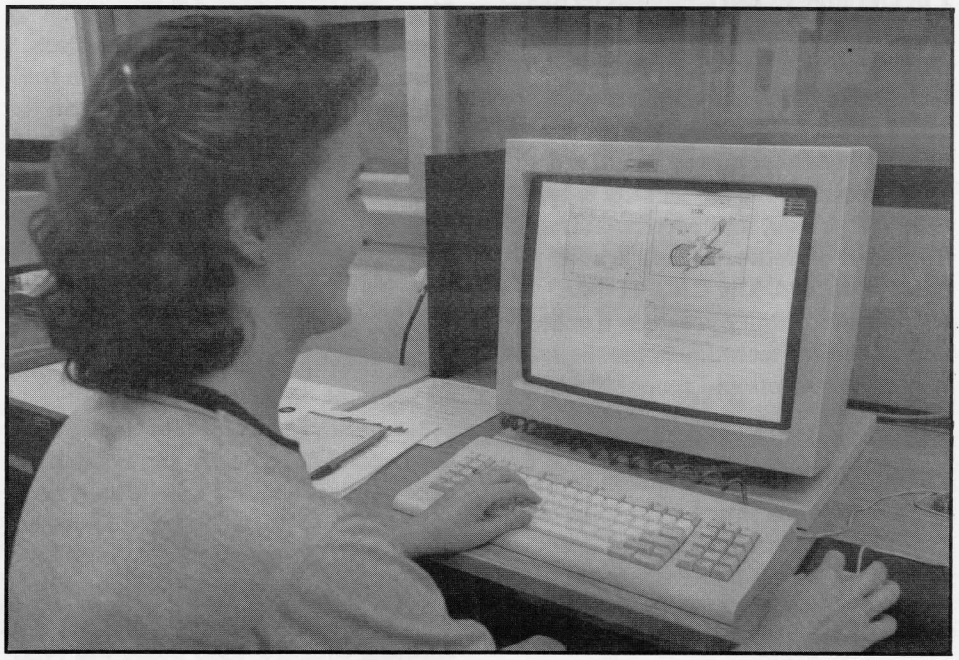


Photo: Alana Sharpe and Julie Perez

Coleen Horgan views query definition screen of the IUE query expert system. Screen shows region-selection module, natural language query line, and instrument information.

The IUE query expert system is composed of a graphical region-selection module, a spatial search module, the NLI product, and an expert-system front-end.

The region-selection module allows users to box regions of interest to simplify the process of specifying the location of desired images on a star map. It also graphically displays the locations of clusters and associations if the user selects them by name. (A version of the system also exists for users with VT100-type terminals.) This module supplies the coordinates of the selected region for inclusion in further query processing.

The spatial search module incorporates data structures and algorithms, which improve the performance of spatial searches. Recent work in spatial search techniques will be reviewed to identify improved data structures and algorithms, and the spatial search module may be revised or replaced to incorporate more efficient techniques. This module supplies a set of potential primary keys to restrict the scope of the query.

The NLI product constructs SQL queries from questions posed using the English language. This package interfaces with the Sybase data base of the IUE catalog by executing the SQL query against the subset of the data base defined by the set of primary keys supplied by the spatial search module. Since the NLI product is application-independent, a mapping between the vocabulary and phrases used by the IUE scientists and the structure of the data base must be defined to the NLI system so that it can construct the proper SQL query.

The expert system interface is made up of a domain-independent inference engine and a domain-specific rule base that enables questions that are too specific to be transformed into more general questions for which the information resides in the IUE catalog. An explanation can be supplied to assist a user whenever a query is recast.

The prototype query expert system for the IUE has been continually revised and enhanced. It handles selected queries against a subset of IUE's 87,000 records of metadata on a Sun 3 UNIX workstation. The prototype was developed in Suntools, C, C++, and Lisp; as preparation for porting the system, the Suntools interface has been rewritten using X Windows. The intent is to convert the system to C or C++ (both options are currently being considered), incorporating the Motif look.

The system is now being ported to the NSSDC Data Archive and Distribution System (NDADS), a VAX 6410 running VMS, where it will handle an increased number of queries against the entire IUE catalog. If successful, the system is slated to become part of the operational IUE system.

Coleen Horgan

Utility CRUSHes Data

Do you find yourself repeatedly dealing with the problem of insufficient disk space? Or perhaps you find that transferring files across a network takes much longer than you would like. With data compression, the disk space required for file storage is typically cut in half, and correspondingly, the speed of network transfers for files is doubled. The CRUSH data compression utility provides a collection of several techniques for the lossless compression and reconstruction of data files.

CRUSH provides an extension to the UNIX Compress program and the various VMS implementations of Compress with which many users are familiar. For users already using Compress, CRUSH provides full compatibility. CRUSH offers additional compression techniques with an option that automatically selects the technique that provides the best compression for a given data file. This provides the user with newer compression techniques that may provide better performance, without necessarily requiring the user to determine which technique works best.

The CRUSH software is written in C and is designed to run on both VMS and UNIX systems. Compressed VMS files will regain their full file attributes upon decompression and, thus, should be indistinguishable from the original files. Compressed files can also be transferred between VMS and UNIX systems and therefore be decompressed on a different system than that on which they were compressed.

To save disk space, a user may compress individual files or use wildcarded filename specifications to compress multiple files. When the files are needed once again, they may be decompressed either individually or once again using wildcarded filename selections. Compressed files may be transferred across a network and reconstructed on a remote machine running CRUSH. VMS users will even be able to store compressed files on a UNIX machine and restore them on a VMS machine.

CRUSH was developed for the NSI as a result of requests from the NSI Users Working Group. The intent is to provide a collection of the best available data compression algorithms in a straightforward, easy-to-use program. The future development of CRUSH will depend heavily upon feedback from the user community to identify which new features and capabilities are desired. Since the performance of the algorithms depends on the type of data compressed (and there is a wide variety of data among users), it will also be very important for users to report the effectiveness of the algorithms on the types of data they have. With this information, CRUSH developers can include techniques that improve performance for particular types of data. CRUSH will also evolve as advances are made in the state of the art of data compression; as superior compression techniques are developed, they will be incorporated into the CRUSH package.

CRUSH is available from the NSI Network Information Center (NSINIC.GSFC.NASA.GOV). It has been developed as part of the research of data compression techniques for the Configurable High-Rate Processor project at NASA Goddard Space Flight Center. Edward Seiler of ST Systems Corporation developed the software and can be contacted via E-mail at SEILER@ AMARNA.GSFC.NASA.GOV on Internet or at AMARNA::SEILER on DECnet.

Edward Seiler

Digitized Skylab Images Arrive at NSSDC

NSSDC has acquired digitized versions of the solar images from the Skylab S-054 X-ray telescope. The images are 512 x 512-pixel arrays, produced by scanning the original photographic film with a microdensitometer. These digital versions of the images are far easier to access, manipulate, and analyze than the original photographic products, using today's image display technology. The images are available for distribution to solar researchers through NSSDC's standard data request channels. The historical and scientific importance of these images is extreme. Obtained with the Apollo Telescope Mount aboard the Skylab space station from 1973 to 1974, the images show the structure of the two-million-degree corona of the Sun as well as transient phenomena such as solar flares. The S-054 X-ray telescope, built by American Science & Engineering (AS&E), revealed—at unprecedented angular resolution (a few arc seconds)—coronal structure invisible from the ground; the observing program accumulated a record of the evolution in the corona on timescales from minutes to months. The synoptic record of solar coronal structure provided by these images has enabled researchers to discover trends in the lives of solar active regions, X-ray bright points, coronal streamers, and other solar wind structures as well as the evolution of the solar magnetic field over an eight-month interval.

Originally, these images were acquired in orbit on photographic film and were processed by printing slides and paper images. (A popular movie was produced from selected images, showing the rotation of the glowing corona to dramatic effect.) Years later, the microdensitometer scans of

see Digital Skylab Images, *p. 7*

NSSDC Delivers Large Microfiche Batch for SMM Scientists

NSSDC recently produced 79 copies of a 1023-microfiche-card data collection. This microfiche collection served as a compact and easily-accessible resource for browsing Solar Maximum Mission (SMM) data on solar flares and cosmic gamma ray bursts. The flares and bursts were recorded with the Hard X-Ray Burst Spectrometer (HXRBS), operated throughout SMM's ten-year mission by a research team headed by Dr. Brian R. Dennis. Dr. Dennis requested the production of these microfiche to bring the data collection up to date and to fill requests from 79 solar physicists interested in conducting further SMM research.

Why is NSSDC still supporting the microfiche archive medium, when the trend is moving away from photographic type archives toward digital systems?

The SMM/HXRBS product illustrates the answer to that question. The HXRBS instrument collected measurements of hard X-ray radiation in the 30-300 keV spectral range and identified the radiation as solar/nonsolar in origin. In performing a study of HXRBS data, a scientist begins with event selection. The time-intensity plot of each observed burst event (total events numbering over 12,000) is recorded on a microfiche card. The scientist decides what type of solar flares or cosmic bursts are of interest, selecting according to the type of time behavior (short or long duration; rapid or slow dynamics) or time of occurrence within an interval when additional observations from other instrumentation are available. For this selection process, it is most convenient to be able to quickly browse large numbers of time-intensity plots—a simple task with microfiche cards and a viewer.

When the HXRBS team evaluated different technologies for producing such a browse data product, no other means could fill the need at such a low cost. Photography remains a superior medium in terms of convenience in image storage and retrieval for certain important applications. Thus, the continued use of microfiche data storage is well demonstrated through the SMM data product.

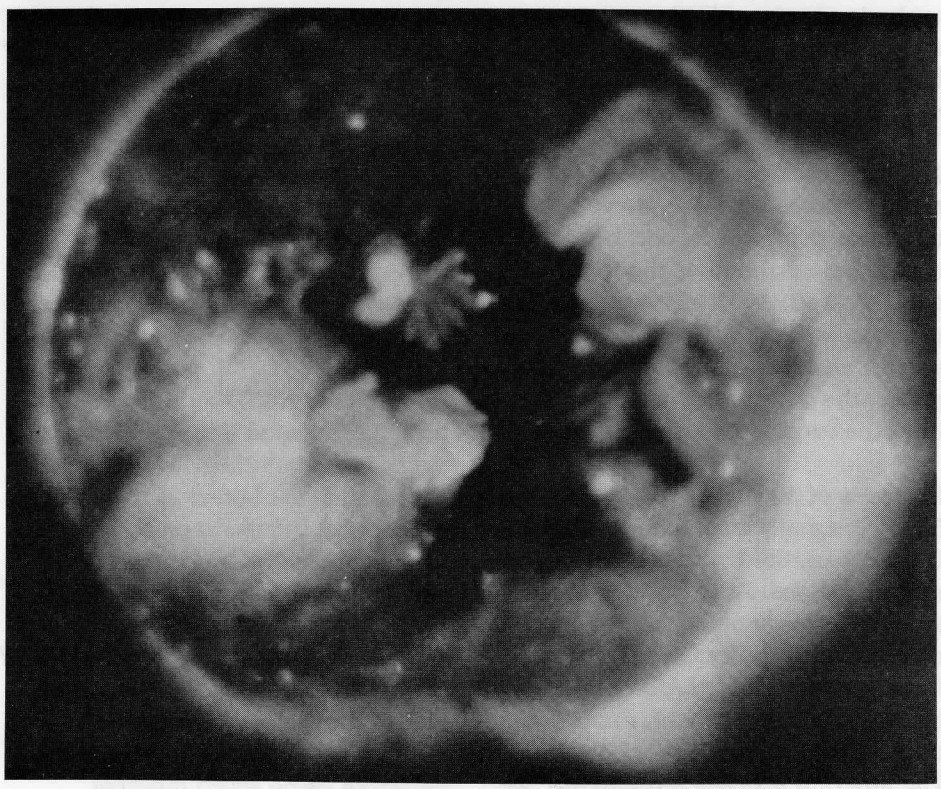
David Batchelor

Digital Skylab Images, *from p. 6*

the original film were made by AS&E researchers and stored there on magnetic tapes. NSSDC has recently acquired the tapes from AS&E and migrated the data to new tape cartridges. Because of the importance of the images and the enhanced convenience in analyzing them quantitatively with modern computers and image display technology, NSSDC plans to place the S-054 images in on-line access via the NSSDC Data Archive and Distribution System (NDADS).

Solar researchers are invited to make use of these data for studies of the Sun going back to the S-054 observing interval (May 14, 1973, to February 8, 1974) for comparisons with more recent rocket and spacecraft observations, for testing software to be used in future missions (e.g., SOHO, OSL), or for educational purposes. The images can now be used even by PC users with graphics adapters that can accommodate 512 x 512 images.

David Batchelor



Skylab soft x-ray photograph of the Sun showing complex structure of solar corona as it appeared on June 1, 1973. A huge, dark coronal hole runs from the North Pole down across the equator. —Courtesy of G. S. Vaiana and NASA

Keeping in STEP: NSSDC Plays Major Role

Over the period 1975-1982, NSSDC was a major contributor to the Scientific Committee on Solar-Terrestrial Physics' (SCOSTEP) International Magnetospheric Study (IMS) program. The Satellite Situation Center (SSC) and the Coordinated Data Analysis Workshop (CDAW) system were developed to support the operational and data analysis phases of the IMS, respectively.

Both systems remain as staples at NSSDC. In part as a follow-on to the IMS, SCOSTEP has a subsequent international program for the decade of the 90s known as the Solar-Terrestrial Energy Program (STEP). STEP is intended to study the generation of mass and energy at the Sun and their storage in and transfer through the various regions of space down to the Earth's surface. In contrast to the IMS, which clearly focused on magnetospheric physics, STEP encompasses a much wider range of disciplines from solar to atmospheric physics and everything in between.

The operational period of STEP is nominally 1990-1995. However, the inevitable delays in certain key spacecraft missions, such as the International Solar-Terrestrial Physics (ISTP) program, will probably result in a two-year extension; with the data analysis phase, the overall program will last until the turn of the century.

In excess of 30 countries participate in STEP, the major members being the U.S., Japan, the U.S.S.R., and the European nations. At the international level STEP has a steering committee currently chaired by Gordon Rostoker from the University of Alberta and an international coordinator, Juan Roederer from the University of Alaska. The program is organized into five science working groups and one informatics working group, which are subdivided into 23 projects each with project leaders and comprehensive international science teams. Through James Green and Joseph King, NSSDC already plays a major role in the informatics area. Many nations, the U.S. included, have national steering committees and coordinators intended to support the national science communities in meeting the overall and project objectives of STEP. The U.S. committee is chaired by Don Williams of the Johns Hopkins University (JHU)/Applied Physics Laboratory (APL), and the U.S. coordinator is Michael Teague, who is co-located with NSSDC in Building 26 at Goddard Space Flight Center.

As with the IMS, NSSDC is playing a major role in STEP, a role that will increase significantly as the ISTP era begins. NSSDC has its own role in STEP in addition to providing extensive support to the coordination office. Joseph King and Nathan James have developed the STEP Bulletin Board, a major communication mechanism for the portion of the STEP community that can access the NODIS account at NSSDC. (Try option 12 from the NODIS main menu.) The NSSDC Bulletin Board system probably will be installed in Japan, Europe, and the Soviet Union in order to expedite international STEP communications.

A number of NSSDC staff members have participated in a significant exercise to update the STEP personnel information contained in the IRAND file; several thousand updates have been made in the last two months, and the number of E-mail addresses contained in the file has increased significantly. Shortly, a new version of PIMS will contain an E-mail syntax matrix that will explain the nuances of communicating among some 30 networks using seven different protocols.

The U.S. STEP Coordination Office produces the *U.S. STEP Newsletter* on a bi-monthly basis, but not without the invaluable assistance of Len Blasso and his publications group at NSSDC, who are responsible for the newsletter design, layout, editing, and production. Judging from the increased circulation in response to requests, the newsletter is a success—a clear tribute to the aesthetic talents of NSSDC staff.

The future NSSDC role is impressive indeed, not only in the perennial SSC and CDAW areas but also in newer areas such as common data formats through the NSSDC/NASA OSSA Office of Standards and Technology (NOST). Extensive work has been done with the SSC system in recent years, and the current codes will shortly be transferred to the ISTP/Global Geospace Science (GGS) project and will be the basis for the Science Planning and Operations Facility to be used for scheduling the GGS spacecraft.

The SSC is already supporting the STEP community directly by processing requests from some of the STEP projects, and Sardi Parthasarthy and Robert McGuire have started a series of articles in the *U.S. STEP Newsletter* on the positions of STEP spacecraft over the 1990 to 1995 (and beyond) time period.

The CDAW system pioneered coordinated data analysis, and NSSDC's experience will soon be applied to developing and operating an interactive data analysis system on behalf of the GGS project—hopefully, a not-too-distant cousin of the current CDAW system.

Through NOST, NSSDC has also pioneered common data formats, and Donald Sawyer is working extensively with the U.S. STEP Coordination Office to establish a STEP standards position within NOST. Such a position

see NSSDC in STEP, *p. 9*

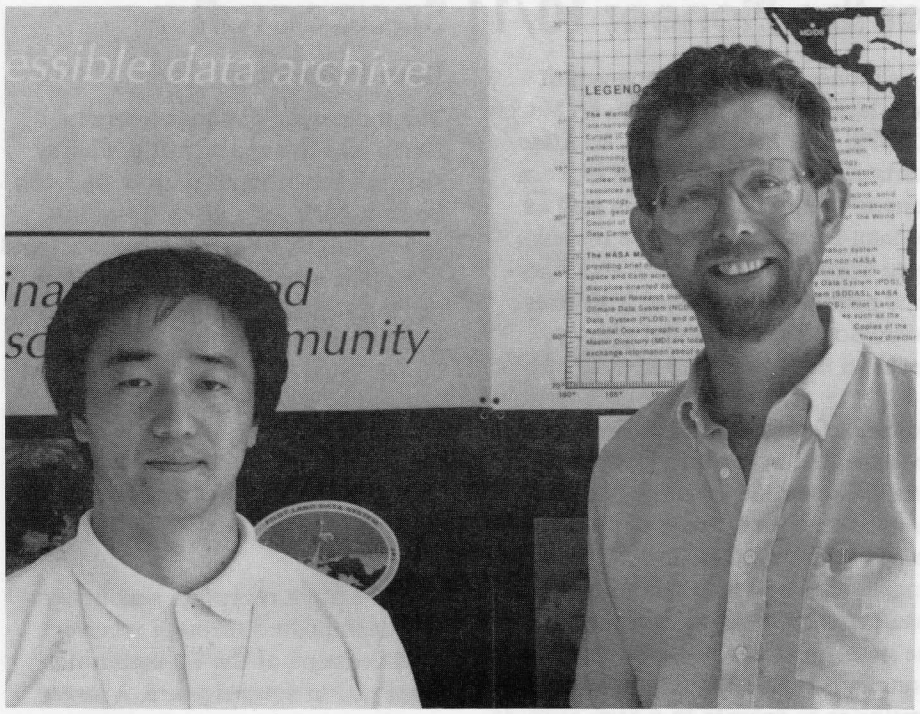
Visiting Scientist Dr. Omura Studies Plasma Waves at NSSDC

Since its inception, the visiting scientist program sponsored by the NSSDC has brought to the data center a great number of talented people. That number was increased by one on July 1, 1991, with the arrival of Dr. Yoshiharu Omura from Japan.

During his tenure at NSSDC, Dr. Omura has been working as a research associate with Dr. James Green, director of NSSDC, and Omura will continue in this capacity for a year before returning to Japan. His research proposal is entitled *Magnetotail Plasma Wave Research by Combined MHD Simulation and Ray-Tracing*. Specifically, Dr. Omura has been studying ray-tracing techniques, which will model the propagation of plasma waves in the Earth's magnetotail. The magnetotail is the wake created by the Earth as its magnetosphere passes through the solar wind.

Omura studies plasma waves by developing computer models that run on a CRAY supercomputer and simulate the magnetotail. Omura says that previously he had worked only with numerical models and simulated data, and he welcomes the opportunity to work with real, satellite-gathered data at Goddard.

While he is here, Dr. Omura serves as a liaison between Japanese and U.S. officials in the development of the GEOTAIL satellite, a joint Japanese-U.S. project. GEOTAIL's purpose is to gather data on the behavior of the magnetotail.



Dr. Yoshiharu Omura, visiting research associate, posed recently with Dr. James Green, NSSDC director.

Dr. Omura is currently on leave from his position as an associate professor at the Radio Atmospheric Science Center of Kyoto University, where he received his scientific education. So far in his career, Professor Omura has published widely in journals such as the *Journal of Geophysical Research, Geophysical Research Letters,* and *Radio Science.*

Omura earned all of his degrees in the field of electrical engineering from Kyoto University—his Doctorate in 1985, his Master's in 1982, and his Bachelor's in 1980. Dr. Omura's doctoral dissertation is entitled *Study on Nonlinear Wave-Particle Interaction in Space Plasma via Computer Simulations.*

In his spare time Yoshiharu Omura enjoys doing things with his family, who are temporarily residing in Greenbelt, Maryland. He and his wife particularly enjoy taking their two sons (ages seven and two) on hikes. In addition, Dr. Omura practices the martial art of "Shorinji kempo," for which, he says, the English translation is "Shorin Temple Boxing."

NSSDC staff will gain much from the experience of knowing and working with Omura, and Kyoto University will benefit from the return of a more experienced scientist in a year. Dr. Omura's work with NSSDC is a classic example of how international cooperation profits everyone involved.

Kenneth Silberman

NSSDC in STEP, *from p. 8*

will be used to support the U.S. science community, particularly the GGS community, in adopting and using common data formats. The GGS project has already adopted the Common Data Format (CDF) scheme for its important key parameter data set.

The future role is, of course, a function of funding considerations, but hopefully, NSSDC, STEP, and the coordination office can continue to work together to ensure a progressive future for all concerned. Thank you, NSSDC, for your support of STEP and my office.

Michael Teague

Mission, Experiment, and Data Set Status for the Pioneer 10/11 Spacecraft

The Pioneer 10 and 11 spacecraft were launched, respectively, on March 3, 1972, and April 6, 1973, by Atlas/Centaur rockets for the first explorations of the outer planets as well as for long-term investigations of magnetic fields, solar wind plasma, energetic particles, ultraviolet (UV) emissions, dust particles, and gravity waves in interplanetary space.

Pioneer experiments have been and are expected to continue providing data for scientific investigations for many more years. Some of the Pioneer data sets archived at NSSDC cover the longest time spans in the center's data catalogs, even as compared to the highly successful IMP 8 mission launched on October 26, 1973, which continues to operate in a high altitude Earth orbit.

Trajectory

Pioneer 10 encountered Jupiter on December 4, 1973, and thereafter followed an escape trajectory out of the solar system; it reached a radial distance of 50 AU from the Sun on September 23, 1990, and is now moving outwards at about 2.4 AU per year near the Ecliptic plane. Pioneer 11 followed with a Jovian encounter on December 3, 1973, and a flyby of Saturn on September 1, 1979, after which it flew out of the Ecliptic plane, reached a radial distance of 33 AU as of spring 1991, and is also now moving outward at 2.4 AU per year.

Pioneer 10's escape trajectory is directed towards the tail region of the heliosphere, the magnetic "bubble" surrounding the Sun within the local interstellar medium. Pioneer 11 is moving in the anti-tailward direction towards a possible heliospheric bow shock region where the high speed solar wind transitions into the slower moving interstellar gas.

Data Telemetry

The increasing distance between Earth and the spacecraft gradually reduces the amount of data that can be sent back for a given downlink power output from the spacecraft and reception sensitivity at the Earth receiving stations. The current downlink bit rates available through the largest receiving antenna dishes (70 meters) in NASA's Deep Space Network (DSN) are 16 bps for Pioneer 10 and 64 bps for Pioneer 11, roughly proportional to the inverse square of the radial distance from Earth.

The downlink reception sensitivity will be improved through receiver modifications at the 70-meter stations within several years. A larger problem is the limited availability through 1995 of the larger dishes to monitor the Pioneers, caused by heavy loads on the DSN by other NASA missions in that time frame when Pioneer will receive only about 50 percent of tracking time requested to fulfill scientific goals. That is to say, each Pioneer was getting an average tracking time of 10 to 13 hours per day in 1988-1989, but these times have declined to four to eight hours per day as of 1991. The coverage problem becomes significantly less severe for Pioneer 10 after 1995, while Pioneer 11 tracking after 1993-1994 is not anticipated because of declining spacecraft power levels as discussed below.

Both spacecraft suffer from problems affecting determination of pointing attitude, which is required to maintain continuous communication links with Earth-based DSN stations. Anomalous changes in the Pioneer 10 spin deceleration rate have complicated predictive modeling of the spin phase, while transmitter-receiver limitations at both spacecraft now preclude accurate measurements of the spin phase. The Imaging Photopolarimeter (IPP) experiments on both spacecraft are being used as backup attitude references by measurements of known stars. Current spin periods are 13.44 seconds for Pioneer 10 and 7.24 seconds for Pioneer 11. Low telemetry rates at the 16 bps level preclude normal sampling of directional intensity distributions by some instruments.

Pioneer 11 has the further problem that only one uplink receiver (A) is operable (Receiver B failed on October 6, 1990), and even that one cannot receive signals through the spacecraft's high gain antenna. However, recent DSN tests indicate that all uplink commands are executed at ground transmitter power levels above 190 kW by using the medium gain antenna. At nominal power levels of 300 kW, an acceptable uplink safety margin for Pioneer 11 will be maintained for the next two to three years. In comparison the 34-meter DSN transmitting stations will be adequate to maintain Pioneer 10's uplink margin through the end of the present decade.

Tracking with Arecibo

A recent Pioneer Program Steering Group (PSG) meeting in San Juan, Puerto Rico, addressed the technical feasibility and potential science data returns from supplementing DSN tracking of the Pioneer spacecraft with the Arecibo 1000-foot radio telescope. This facility has the largest collecting area in the world (20 acres!) for radio astronomy at centimeter wavelengths. Dedicated line-feed antennae provide directional sensitivity to celestial sources within 20 degrees of the vertical reflector axis and thereby support up to two hours of tracking time per day for celestial sources. Each line feed is tuned to receive narrow bandwidth signals within the sensitive range of 50 MHz to 5 GHz. The 2292-MHz downlink signal from

see Pioneer 10 & 11, *p. 11*

Pioneer 10 & 11, *from p. 10*

Pioneer could probably be accommodated with an existing line feed. Arecibo could not, however, support the uplink frequency of 2110 MHz. A wide-band Gregorian feed system has been tested at Arecibo, and the telescope will be fully upgraded with this system by 1993 for continuous frequency coverage in the 0.3-8 GHz range with an order of magnitude greater sensitivity.

Usage of Arecibo for Pioneer tracking is currently under study by the Pioneer Project Office at the NASA Ames Research Center and by DSN engineers at NASA's Jet Propulsion Laboratory. Arecibo could provide valuable backup telemetry capability for Pioneer 10 prior to DSN receiver upgrades by 1995 and until lighter NASA mission tracking requirements after 1995 alleviate the DSN loading problem. Supplementary tracking would be useful in the search for the postulated heliospheric boundary, the "heliopause," and for provision of high-rate telemetry data to improve temporal resolution and directional sensitivity of some measurements. Unfortunately, the Arecibo support would most likely be limited to a few hundred hours per year (e.g., one-to-two two-hour tracks per week on the average) to limit interference with other observing programs.

Spacecraft Power Lifetime

More serious limitations on the productive scientific lifetimes of the Pioneer spacecraft missions are the declining output levels in the Radioisotope Thermoelectric Generators (RTGs), which supply electrical power via thermoelectric conversion of heat from radioactive decay. Plans for sharing power among the various scientific experiments have already been implemented on both spacecraft. On

see Pioneer 10 & 11, *p. 12*

Pioneer Cruise Data Sets in the NSSDC Digital Tape Archive

Exper.	Data Sets	Time Intervals	
PA	*Full History, Solar Wind Protons*	*4/72 - 12/86*	*4/73 - 5/86*
	Hr. Avg. Solar Wind Protons & Moments	*4/72 - 12/86*	*4/73 - 4/86*
	Daily Avg. Solar Wind Proton & Moments	*4/72 - 11/86*	*4/73 - 5/86*
TRD	*24-Hr. Inhomog. Compressed IP Summary*	*3/72 - 12/88*	*4/73 - 12/88*
UV	*EUV EDR Photo Emission Data*	*3/72 - 12/89*	*4/73 - 12/89*
CRT	*6-Hr. Averaged Interplanetary Data*	*3/72 - 12/90*	*4/73 - 12/90*
CPI	*Pulse Height Analysis Data*	*3/72 - 12/89*	*4/73 - 12/90*
	5-Min. Avg. Count Rates	*3/72 - 12/89*	*4/73 - 12/89*
HVM	*1-Min., Hourly, Daily Avg. Cruise*	*2/72 - 11/75*	*4/73 - 12/86*
GTT	*One-Hour Cruise Averages*	*3/72 - 3/88*	*4/73 - 3/88*
	24-Hr. Corrected Count Rates	*3/72 - 3/88*	*4/73 - 3/88*

Pioneer 10 & 11, *from p. 11*

Pioneer 10 some experiments would have only partial coverage in 1992 and only one experiment would be active at the anticipated time of power dropout in mid-1998. Power sharing on Pioneer 11 began in 1990, and only one experiment would be operative until dropout in early 1993. Although the current power sharing plans call for month-by-month rotation of observations by different instruments, the Pioneer experimenters have requested changes to a week-by-week rotation plan that would allow more frequent but shorter observation periods.

Experiment Status

The operative science experiments on one or both spacecraft currently consist of the Helium Vector Magnetometer (HVM), Plasma Analyzer (PA), Charged Particle Instrument (CPI), Cosmic Ray Telescope (CRT), Geiger Tube Telescope (GTT), Trapped Radiation Detector (TRD), the Ultraviolet Spectrometer (UV), and the Imaging Photopolarimeter (IPP), where the latter is now used only for backup determination of spacecraft attitude. The magnetometer on Pioneer 10 failed in November of 1975 and was turned off in June of 1986. The plasma analyzer on Pioneer 10 experienced a partial failure of voltage indicators on February 20, 1990, which affected solar wind density and pressure measurements but which may be correctable in the data reduction software. Some energetic particle detectors in the CPI experiment suffered from temporary radiation damage effects during the Jovian encounters but have performed well since then. The UV instrument team reports transient noise spikes in their Pioneer 10 instrument from late 1989 and onward. These spikes are related to instrument power cycling and can be corrected for in data processing software.

NSSDC Catalogs and Data Inventory

The current NSSDC inventories for Pioneer data sets are described in the on-line Master Directory, which can be accessed on DECnet/NSI via the NSSDCA::NODIS public account. An updated list of cruise data sets from Pioneer 10 and 11 is shown in the table on page 11. More detailed descriptions of missions, experiments, and data sets from Pioneer and other heliospheric spacecraft are given in the following NSSDC publications:

R. Horowitz, J. E. Jackson, and W. S. Cameron, *Data Catalog Series for Space Science and Applications Flight Missions, Volume 1B, Descriptions of Data Sets from Planetary and Heliocentric Spacecraft and Investigations*, NSSDC/WDC-A-R&S 87-03, 1987.

W. S. Cameron and R. W. Vostreys, *Data Catalog Series for Space Science and Applications Flight Missions, Volume 1A, Descriptions of Planetary and Heliocentric Spacecraft and Investigations*, NSSDC/WDC-A-R&S 88-07, 1988.

The heliospheric spacecraft trajectories have been described and plotted in two other publications:

R. Parthasarathy, H. K. Hills, D. A. Couzens, and J. H. King, *Trajectories of Pioneers 6-11, Helios A and B, and Voyagers 1 and 2*, NSSDC/WDC-A-R&S 86-03, 1986.

R. Parthasarathy and J. H. King, *Trajectories of Inner and Outer Heliospheric Spacecraft, Predicted Through 1999*, NSSDC/WDC-A-R&S 91-08, 1991.

Other information on NSSDC data catalogs and archived data can be obtained through the NSSDC Coordinated Request and User Support Office (CRUSO) at (301) 286-6695 (FAX [301] 286-4952) or NCF::REQUEST.

The HELIO and COHO On-Line Data Bases

As part of NASA's planned Coordinated Heliospheric Observations (COHO) Program the trajectory and hourly average data for the magnetometer, plasma, and selected energetic particle experiments are being made available on line from NSSDC via the NASA Science Internet (NSI, formerly SPAN) network in two public access directories. The directory

NSSDCA::ANON_DIR:[ACTIVE.HELIO]

currently contains files and associated software for reading selected pre-1989 trajectory points and post-1989 predictions through 1999, whereas

NSSDCA::ANON_DIR:[COHO]

contains hourly data for some experiment data sets currently archived at NSSDC. The COHO directory files BIBLIOGRAPHY.TXT and DATASETS.TXT, respectively, give current bibliographic and data set information for Pioneer and other heliospheric missions, while hourly average data for magnetic field and plasma experiments will be found in the different COHO subdirectories for each spacecraft and experiment. The Standard Formatted Data Unit (SFDU) subdirectory will contain registered versions of current metadata descriptions in SFDU format for Pioneer data sets that are currently being updated and more fully documented. Sardi Parthasarathy ([301] 286-8105) and John Cooper ([301] 513-1668), both at NSSDC, can be contacted for more information on the HELIO and COHO data bases, respectively.

John Cooper

Attendees at recent Seventh Catalog Interoperability Workshop assemble on steps of legislative building in Annapolis, Maryland.

Seventh Catalog Interoperability Workshop Held

The seventh in a series of semiannual workshops promoting an effective Master Directory (MD) of Earth and space science data as well as interoperability among directories and catalogs was held in Annapolis, Maryland, on May 13–17, 1991. This workshop, organized and hosted by NSSDC, was attended by 125 persons representing various federal agencies (the Environmental Protection Agency [EPA], NASA, the National Oceanographic and Atmospheric Administration [NOAA], the Department of Interior), universities, research institutes, and government contractors. In addition, representatives from six foreign countries attended the workshop. The Seventh Catalog Interoperability Workshop (CI7) reports are available from NSSDC (see the back page of this newsletter for the address).

The first two days were primarily dedicated to status reports on current activities within the multi-discipline NASA Master Directory (presently the same as the multi-agency Global Change Master Directory), Catalog Interoperability thrusts of the NSSDC MD team, and related activities being pursued within the Earth Observing System Data Information System (EOSDIS) community at the Jet Propulsion Laboratory (JPL) and elsewhere.

The Catalog Interoperability Advisory Group, led by Dr. Ray Walker (UCLA) and consisting of several persons from the NASA-funded research community and other U.S. agencies, reported pleasure at the significant progress the effort has made. The group offered suggestions for evolving the effort to best satisfy the needs of scientists searching for data relevant to their research areas.

The final three days of the workshop featured five technical panels addressing the following: system architecture building blocks, user interfaces, network access, results objects integration, and inventory-level spatial search techniques. These sessions combined academic, leading-edge concepts discussions and presentations on various extant systems using advanced techniques. (Detailed descriptions of the agendas to be followed for technical sessions appeared in the Winter 1990 issue of the *NSSDC News*).

The Eighth Catalog Interoperability Workshop (CI8) is being planned for the week of November 18, 1991. Technical sessions will again represent a major part of the workshop. Suggestions for topics and chairpersons are welcome; please forward them to James Thieman of GSFC, Code 933, at (301) 286-9790.

Joy Beier and James Thieman

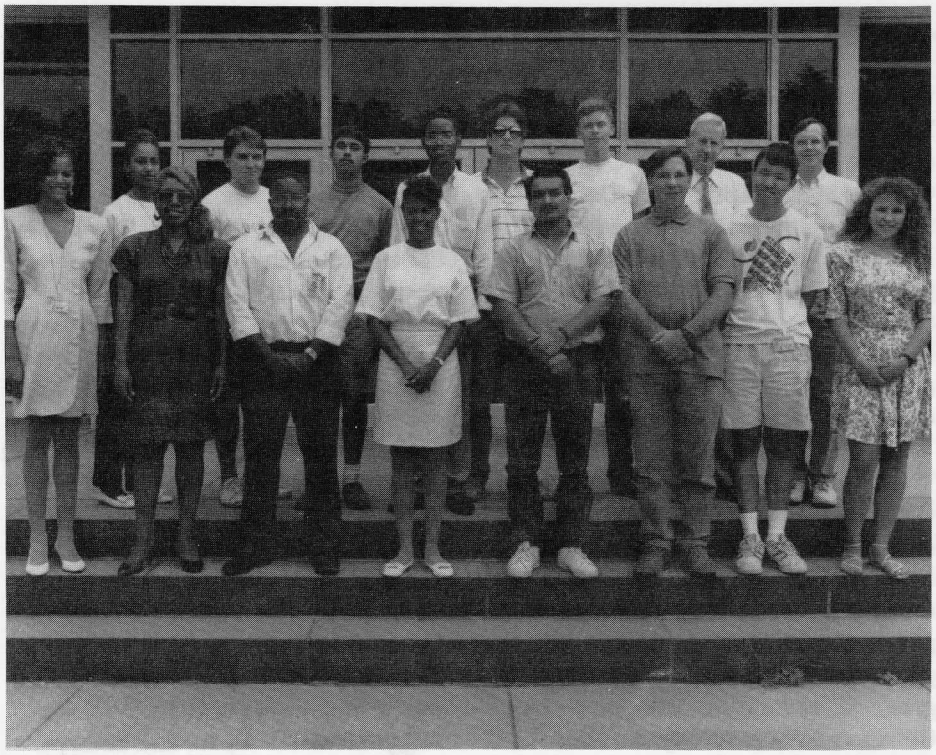
Summer Students Discover Their Future as Scientists

Every summer students compete for the opportunity to work and learn in the real-life classroom of the NSSDC. The data center's summer students are primarily drawn from the Space Data and Computing Division's (SDCD) Visiting Student Enrichment Program (VSEP). NSSDC's Nathan James is the SDCD's coordinator for the summer student program, which runs for a ten-week period from early June to early August.

While at the data center, students work with world-class computer and archive scientists on state-of-the-art computers, including CRAY supercomputers. They also attend a lecture series that features a different staff scientist each week. Participants must give both a written and an oral final report on their achievements during the summer.

Students are kept busy working on challenging projects in areas such as neural networks, artificial intelligence, communications networking, graphics software development, and applications for large data center programs such as the Pilot Land Data System and NASA Climate Data System. The lecture series covers a variety of fields such as biological systems simulation, remote sensing, graphics workstations, the Earth Observing System, and the computer's role in making movies.

This year's students, like their predecessors, have proven to be bright and enthusiastic. Repeatedly they have stated that they find their work both enriching and exciting. Staff scientists have praised the positive and significant contributions of the 1991 VSEP class.



Summer 1991 VSEP students at NSSDC. Bottom left to right: Alana Sharps, Valerie Thomas, Reginald Bush, Erelethera Smith, Rajendra Kulkarni, Tim Kovsky, Kevin Yeh, Julie Perez. Top left to right: Raemeka Gant, Eric Bachran, Manoj Kasichainula, Nathan James, Chuch Higgins, Mark Birmingham, Owen Storey, Dwight Macomber

The next generation of scientists is off to a superb start. Using VSEP as their vehicle, the SDCD and the data center are encouraging the development of young scientific talent, thus helping to train tomorrow's scientists.

Kenneth Silberman

Data Archives Grow

NSSDC routinely receives data from many sources. These data may arrive in the form of magnetic tape, optical disk, floppy disk, CD-ROM, or electronically on film, as hard copy, or in photographic form.

Over the last several years, the data center has received an average of 3,000 to 5,000 tapes each year. NSSDC's total archive now contains approximately 100,000 tapes; the optical disk inventory of data is approaching 200, with floppy disks numbering about half that amount. The number of unique CD-ROMs is currently about 42.

The processing of the machine-sensible data is done by using the MODCOMP, VAX, IBM, Aquidneck, and PC computers. Routine processing of the data usually involves making duplicate copies of the media and verifying the format and information contained in the documentation. The data are tracked by NSSDC's Interactive Data Archive file and various other inventory files.

In the future, the more traditional forms of media gradually will be replaced with the higher-storage-capacity forms, such as CD-ROM and optical disks. Currently, however, the standard open-reel magnetic and square tape still appears to be a popular form of archival media.

Ralph Post

ROSAT MIPS and Planning Team Respond as Observation Program Evolves

The ROSAT Mission Information and Planning System (MIPS) provides a significant service in support of potential ROSAT guest observers. The second NASA Research Announcement (NRA) asking for proposals for observing time on the U.S.-West German Roentgen Satellite (ROSAT) was distributed by NASA Headquarters in January for a proposal period of February 1-April 5, 1991.

MIPS is an on-line information retrieval system devised for ROSAT guest observers. A primary task of MIPS is to assist guest observers in the development of pointed observation proposals for ROSAT. MIPS is both command- and menu-driven and allows users access to the mission timeline schedules, tools such as an observing time calculation program and ROSAT viewing window program, and to the ROSAT Bulletin Board. During the period of February 1 to April 5 this year, 194 users logged into MIPS. Users accessed MIPS 1373 times during this two-month period.

After the first NRA period in 1989, the ROSAT mission planning team reevaluated and redesigned the MIPS software to provide better support for the second ROSAT NRA. Some of these improvements include new software to allow users to access the mission timeline and a new command mode version of MIPS to allow experienced users to bypass the menu system. The interface to the observing time program has also been improved in response to user comments and requests. MIPS resides on a dedicated MicroVAX II and is accessible via NSI-DECnet, NSI-TCP/IP, and PSI. The ROSAT mission planning team consists of programmers from ST Systems Corporation and the Center for Astrophysics at the Smithsonian Astrophysical Observatory (SAO).

ROSAT Team Provides Proposal Support

In response to the NASA Research Announcement 2 (NRA-2) for the ROSAT Guest Observer Program, the ROSAT Mission Planning team received 405 proposals from NASA Headquarters (Code SZ) on April 9, 1991. Specific information concerning the proposal, particularly potential ROSAT targets of observation, needed to be entered into the ROSAT mission planning data base. The team responded to this challenge and entered the significant information into the data base on the Mission Information and Planning System MicroVAX of the U.S. ROSAT Science Data Center by April 17, despite a major hardware failure on April 8. Copies of this information were sent to all ROSAT NRA-2 proposers, who then contacted the staff with corrections. In support of the ROSAT review, numerous reports were prepared for the benefit of the review panels. These reports included printouts containing target conflicts, comparisons of proposed targets with Imaging Proportional Counter (IPC) and Channel Multiplier Array (CMA) catalogs, and summaries of the initial six-month program.

The mission planning staff also provided support to the ROSAT proposal review held in Seattle, Washington, May 30-June 2, 1991. Results from the review including target priorities were keyed into the system in real time during the review meeting. Based on the information in the data base, reports were generated providing the panel chairmen statistics on the 405 proposals. The chairmen were then able to determine where to change priorities and how to assess the status of the review. Following the review, final changes were made to the data base and the approved U.S. ROSAT proposals were sent to the ROSAT International Users Committee (IUC). The IUC merged the U.S. proposals with the proposals from Germany and the United Kingdom in order to facilitate the development of the international ROSAT mission timeline.

ROSAT Meeting Determines Data Processing Status

A ROSAT data center meeting was held June 17–18, 1991, at the Max Planck Institute for Extraterrestrial Physics (MPE) in Munich. The purpose of the meeting was to ensure that identical software systems and parameters necessary for processing exist on both sides of the Atlantic and to agree to begin processing data. It was determined that Goddard Space Flight Center (GSFC) will not necessarily process the same ROSAT data simultaneously with MPE. Since GSFC's central processing unit is more powerful than MPE's, GSFC will act as the pathfinder in uncovering "bugs" and other problems with both the data and software. Both before and after the formal meeting, members of the processing team, which included P. Damon, R. Fink, and E. Seufert (ST Systems Corporation)/ Code 936, met with their counterparts at MPE to learn more about the software system and installed updated software remotely on GSFC's computer.

The data processing team in Code 936 has finished processing all the verification data from ROSAT. It consists of ROSAT days 48 through 59 and has observations that belong to 38 distinct Principal Investigators (PIs). The data has passed both quality assurance and data validation and, as a result, is being sent out to 14 U.S. PIs. The remaining 24 non-U.S. observations will be archived and released when they become public domain. This was the first ROSAT data processing milestone. The second one will be the processing of AO1 data (pointed phase data).

Jeanne Behnke, M. Duesterhaus, and R. Pisarski

NEWSBRIEFS › NEWSBRIEFS

NASA Master Directory Supports the United Nations

In continuing support of the United Nations Environmental Program (UNEP), the NASA Master Directory (NMD) system was installed at the UNEP facilities in Geneva, Switzerland. The MD software was installed onto an IBM RT workstation running AIX and the ORACLE RDBMS. This new MD installation is currently being tested and evaluated by UNEP personnel. The UNEP personnel are also working on Data Interchange Formats (DIFs) describing the data holding of the UNEP/GRID system. Once complete these DIFs will be sent to the NASA Master Directory. The NMD support of UNEP has proven to be very valuable to the entire MD project. The conversion of the MD software to UNIX was initiated for the UNEP system. However, the UNIX version of the MD has been very popular and is installed at the German Research Laboratory for Aeronautics and Astronautics (DLR) in Germany and the Earth Observations Data Centre (EODC) in the United Kingdom. In addition, the Earth Observing System Data Information System (EOSDIS) project has requested a copy of the UNIX version for potential integration into version 0 of the International Magnetospheric Study (IMS). Beyond the popularity of the software, the MD development staff has gained a wealth of insight and experience in the UNIX programming environment. These experiences have led to a better MD product for UNIX and VMS as well.

Patty Bailey

Astronomical Data Center Data Requests

As of August 1, 1991, all general inquiries dealing with requesting astronomical catalogs should be directed to the Coordinated Request and User Support Office (CRUSO) at (301) 286-6695 or via NSI-DECnet at NCF::REQUEST.

Gail Schneider, the Astronomical Data Center (ADC) request coordinator, will continue to support the inquiries about data availability and the ADC Online Information System. She has acquired new responsibilities of archiving and managing the ADC data at the NSSDC Data Archive and Distribution System (NDADS) facility.

The ADC Online Information System provides information on all catalogs held at the ADC and allows interactive submissions of requests. The system can be accessed by connecting to the NSSDC Online Data and Information Services (NODIS) account and selecting the ADC option.

Gail Schneider

Former SPAN Security Team Members Named Unsung Heros of Computer Security

FedSECURITY'91 and *Federal Computer Week* conducted a search for the Unsung Heroes of Computer Security in order to honor them. Employees from the federal government, contractors, and hardware and software vendors were all eligible for this recognition. Each candidate was evaluated based on the problem solved, its importance and relevance to other organizations, and each candidate's unique and innovative tools and techniques used to tackle the problem.

Pat Sisson (formerly of ST Systems Corporation), Ron Tencati (ST Systems Corporation), Mike Bartman (ST Systems Corporation), and Todd Butler (RMS Technologies, Inc.), all formerly members of the SPAN Security Team of the NSSDC, were selected for this honor. They were cited for their role in developing and implementing an international security program to protect SPAN computer nodes from the rash of international hackers and "worms," collecting and supplying information to investigative agencies, developing and distributing a Security Tool Kit, developing security guidelines to protect the computer hosts on SPAN, preparing a risk analysis and management plan, and for their overall dedication and diligence in significantly stopping unauthorized access to thousands of computer hosts worldwide.

The Unsung Heroes will be recognized at the executive luncheon at FedSECURITY'91 in Arlington, Virginia, and in *Federal Computer Week*.

Valerie Thomas

PDS Quarterly Management Council Meeting

The Planetary Data System (PDS) is now the usual point of entry for planetary data into the NASA archives. NSSDC already holds about a hundred data sets from old missions submitted through the PDS and has re-

NEWSBRIEFS › NEWSBRIEFS

cently started to receive Magellan data prepared through a collaboration between the PDS and the project. As the PDS has become operational and its operations have become of increasing importance to NSSDC, coordination between the two organizations has become vital. Direction of the PDS is accomplished by a Management Council that meets four times a year and is made up of the managers of its various components (known as nodes). An NSSDC representative has been invited to some of these meetings in the past and an open invitation to future participation has just been issued.

Paul Butterworth attended the most recent meeting, held in June 1991 at the Jet Propulsion Laboratory (JPL). Topics discussed included the distribution of CD-ROMs, policy questions associated with distributing software as part of PDS products, the PDS decision-making process at levels below the Management Council, Management Council membership, the organization's evolving five-year plan, and publication strategies. There were major debates on how the PDS should respond to the Consultative Committee for Space Data Systems (CCSDS) Standard Formatted Data Unit (SFDU) initiative and the possibilities for foreign involvement with the PDS—which include PDS foreign nodes. PDS Management Council meetings have proved to be excellent discussion/decision forums for the PDS project, and their openness to other interested agencies is proving highly beneficial to inter-agency cooperation. The next meeting will be held at JPL in mid-October 1991.

Paul Butterworth

CEOS Working Group on Data/Catalog Subgroup Meeting

The seventh meeting of the Committee on Earth Observations Satellites (CEOS) Working Group on Data/Catalog Subgroup was held at the Earth Observations Data Centre (EODC) in Farnborough, the United Kingdom, on June 25-27, 1991. The meeting was chaired by Mr. G. Saxton of the National Oceanographic and Atmospheric Administration (NOAA), who has recently replaced W. Calicott as chairman of the subgroup. Major topics discussed included the preparation of a document entitled *Guidelines for an Internationally Interoperable Catalog System*, which should be available for distribution at the end of this year. Production of this document is being led by Dr. M. Elkington of EODC.

Discussion of the status of the Prototype International Directories (PID) effort was led by Dr. J. Thieman of NSSDC. It was decided that the system is now operational, and the PID name has been changed to International Directory Network (IDN). Representatives of the three coordinating nodes of the IDN (P. Bailey and J. Beier for NASA/GSFC; G. Triebnig for the European Space Agency [ESA]; and T. Moriyama for the National Aeronautics and Space Development Agency—Japan [NASDA]) summarized recent activities at their sites. A more detailed explanation of this international directory effort can be found in the *NSSDC News*, Vol. 6, No. 2, Summer 1990 issue.

K. McDonald and D. Blake of NSSDC reported on the status of the Earth Observing System Data Information System (EOSDIS) International Magnetospheric Study (IMS) effort. In addition, G. Milkowski of the University of Rhode Island presented a report on the status of the Advanced Very High Resolution Radiometer (AVHRR) interoperability experiments and the finalization of a standard AVHRR inventory exchange format to be used in exchanging information between various archive sites.

The eighth meeting of the Catalog Subgroup has been tentatively planned for early February at the Canadian Centre for Remote Sensing (CCRS) in Ottawa, Canada.

Joy Beier

American Geophysical Union Meeting

At the American Geophysical Union (AGU) meeting held May 28-31, 1991, NSSDC manned a booth featuring its data and services. The Master Directory and NASA Climate Data System were of much interest, as were the various data and services electronically accessible through the no-password NODIS account. NSSDC personnel demonstrated data and services, including several CD-ROMs containing Earth, planetary, and astrophysics data. Various NSSDC documents involving geophysical models, heliospheric spacecraft trajectory information, PROMIS data, etc., were available for perusal and request. Joy Beier (ST Systems Corporation) coordinated the NSSDC booth.

Joseph King

NEWSBRIEFS › NEWSBRIEFS

PLDS Holds Science Working Group Meeting

The Pilot Land Data System (PLDS) recently held its semi-annual Science Working Group meeting at GSFC. One of the chief topics of discussion was whether the construction of the Earth Observing System (EOS) Version 0 Distributed Active Archive Center (DAAC) would override the ongoing program science support requirements for the PLDS this year. This topic generated much discussion, particularly since Dixon Butler attended this part of the meeting. The Science Working Group stressed that to serve the scientific community, the four "Cs"—continuity, credibility, control by the scientific community, and capability—must be maintained as PLDS moves into the next year and is integrated into the appropriate EOS-DAACs over the next two years. Dixon Butler supported this concept and agreed that these were essential elements for maintaining the services to the scientific community and for ensuring that the "no interruption in service" requirement of Version 0 Earth Observing System Data Information System (EOSDIS) was fulfilled.

Other topics discussed at the meeting included

- The overall status of the data system services and their readiness for operational status.
- Realistic user requirements for window-based user interfaces as compiled by a subcommittee of the Science Working Group.
- Prioritizing of data sets to be supported in the on-line information system.
- Planning activities for the PLDS workshop to be held in the fall.

The reports on the progress toward operational status indicated that all data system services were nearly ready to begin full operational mode. In conjunction with the operational status, the data system will be holding a workshop at the University of New Hampshire in late September 1991. Location, date, and topics for the workshop were established. Detailed plans will now begin in earnest.

The discussions on the user interface requirements were also productive and led to many questions that need to be addressed. Lastly, the efforts to prioritize a voluminous list of potential data sets for the on-line system were very successful. A short list of data sets was produced. After further analysis, the final, prioritized list will be established.

Blanche Meeson

"A Dream Come True" for Morgan State

The NASA Center for Computational Sciences (NCCS) has transferred its ETA10 supercomputer to Morgan State University. The system will serve as a resource to Morgan and other minority colleges and universities via the Minority University–Space Interdisciplinary Network (MU–SPIN). This is a major MU–SPIN accomplishment, which will provide training and research opportunities to students and faculty who otherwise would not have had exposure to this level of computer science and applications. With the ETA10, these universities will be able to increase their capability to support NASA-related research.

The people responsible for making this a "dream come true" for the minority institutions include Dr. James H. Trainor, associate center director; Larry Watson, chief counsel; Dr. Gerald Soffen, Dr. Philip Sakimoto, Dr. Mildred Wyatt, and Mitch Hobish, Office of University Programs; Jennie Wiseman, University Programs Office; Dr. Milton Halem, Dr. Daniel Spicer, Christopher Bock, and Valerie L. Thomas, Space Data and Computing Division; Robert Moylan, Richard Pickett, and Wynn Ingham, Control Data Corporation; and Dr. George Peterson and Dr. Earl Richardson, Morgan State University.

Representatives from the MU–SPIN institutions will learn more about the ETA10 and other resources electronically accessible to them over the network when they attend the first MU–SPIN Users Working Group Meeting on September 25–27, 1991, at GSFC. For more information about the users meeting, contact Dr. Nagi Wakim, MU–SPIN coordinator, Code 930.5, (301) 286-3409.

Valerie Thomas

GSFC Selected to Direct Science Information Systems Element for OAET Project

In response to the Augustine Report, Code R has initiated a study to develop new technology thrusts needed to support agency programs. William J. Campbell, head of the Data Management Systems Facility of the National Space Science Data Center, has been selected as project manager for the Science Information Systems element of the Office of Aeronautics, Exploration and Technology (OAET) five-year Space Science Technology Initiative. The program, designed to develop technologies requested by the Office of Space Science and Applications (OSSA), is organized into the following

NEWSBRIEFS › NEWSBRIEFS

four top level elements: Science Sensing, Observatory Systems, In Situ Science, and Science Information Systems. The Science Information Systems element has two primary sub-elements: 1) data archive, access, and retrieval; and 2) scientific visualization. GSFC is responsible for the data archiving, access, and retrieval, and the Jet Propulsion Laboratory is responsible for the visualization work. The goal of the Science Information Systems is to develop technologies for automated science data characterization, and interactive retrieval and visualization of very large, complex scientific data sets. This effort is being targeted for the long-term requirements of the Earth Observing System Data Information System (EOSDIS) and the astrophysics community. Specific technological developments include advanced mass data storage, browse capabilities, multidisciplinary research tools, automatic data characterization and labeling, data organization, user interfacing, real-time touring of remotely sensed data, and virtual reality user environments.

The Information Sciences & Human Factors Division (Code RC) and the Space Technology Spacecraft Systems (Code RS) sponsored a five-day program review for the External Space Systems and Technology Advisory Committee, chaired by Dr. Joseph Shea of the Massachusetts Institute of Technology, June 24–28, 1991. On June 26, Admiral Truly spoke to the participants, stressing the importance of these technological developments and his firm commitment to this effort. The remainder of the week was dedicated to technical reviews. The committee has drafted an initial response and will present its findings to Admiral Truly.

Wendy Ames

LLNL Software Undergoes Review

Lawrence Livermore National Laboratory (LLNL) and U.S. Department of Energy (DOE) management asked Fred Schaffer (Code 931) to participate in a review of the LLNL National Energy Research Supercomputing Center's (NERSC) operating system's option and direction. NERSC, having received the first CRAY 2 system, has a contract for the first CRAY 3 system.

An important review issue was the process by which NERSC will move from CTSS to a UNIX-based operating system on its current and future supercomputing systems. CTSS, initially developed by LLNL, was the flagship operating system of the LLNL and DOE computing centers and was a contender for the dominant operating system of the CRAY. However, UNIX entered the picture and overcame all opposition with the introduction of the CRAY Y-MP machine family.

Sid Karin, director of the San Diego Supercomputer Center, chaired the panel. The remaining panelists were

- David Bader, Department of Energy/Pacific Northwest.
- Dona Crawford, Sandia National Laboratories, Livermore.
- Stephen Elbert, Ames Laboratory/DOE (Iowa State University).
- Dennis Hall, Lawrence Berkeley Laboratory.

The panel developed a draft report to adopt a UNIX-based operating system after LLNL and DOE management reviewed panel presentations.

Milton Halem

NSSDC To Distribute Venus Data on Film and CD-ROM

The NSSDC participated in a meeting held at the Jet Propulsion Laboratory on August 8, 1991, to discuss the distribution of Venus data from the Magellan mission. NASA Headquarters Solar System Exploration Division (SSED) convened the meeting attended by representatives of the Magellan project, the Planetary Data System (PDS), the Regional Planetary Image Facility system, and the NSSDC.

The meeting's objective was to assure a readiness, and a uniformity in the understanding of participating organizations' respective roles in the imminent release and dissemination of Synthetic Aperture Radar-derived mosaiced photoproducts on both film and CD-ROM.

NSSDC will be the sole distributor of film products, about 550 for each survey of the Venusian surface, as well as of the digital data on CD-ROM going to the non-SSED-funded research community, the educational community, and other public sectors. The SSED-funded research community will request data from the PDS, and those requests will be forwarded to NSSDC for fulfillment. Image retrieval and display software will be provided with the digital data.

Each month, the Magellan project will create eight new CD-ROMs, 200 copies of which will go to the NSSDC, which will replenish its stock as needed through interactions with the mastering house. Support for requests and distribution of Magellan data will be one of the major operational challenges for NSSDC in its history.

Joseph King

Intelligent Information Fusion System Presented at Graphics Conference

The National Computer Graphics Association recently held its twelfth annual conference and exposition dedicated to computer graphics applications. The meeting was attended by several thousand graphics users, system developers, and hardware vendors who listened to a variety of approaches and solutions to the multifaceted complexities of computer graphics applications.

William J. Campbell, head of the Data Management Systems Facility at the National Space Science Data Center (NSSDC), was invited to be a speaker in the technical session on "Managing & Visualizing Terabyte Databases." Campbell's talk focused on his concept of an "Intelligent Information Fusion System," which is an end-to-end Intelligent Data Management (IDM) system designed specifically to manage and store large, complex scientific data sets.

This IDM project is being funded by NASA's Office of Aeronautics, Exploration, and Technology. Campbell's presentation included a seven-minute videotape of a prototype that illustrates these concepts and was developed by IDM researchers. An enthusiastic discussion period followed the presentations.

Other panel presenters included chairperson Lloyd Treinish of IBM Watson Laboratory, who discussed the problems associated with data standards and visualization. The panel members were Dr. Elbert Branscomb of Lawrence Livermore National Laboratory, who talked about the Humane Genome Project; Dr. Kenneth Salem of the University of Maryland and the Center for Excellence in Space Data Information Systems (CESDIS)/GSFC, who talked about problems of disk data transfer and organization; and Dr. Frank Allen of E-Systems Corporation, who talked about mass storage devices and techniques.

William Campbell

CALENDAR

September 19-20, 1991
PLDS Workshop
Durham, NH

September 25-27, 1991
MU-SPIN Users Working Group Meeting
NSSDC (Building 26)
Goddard Space Flight Center
Greenbelt, MD

January 5-10, 1992
American Meteorological Society Meeting
Atlanta, GA

NSSDC news

Managing Editor: Leonard Blasso
Senior Editor: Carol Kanga
Associate Editor: Miranda Knowles
Editorial Assistant: Lynda Williams
Staff Photographers: Jay Friedlander, Keri Gudaz, Mark Harrell, Timothy Nohe

NSSDC News is published quarterly by NASA's National Space Science Data Center. Inquiries or comments may be directed to the editors at the address below, at (301) 286-7688, or via NSI-DECnet at NCF::KANGA. To subscribe or change your address, contact the Coordinated Request and User Support Office at (301) 286-6695 or via NSI-DECnet at NCF::REQUEST.

National Space Science Data Center
Code 933
NASA/Goddard Space Flight Center
Greenbelt, MD 20771 U.S.A.

NSSDC Services

Researchers can obtain information about NSSDC's data archive—how to contribute to it or how to request data from it (including cost and availability concerns)—by addressing their questions as follows:

INSIDE UNITED STATES

Data Submissions

Dr. H. Kent Hills
NSSDC/Code 933.9
Goddard Space Flight Center
Greenbelt, MD 20771
Telephone: (301) 513-1670
FAX: (301) 513-1608
NSI-DECnet: NCF::HILLS

Data Requests

NSSDC/Code 933.8
Goddard Space Flight Center
Greenbelt, MD 20771
Telephone: (301) 286-6695
FAX: (301) 286-4952
Telex: 248496 or 197640
TWX: 7108289716
NSI-DECnet: NCF::REQUEST

OUTSIDE UNITED STATES

Data Submissions

Dr. James L. Green, Acting Director
World Data Center A for Rockets and Satellites/Code 930.2
Goddard Space Flight Center
Greenbelt, MD 20771 U.S.A.
Telephone: (301) 286-7354
FAX: (301) 286-4952
Telex: 248496 or 197640
TWX: 7108289716
NSI-DECnet: NCF::GREEN

Data Requests

World Data Center A for Rockets and Satellites/Code 930.2
Goddard Space Flight Center
Greenbelt, MD 20771 U.S.A.
Telephone: (301) 286-7354
FAX: (301) 286-4952
Telex: 248496 or 197640
TWX: 7108289716