NSSDC NEWS

NATIONAL SPACE SCIENCE DATA CENTER

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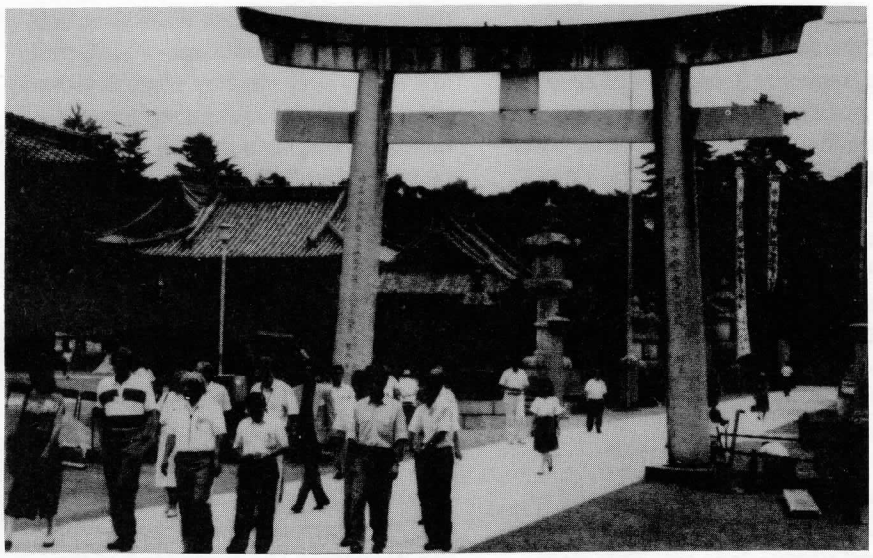
STELAB of Japan Hosts CDAW 9.3



Several participants in the recent CDAW 9.3 workshop, while on tour in Toyokawa, pass through an archway just outside a Buddhist temple located near STELAB of the University of Nagoya.

The third meeting in the Coordinated Data Analysis Workshop (CDAW) 9 series was held August 28-31, 1990, in Toyokawa, Japan, at the newly formed Solar Terrestrial Environment Laboratory (STELAB) of the University of Nagoya. This workshop was specifically planned to occur during the time between the Western Pacific Geophysics Meeting in Kanazawa and the Chapman Conference on Magnetospheric Substorms in Hakone.

The CDAW 9 workshop series centers on the global and coordinated magnetospheric science made possible by data collected during the PROMIS (Polar Regions Outer Magnetosphere International Study) observational campaign of March-June 1986.

The meeting was well attended by senior space physicists from 14 countries, including Japan. A significant technical departure from the previous two CDAW 9 workshops was that a copy of the data base normally resident at NSSDC was extracted from its native Common Data Format (CDF) form into a more generic ASCII-export tape format and sent to Japan. There, it was reformatted to run locally at STELAB with display and analysis software developed there. Although it required extraordinary dedication on the part of the science staff at STELAB to accomplish this work in the limited time available, those attending CDAW uniformly report that the software system and computational facilities used were impressive and greatly contributed to the meeting's scientific success.

The Japanese scientific and local organizing committees planned

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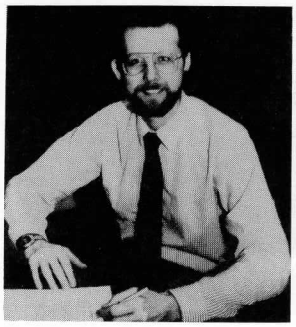


Message from the Director

Online Data Archives Simplify Comparison Studies

The addition of the Science Information System (details on page 7) marks the eighteenth online information and data system that the NSSDC makes available to users all over the world. Once users log onto the appropriate online system account, they enter a session where they can make a variety of decisions, and that ability denotes these special accounts as "interactive." Interactive accounts are available as long as the computers are operational, which keeps the data center open, providing information and data whenever users need it rather than only during specific hours.

Operational online archives are the ultimate in making NASA highly-valued data readily available to the space and Earth science research community. Since becoming operational, these systems have elicited a tremendous response from their user communities. In 1989, NSSDC had over 13,000 accesses to existing online systems from science users all over the world.

There is an ever-growing volume of online data being supported by several organizations, some of which are the most requested data that NASA holds in its archives. Many of these data have been migrated and are now stored on new technology mass storage media rather than on magnetic tapes.

The operational online archives managed by NSSDC are accessible over a variety of computer networks (such as SPAN, NSN, BITNET, and X.25) and comprise a distributed set of computers and mass storage technologies. The data center operates 18 online systems, of which only a few will be discussed here.

NSSDC built and continues to update a multi-spacecraft data set of near-Earth, hourly-averaged interplanetary magnetic field and plasma data. This data set, widely known as the OMNI data, covers the period from the 1963 launch of IMP 1 through the current time. Principal contributors over the past several years have been the NASA ISEE 3 and IMP 8 spacecraft and the Soviet/Czechoslovakian Prognoz 10 spacecraft. (Only IMP 8 contributes now.)

Data have been cross-normalized at NSSDC to assure a maximally uniform and useful data set. This data set has been used to generate the *Interplanetary Medium Data Book* series, which is distributed worldwide. Despite this wide distribution, several tens of scientists log in monthly to NSSDC's computer to select interplanetary parameters for times of interest, which they download to their computers, typically for correlations with data they already possess.

The Nimbus 7 spacecraft was launched over ten years ago. Two instruments on Nimbus 7 have been generating data of considerable importance in global change studies; they are the Total Ozone Mapping Spectrometer (TOMS) and the Coastal Zone Color Scanner (CZCS). The data from TOMS was used to confirm the hole in the ozone that develops annually during the Antarctic Spring.

Since TOMS continues to operate, its data (during the season the hole develops) are received at GSFC, processed, assembled, and placed on line using random access WORM optical disks. In its online form, TOMS data are easily accessed by scientists running correlative measurements. Immediate comparisons are made. To facilitate other TOMS data comparison studies, NSSDC has also placed on line eight to nine years' worth of Antarctic ozone data.

After many years of research and algorithm development, it is now possible to create a map of the phytoplankton in the ocean with data from the CZCS instrument. Because of increased demand of the CZCS data and the status of the reprocessing of the data from the beginning of the mission into phytoplankton image scenes, the archive for the data is collocated with the processing systems at Goddard Space Flight Center.

As soon as a final CZCS product is completed, it is stored in a Sony optical disk jukebox, shown in the photograph. An information system is available for remote users to log onto the system, find key CZCS data they need, and place a request for the data. Over 200 gigabytes are stored on line in the jukebox. In addition, a laser video disk is made of the scan, allowing users to browse data at leisure and order what data segments they need. This effort is being done cooperatively with NSSDC and the Space Information Science Center, both at Goddard.

see Director's Message, *p. 4*

PLDS Begins Trial Operational Period

In October, the Pilot Land Data System began a trial operational period. During this time, the data system is available to a limited number of authorized users who will provide feedback on all aspects of the data system. This period will last two to three months, during which any major flaws in the data or the software will be corrected. Users for the pilot system's trial run have been selected by the PLDS Science Working Group to represent all major facets of NASA's land science community.

At the end of this trial, a longer six-to-nine month test and evaluation period will begin. The data system then will be made available to a much larger community of users. Feedback from these users will also be collected and used to correct errors, and identify near-term and long-term software enhancements, data sets, and services that need to be added.

The version of the data system available during the trial period significantly differs from the previous version. The three PLDS sites—ARC, GSFC, and JPL—all use the same user interface now (so users only need to learn one), and there is more data in the data system.

This interface has a *brief* mode to make it easier for first time users to formulate and run queries. As with the *brief menus* option on a Macintosh or PC, you don't have all the functionality as in the *full* mode, but the essential elements are there and it's easier to use.

It's also easier to order data now, and you can specify how the data is shipped to you and the media that it's on. Also, from your local node you will be able to identify and order pieces of data from the other PLDS nodes without connecting to them.

As before, you will find summary descriptions for entire data sets are available in the PLDS and elsewhere, such as all AVHRR data available via the PLDS, detailed descriptions of many of these data sets, and services to assist users with the electronic networks for mail, data transfers, or access to other computers. At most of the nodes there is also a service to send comments to the data system staff. So if there is something you like or dislike, you can fire off a note before you forget it.

Previous users of the data system will notice a significant improvement in response time of the online system at the GSFC and JPL sites. Both of these sites have undergone major upgrades to their computer resources. JPL now has two computers networked together to provide better performance to users. One machine will be dedicated to the information system portion of PLDS, while the other will provide the computer resources for analysis of spectral or image data available at that site. The GSFC site now has dedicated computer resources for its scientific users. This resource is used exclusively by the scientific users and only runs the information system portion of PLDS, as the GSFC site does not currently provide an analysis service.

The ARC node has also upgraded its computer resources by adding online storage and providing an online backup system for their data base. Computer resources are not yet a bottleneck at this site. In a future article, once the extended test and evaluation period has begun, we will discuss in more detail the features and data sets available through the PLDS.

Blanche Meeson

ST Systems Corporation Wins Five-Year Contract To Support Data Center

On October 11, NSSDC announced that ST Systems Corporation (STX) had been awarded a new five-year contract to provide operations and analysis support for NASA/Goddard's National Space Science Data Center.

This facility serves as NASA's primary data center and archive supporting Earth science, astrophysics, astronomy, space physics, and other sciences related to the space administration's unmanned research missions. Expected to take effect on December 15, the contract will run for five years. Science Applications Research (SAR), now a wholly-owned subsidiary of STX (which is based in Lanham, Maryland), has worked on the project since May 1, 1986.

During the new contract term, 128 STX staff members will be working to support the renewed contract. Of these employees, about 80% serve in offices at the data center's facilities. All of these qualified STX personnel will support NSSDC's six basic functions: to provide special online information and data systems; to serve as NASA's data archive; to publish a variety of newsletters and paper catalogs; to provide value-added services; to conduct computer science research and development and implement mass storage technologies; and to provide system support for NSSDC's computer facility and networks.

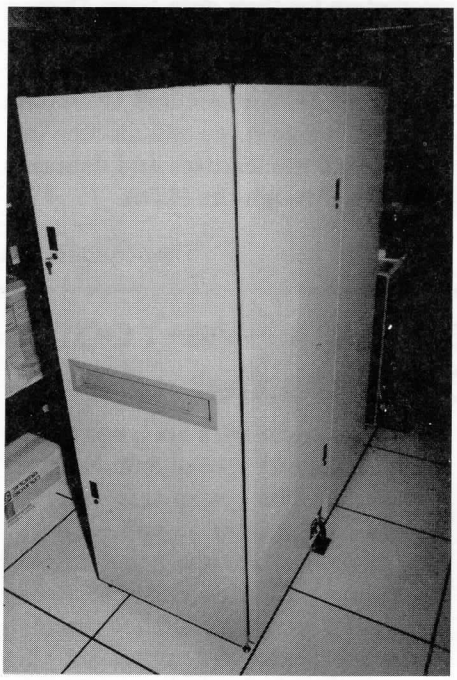
Dr. Ken Klenk, manager of the project, said STX's major goals over the next five years include solving the problems associated with managing the unprecedented volume of data that will be generated by NASA missions in the 1990s; developing advanced data and information management services to enable efficient and electronic access by scientists; and finding ways to reduce the costs associated with data archiving, management, and dissemination.

Len Blasso

Director's Message, *from p. 2*

In the next ten years, NASA will be launching and acquiring data from more than 90 missions that are unparalleled in terms of the science that will be accomplished and the volume of data that will be beamed back to Earth. NASA has embarked on a series of programs that will serve as stepping stones to solutions for the data management problems it now faces.

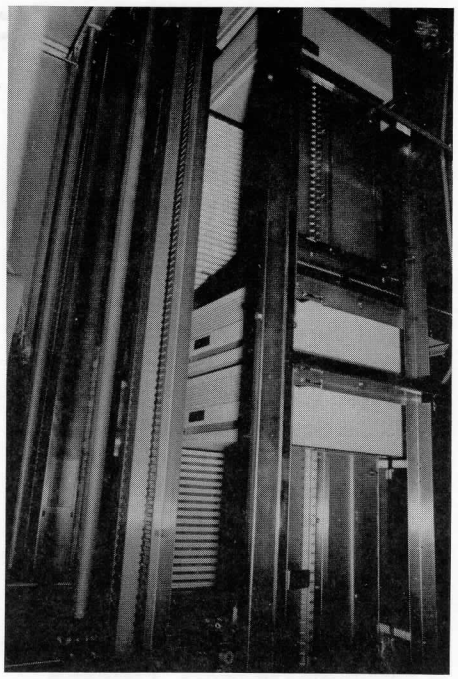
Last spring, the Hubble Space Telescope was launched, and within the next two years, a state-of-the-art data management and archiving system will be completed. This system is called the ST-DADS (Space Telescope–Data Archive and Distribution Service) and will use nine computers and manage 15 years of HST data on WORM optical disks. The ST-DADS system is one of the fully online advanced data management systems NASA is developing that will provide a complete archive backup as well as manage a massive amount of online data (perhaps as much as 50 terrabytes).



From the outside, this is how the Sony optical disk jukebox appears.

NASA is beginning to explore ideas for participation in global studies of the Earth's environment. Its new mission, known as Earth Observing System (EOS), will be required to record a staggering volume of detailed data over an extended period—perhaps as long as 20 years. These data must be appropriately managed and archived so that they can quickly be incorporated into global climate studies. The EOS project, recognizing the importance of the data, is currently spending 30 percent of its resources studying how to operate the EOS Data and Information System (EOSDIS) that will be necessary for mission success.

An early version or prototype of the EOSDIS is currently on the drawing boards right now at GSFC. It is called the GSFC EOS-Distributed Active Archive Center (EOS-Version 0 DAAC).



Inside the jukebox, layers of optical disks store more than 200 gigabytes of CZCS data.

There are plans to have seven DAACs supporting EOS distributed all over the United States. The DAAC is being designed to support the online interactive access to existing Earth science data. By 1994, if all goes as planned, the DAAC will be fully operational. Look for more information about the EOS-DAAC in *NSSDC News* as details become available.

James L. Green

How To Access NSSDC Through SPAN or the TCP/IP Internet

Authorized users may access NSSDC online services by issuing the following commands:

From SPAN (VAX/VMS) Nodes:

SET HOST NCF

(If you receive the error message "HOST UNKNOWN," then your DECnet node data base needs to be updated; until an update is performed, the command SET HOST 6283 can be used.)

From TCP/IP Internet Nodes:

TELNET NSSDCA.GSFC.NASA.GOV

(If this command doesn't work, try TELNET 128.183.10.4)

Climate Data System's Atmospheric Constituent Subdiscipline Supports Newly Reprocessed Data

This is the last in a series of articles covering the subdisciplines of NASA's Climate Data System (NCDS).

In a workshop held last year, a section of the conference was devoted to presentations and a hands-on session for data sets in the subdiscipline of Atmospheric Constituents. One of the speakers was Dr. Richard McPeters, Nimbus 7 project scientist (pictured at right), who spoke on "Trace Gas Retrievals from SBUV/TOMS."

It has been suggested that changes in the vertical distribution of atmospheric ozone, along with changes in the atmospheric concentrations of other infrared active gases, contribute to the change in climate structure. Having the remotely sensed data for these gases easily accessible by researchers on a global scale is valuable to the atmospheric research community. NCDS provides online catalog, inventory, and data access support for atmospheric constituent data (such as ozone, water vapor, carbon dioxide, nitrogen dioxide, nitric acid, and aerosols) that are retrieved through different experiments. NSSDC also provides access to these data through its Request Office.

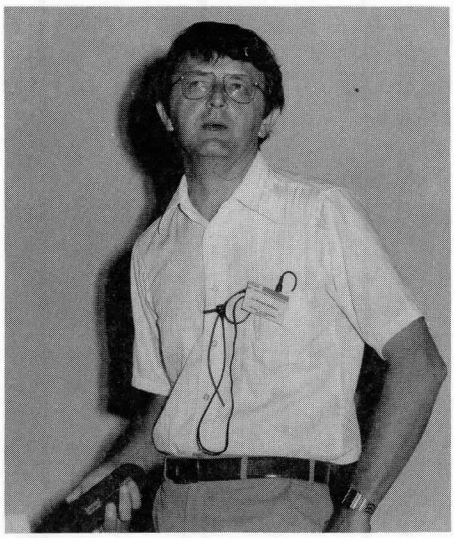
NCDS offers access support for the ozone profile and total ozone data derived from measured backscattered ultraviolet radiation associated with two experiments—Backscattered Ultraviolet (BUV) on Nimbus 4 and both the Solar Backscattered Ultraviolet (SBUV) and Total Ozone Mapping Spectrometer (TOMS) on Nimbus 7. BUV and SBUV ozone data are held as the "CPOZ_B" and "CPOZ_S" data sets, respectively. TOMS total ozone data can be accessed through NCDS as "GRIDTOMS" in the Data Access Subsystem. GRIDTOMS provides global information about the total ozone content of the atmosphere.

Users also can gain access to the High-Density SBUV (HDSBUV) and the High-Density TOMS (HDTOMS) ozone data through NSSDC's Request Office. The revised TOMS version 6 ozone data have recently arrived at NSSDC.

NCDS fully supports the archiving of products from the Stratospheric Aerosol and Gas Experiment I and II (SAGE I and SAGE II). Gas and aerosol concentration profiles of the stratosphere were derived from solar occultation radiometric measurements in both experiments. NCDS provides access to the aerosol, ozone, and nitrogen dioxide data of SAGE I as "SAGEI-PROF" and to the ozone, water vapor, aerosol, and nitrogen dioxide data of SAGE II as "SAGEII-PROF." SAGE II ozone and aerosol data covering the years 1984 through 1988 are being reprocessed. NSSDC expects to receive the readjusted products and to make them available to the requesters by the end of the year.

Vertical profiles of ozone, water vapor, nitric acid, and nitrogen dioxide from the Limb Infrared Monitor of the Stratosphere (LIMS) aboard Nimbus 7 are held as the "LIMS-LAMAT" data set, which contains LIMS results in the form of daily global maps at 18 pressure levels from October 25, 1978, through May 28, 1979. These daily maps provide ascending, descending, and combined node information of the vertical distribution of the gases, allowing diurnal variations to be studied.

The aerosols measured by the Stratospheric Aerosol Measurement (SAM II) on Nimbus 7 are also available as "BANAT" in the Data Access Subsystem. SAM II is the first satellite experiment to globally monitor stratospheric aerosols to determine their effect on radiation balance and climate in the polar regions. After 12 years of operation, SAM II is still functioning well. Several more years of successful operation are anticipated.



Dr. Richard McPeters serves as project scientist for Nimbus 7.

Nimbus 7 SMMR monthly mean water vapor data covering the global ocean between 50 N and 50 S from January 1979 through September 1983 with a spatial resolution of three degrees by five degrees were recently made available at NCDS as the "SMMR_PREC_VAP_MONTHLY" data set in the Data Access Subsystem.

Long-term measurements of atmospheric carbon dioxide concentrations at Mauna Loa Observatory, Hawaii, are held on line at NCDS as the "MLOA_CO2" data set. Because of the remoteness of the site, the data are believed to be a reliable indicator of the regional trend in atmospheric carbon dioxide concentration increase in the middle troposphere. Interested users can access this data set through the online query.

NCDS data are available to NASA-funded researchers. The table on the following page displays a newly updated list of NCDS's available atmospheric constituent data sets. Users who wish to access these data may call the NCDS User Support Office at (301) 286-3209 or send a SPAN message to either NCF::CLOSS or to NCF::REQUEST.

Chung Yu Wu and Lola Olsen

ATMOSPHERIC COMPOSITION DATA SETS AVAILABLE VIA NCDS AS OF 10/20/90

Data Set	Parameters	Temporal Coverage/ Resolution	Spatial Coverage/ Resolution	Archive Media:Volume	Output Options CDF,Tape	NCDS Data Set or CDF* Name
AEM-2 SAGE I Profiles	Aerosols, Nitrogen Dioxide, and Ozone.	02/21/79 - 11/18/81, only sunset data after 6/79; full coverage every 18 days	Global from 72 deg N to 72 deg S, above cloud tops; Horizontal: 1 km x 250 km; Vertical: 1 km for heights below 25 km and 5 km for those above	Tape (33): 185 Mbytes	CDF, Tape	SAGE I-PROF
ERBS SAGE II Profiles	Aerosols, Ozone Humidity, Nitrogen Dioxide	10/24/84 - 11/30/87, ongoing; full coverage every 18 days for aerosols and ozone only	Global from 80 deg N to 80 deg S, above cloud tops; Horizontal: 1 km x 250 km; Vertical: 1 km below 25 km and 5 km above	Tape (6): 62 Mbytes	CDF, Tape	SAGE 2_PROF
Mauna Loa Carbon Dioxide	Carbon Dioxide	01/58 - 12/88; monthly	19.28N, 155.38W; point	Online CDF: 12 Kbytes	CDF	MLOA_C02*
Nimbus-4 BUV CPOZ	Albedo, Ozone	04/10/70 - 05/06/77, daylight only; 14 days for global coverage, 32 sec/ observation	Global: 100 - 0.3 mb; Horizontal: 200 km x 200 km, Vertical: 8 km for heights above 25 km and 15 km for those below	Tape (4): 214 Mbytes	CDF, Tape	CPOZ_B
Nimbus-7 LIMS Map Archival Tapes	Height, Humidity, Nitric Acid, Nitrogen Dioxide, Ozone, Temperature	10/25/78 - 05/28/79; Daily (ascending, descending, and combined nodes)	Global: 84 deg N to 64 deg S, Vertical: 100 - 0.05 mb; Vertical: 1.5 km intervals	Tape (8): 151 Mbytes	CDF, Tape	LIMS-LAMAT
Nimbus-7 SAM II BANAT	Aerosols	11/01/78 - 02/01/89, ongoing; full latitude coverage in 3 months	Global from 64 deg N to 80 deg N and from 64 deg S to 80 deg S; Horizontal: 1 km x 250 km, Vertical: 1 km	Tape (102): 719.3 Mbytes	CDF, Tape	BANAT
Nimbus-7 SBUV CPOZ	Reflectivity, Ozone	10/31/78 - 03/01/89, daylight only; 14 days for global coverage	Global: 100 - 0.3 mb; Horizontal: 1 km x 250 km, Vertical: 1 km for heights above 25 km and 15 km for those below	Tape (12): 1.21 Gbytes	CDF, Tape	CPOZ_S
Nimbus-7 SBUV Ozone	Reflectivity,Ozone	11/01/78 - 03/01/88, ongoing; 14 days for global coverage	Global, 100 to .3 mb; Horizontal: 200 km x 200 km; Vertical: 8 km above 25 km, 15 km below 25 km	Tape (43): 3.12 Gbytes	CDF, Tape	OZONE-S
Nimbus-7 TOMS Gridded Data	Ozone, Reflectivity	10/30/78 - 12/31/89, ongoing, daylight only; monthly, and seasonal averages	Global; varies from 1 deg latitude x 1.25 deg longitude at low latitudes to 1 deg latitude x 5 deg longitude at higher latitudes	Tape (12): 546 Mbytes; Also Online CDF on optical disk	CDF, Tape	GRIDTOMS
Nimbus-7 TOMS Ozone	Ozone, Reflectivity	10/31/78 - 08/05/89, daylight only, ongoing; 200 msec/observation	Global; 50 km x 50 km at nadir to 130 km x 300 km at scan extremes	Tape (172): 17.98 Gbytes	Tape	N7-HDTOMS
Prabhakara's SMMR Monthly Mean Water Vapor	Water Vapor	01/01/79-09/30/83 Monthly Means	Global Oceans: 50N-50S; 3 deg X 5 deg	Online CDF: 6.3 Kbytes	CDF	SMMR_PREC_VAP _MONTHLY*

NSSDC Provides Astronomical Services through a Variety of Channels

This is the first of two articles highlighting current and future NSSDC Astrophysics Services.

Over the last 20 years, NSSDC has accumulated several hundred gigabytes of astrophysics and astronomy data sets and catalogs in digital form and thousands of feet of film. The astrophysics data in NSSDC archive come from such international spacecraft missions as the International Ultraviolet Explorer (IUE) and the Infrared Astronomical Satellite (IRAS). In addition to the large astrophysics data holdings, there are over 580 astronomy catalogs of stars and galaxies in NSSDC's long-term archive, designated as a permanent NASA facility.

NSSDC is in the process of ensuring that all data in its archive have backups stored at a separate location. Also, NSSDC's data holdings are undergoing periodic media replacement. For instance, the IUE and IRAS data holdings, currently stored on magnetic helical scan tape and nine-track magnetic tape, respectively, are being rewritten to random access optical disk.

NSSDC has been relocating more of its astrophysics data and catalog archive to online or near-line status to make them readily accessible electronically over national and international computer networks. The data center supports electronic access from all of the major computer networks, such as Internet (TCP/IP), SPAN (DECnet), BITNET (RSCS), and the international public packet switched network (X.25).

During the next ten years, NASA will be launching many astrophysics spacecraft whose data will be accessible through a variety of services at NSSDC for NASA researchers and through the NSSDC World Data Center-A for Rockets and Satellites (WDC-A-R&S) for the international science community. There are now 36 world data centers internationally in the United States, Europe, the Soviet Union, Japan, and China. A comprehensive guide to the services of NSSDC is now available upon request (Green, 1990). In addition, the documents by Kim (1988) describe the NSSDC astrophysics archive data holdings, and those by Warren et al. (1990) provide a brief description of the astronomy catalog archive. This article gives an overview of NSSDC's astrophysics services, which afford scientists all over the world access to both online and off line astrophysics and astronomy data and information in the vast NSSDC archive.

The Astronomical Data Center

Astronomical catalogs in computer accessible form are very important to many astronomical research projects. As a result the Astronomical Data Center (ADC) at NSSDC, one of six international astronomy data centers, works to provide the astronomical community with machine-readable astronomical catalogs and documentation. They range from such well-known catalogs as the *Bonner Durchmusterung* (BD) and the *Smithsonian Astrophysical Observatory Star Catalog* (SAO) to less widely known but important catalogs such as the *Fifth Fundamental Catalogue* (FK5).

To service the astronomical community, the ADC acquires, verifies, modifies, documents, and distributes astronomical catalogs and documentation in computer-readable form. Currently, the ADC archives hold more than 580 computer-readable catalogs of astrometry, photometry, spectroscopy, and other miscellaneous data for both stellar and non-stellar objects. These data are acquired through exchanges with the Centre de Donnees Astronomique de Strasbourg (CDS) and other astronomical data centers throughout the world as well as by direct contributions from the members of the international astronomical community.

In 1989 the ADC began publishing astronomical catalogs on Compact Disk Read-Only-Memory (CD-ROM). This extremely flexible and cost-effective distribution media can hold up to 640 megabytes of data on a single disk. The first ADC CD-ROM has already been published as a limited edition disk containing 31 astronomical catalogs in both plain ASCII text-file format and as standard FITS tables (Brotzman and Mead, 1989). The ADC is currently producing the first of a series of general distribution CD-ROM disks containing astronomical catalogs. This first CD-ROM pair (ASCII text-file and FITS) will contain approximately 100 of the most requested astronomical catalogs and is expected to be ready for distribution in the summer of 1991. The production of more CD-ROM astronomical catalog disk pairs (ASCII text-files and FITS) is anticipated for succeeding years.

To assist the astronomical community in identifying what astronomical catalogs are available from the ADC, a menu-driven program is available on the NSSDC VAX computers that allows users to browse through descriptions of all the ADC catalogs and interactively place requests. In addition, for the past several years the ADC has been using computer networks to distribute astronomical catalog data and documentation held in its archives, thus avoiding the potential problems and time delays involved in sending magnetic tape through the mail. This service is available through the NASA Science Internet (NSI) which supports the major national and international computer networks as well as dial-up modem lines.

see Astrophysics, *p. 12*

NASA's Space Physics Analysis Network Disbands: Government Mandates Transition to Open Systems Interconnect

After ten years of service to the NASA science user community, on December 15, 1990, the NASA Space Physics Analysis Network (SPAN) will no longer organizationally or functionally exist. The NASA science-oriented DECnet networking for which SPAN was responsible will be turned over to a new support group, and in most cases, new personnel. Also, plans have been made to significantly alter the physical architecture of the network sometime in 1991. This situation only applies to the NASA portion of SPAN (U.S.-SPAN) and will not affect the ESA-supported European SPAN (E-SPAN).

It is important to note that, from a user perspective, this change should not be considered "bad." The new management structure should be given a chance to show its capabilities to the science user community. Every effort is being made to ensure that this transition is as transparent to the user as possible.

This brief article touches on some of the background for this change and explains what users can look forward to in the near future. The next issue of *NSSDC News* will feature a more in-depth article about this transition, the details of which will be worked out in the next few months. NSSDC is committed to providing the space and Earth science SPAN user community with as much correct and up-to-date information as possible to make this transition as easy as possible.

In the last several years, SPAN Management (a confederation of network personnel at the NASA centers: GSFC, MSFC, JPL, JSC, KSC, and ARC) has struggled to provide the rapidly growing SPAN user community with communications and user services under a tightly constrained budget. These user services have included network security, network pass through accounts, computer gateways, the SPAN-Network Information Center (SPAN_NIC), a help desk with SPAN specialists, extensive online and offline documentation, user groups, and many others. SPAN has been known for accomplishing a great deal with very few resources over its long history.

Because of this wider goal and management reorganization, current SPAN users will finally have the increased bandwidth they have desperately needed.

However, SPAN Management has been completely unsuccessful in many other areas, such as upgrades in bandwidth to science institution tail circuits, bandwidth upgrades for NASA center to NASA center backbone circuits, and the purchase of new network routers to allow the migration to DECnet/OSI Phase V. This situation has caused SPAN's Management and user community a considerable amount of grief. In addition, NASA Headquarters has wanted ARC to take the lead role in all wide area networking for both TCP/IP and DECnet, so that NSSDC could drop all wide area networking responsibilities at GSFC and concentrate exclusively on data archiving problems and issues.

Starting in June 1990, a series of meetings called the NASA Network Management Retreat was held. Key NASA personnel (including James Green) met to discuss the future of NASA networking and any possible consolidation. NASA is currently operating several computer communications networks, in addition to SPAN, using different protocols and managed under different organizations. A single suite of communication protocols has emerged as an international standard. This suite is the Open Systems Interconnect or OSI. The U.S. federal government has mandated that all its agencies will transition their computer networks to a subset of OSI protocols as defined by the Government Open Systems Interconnect Profile (GOSIP). At the first retreat it was decided that an overall goal for the Agency should be to eventually maintain and operate one network using the OSI protocol.

The transition plan worked out at these retreats will begin the process of consolidating appropriate network communications links that will facilitate the network protocol transitions to OSI (for both TCP/IP and DECnet). This will require specific network management reorganizations with better defined roles and responsibilities. As soon as the completed plan has been signed, it will be published in a variety of places to inform the user community.

Because of this wider goal and management reorganization, current SPAN users will finally have the increased bandwidth they have desperately needed. With users' and upcoming NASA missions' heavy reliance on computer networks, major structuring changes are necessary.

The new network management team will be led by the ARC NASA Science Internet (NSI) team (headed by Fred Rounds) with the Advanced Data Flow Technology Office (ADFTO) at GSFC performing user support and network application development under ARC direction. In addition, within the next few years the SPAN "routing centers" management teams will

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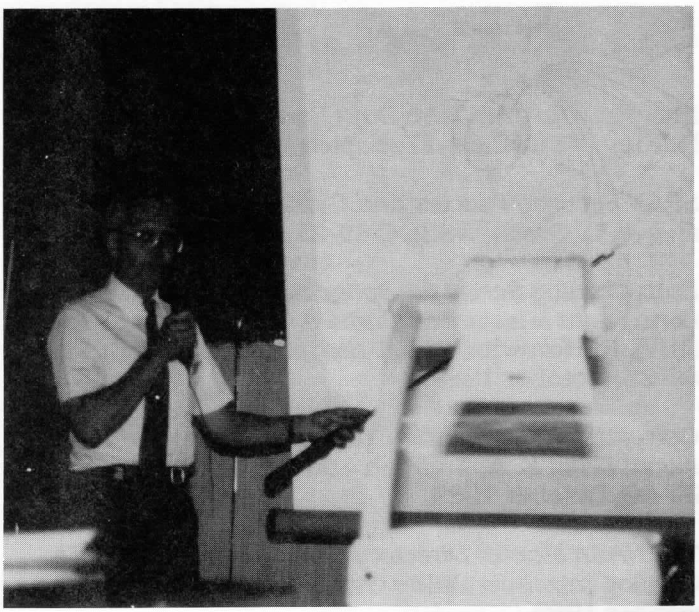
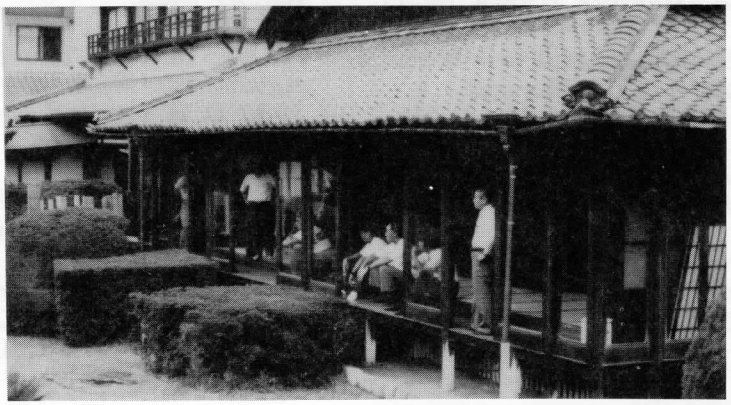


Views from Japan . . .

Dr. Robert McPherron, a UCLA professor, discusses suggested magnetospheric current systems configuration during one CDAW 9.3 event.



Several CDAW attendees looking out from Toyokawa-Inari—the site at which they enjoyed a "Buddhist Lunch."

events with great care and extended warm hospitality to their many guests.

CDAW 9's co-conveners, Drs. Robert Manka and Dan Baker, and the various event group leaders report that the CDAW 9 series of workshops is "moving well toward what will be important and very valuable research papers from the PROMIS data interval." Scientific analysis of the CDAW 9 data base continues both at STELAB and (over domestic and international network links) at NSSDC to bring those research papers to fruition.

Hopefully, the CDAW program—now including CDAW 9.3 as a specific demonstration for future worldwide data exchanges—is a prototype and development laboratory for one mode of cooperative space science in the ISTP era.

Robert McGuire, Dan Baker,
Robert Manka, T. Ogino,
and T. Watanabe

CDAW 9.3 participants concentrate at several of the 11 workstations made available at STELAB.

New Documents Published Since Summer '89 Are Now Available from NSSDC

Since the Summer 1989 edition of *NSSDC News* (Vol. 5, No. 2), the data center has published the documents listed here. Readers interested in ordering copies of these publications may do so by contacting the Coordinated Request and Support Office at (301) 286-6695 or via SPAN at NCF::REQUEST.

Conference Proceedings

Report on the Third Catalog Interoperability Workshop — November 16-18, 1988, J. R. Thieman, M. E. James, and P. A. Bailey, NSSDC 89-04, March 1989.

Minutes of CD-ROM Workshop — June 19-20, 1989, Dr. J. H. King and Dr. E. J. Grayzeck, NSSDC 89-11.

NASA Science Internet (NSI) Networking Users Working Group Meeting Proceedings, V. L. Thomas and J. L. Green, November 13-15, 1989.

Proceedings of the First NASA Climate Data Workshop, L. M. Olsen, NSSDC 90-09, March 1990.

"Intelligent Information Fusion for Spatial Data Management," E. Dorfman (coauthor), *Proceedings of the 4th International Symposium on Spatial Data Handling*, 1990.

Miscellaneous Publications

A Beginner's Guide to Using the NSSDC VAX Computer System, Version 1, D. Parker, NSSDC 89-18, August 1988.

Directory Interchange Format Manual, Version 2.0, NSSDC 89-24, July 9, 1989.

Data Catalog Series for Space Science and Applications Flight Missions Volume 4B, Descriptions of Data Sets from Meteorological and Terrestrial Applications Spacecraft and Investigations, C. Ng and G. R. Stonesifer, NSSDC 89-10, September 1989.

Software for Optical Archive and Retrieval (SOAR) User's Guide, Version 4.0, C. Davis and N. Vaidya, NSSDC 89-16, September 1989.

Interplanetary Medium Data Book, Supplement 4, J. H. King, NSSDC 89-17, September 1989.

SPAN Security Policies and Guidelines, P. L. Sisson and J. L. Green, NSSDC 89-21, October 1989.

Data Catalog Series for Space Science and Applications Flight Missions, Volume 6, Master Index Volume (MIV), R. Horowitz, P. A. Ross, and J. H. King, NSSDC 89-25, October 1989.

Correlative Visualization Techniques for Multidimensional Data, L. A. Treinish and C. Goettsche, NSSDC 89-26, October 1989.

The NASA Master Directory Quick Reference Guide, Catalog Interoperability Group, NSSDC 89-19, November 1989.

PROMIS SERIES Volume 7, GOES 5 and GOES 6 Geosynchronous Magnetic Field Data for March-June 1986, D. H. Fairfield and K. Takahashi, NSSDC 89-22, November 1989.

ULDA User's Guide, C. Perry, C. Driessen, and F. Pasian, NSSDC 89-27, December 1989.

Management of the Space Physics Analysis Network (SPAN), J. L. Green, V. L. Thomas, T. F. Butler, D. J. Peters, and P. L. Sisson, NSSDC 89-23, January 1990.

NSSDC Data Listing, R. Horowitz and J. H. King, NSSDC 90-06, February 1990.

PROMIS SERIES Volume 8, Midlatitude Ground Magnetograms, D. H. Fairfield and C. T. Russell, NSSDC 90-10, April 1990.

1983 Tail-Era Data Series, Volume 1, ISEE 3 Plasma, D. H. Fairfield and J. L. Phillips, NSSDC 90-11, April 1990.

1983 Tail-Era Data Series, Volume 2, ISEE 3 Magnetic Field, D. H. Fairfield and J. L. Phillips, NSSDC 90-12, April 1990.

Accessing SPAN from Non-SPAN Nodes, C. M. Perry, P. L. Sisson, and L. Jackson, NSSDC 90-18, April 13, 1990.

CDAW 9.2 Data Catalog, Version 1.24, April 13, 1990.

see New Publications, *p. 11*

New Publications, *from p. 10*

Accessing SPAN from Non-SPAN Nodes, NSSDC 90-14, May 1990.

A Guide to the National Space Science Data Center, NASA/Goddard Space Flight Center, NSSDC 90-07, June 1990.

A Cost Model for NASA Data Archiving, Version 2.0, K. F. Klenk, J. L. Green, and L. A. Treinish, NSSDC 90-08, June 1990.

Solar-Terrestrial Models and Applications Software, Dieter Bilitza, NSSDC 90-19, July 1990.

SPAN Cookbook — A Practical Guide to Accessing SPAN, S. Mason, R. D. Tencati, D. M. Stern, K. D. Capps, G. Dorman, and D. J. Peters, NSSDC 90-21, August 10, 1990.

International Reference Ionosphere 1990, D. Bilitza (with contributions by K. Rawer, L. Bussy, I. Kutiev, K. -I. Oyama, R. Leitinger, and E. Kazimirovsky), Committee on Space Research, NSSDC/WDC-A-R&S 90-22, November 1990.

Refereed Publications

"The Development and Utilization of an AVHRR Based Vegetation Index for Climate Monitoring," R. Tomlinson (coauthor), *Proceedings of the 14th Annual Climate Diagnostics Workshop*, La Jolla, California, October 16-20, 1989.

"The Father Xmas Worm," J. Green and P. Sisson, *Proceedings of the 12th National Computer Security Conference*, p. 359, Baltimore, Maryland, October, 1989.

"NASA Astronomical Data Center," W. H. Warren, Jr., *Astronet Newsletter*, No. 2, December 1989.

"Electron Density Profile Description in the International Reference Ionosphere," K. Rawer and D. Bilitza, *Journal of Atmospheric and Terrestrial Physics*, 1989.

"N(H) Profile Data at World Data Centers," J. H. Allen, R. Conkright, D. Bilitza, A. Y. Feldstein, and D. Willis, *Advances in Space Research*, 9, 1989.

"Solar Activity Variation of Ionospheric Plasma Temperatures," D. Bilitza and W.R. Hoegy, *Advances in Space Research*, 9, 1989.

"Characteristics of Wave-Particle Interactions During Sudden Commencements: 1. Ground-Based Observations," W. B. Gail, U. S. Inan, R. A. Helliwell, D. L. Carpenter, S. Krishnaswamy, T. J. Rosenberg, and L. J. Lanzerotti, *Journal of Geophysics Research*, Vol. 95, No. A1, pp. 119-137, January 1, 1990.

"The NSSDC Trapped Radiation Models," J. D. Gaffey, Jr., and D. Bilitza, *AIAA-90-0176*, January 1990.

"Sphere Quadtrees: A New Data Structure to Support the Visualization of Spherically Distributed Data," G. Fekete (principal author), *Proceedings, International Society for Optical Engineering—Extracting Meaning from Complex Data Processing, Display, Interaction*, p. 242, February 1990.

"Worldwide Interactive Access to Scientific Databases via Satellite and Terrestrial Data Network," H. K. Hills (coauthor), *ESA Bulletin*, No. 61, pp. 63-69, February 1990.

"Corrections to Excitations of Low-Frequency Hydromagnetic Waves by Freshly Created Ions in the Solar Wind," J. D. Gaffey, Jr. (coauthor), *Journal of Geophysical Research* 95, 2477, March 1990.

"DAVID: NASA's Heterogeneous Distributed Database Management System," B. Bhasker (coauthor), *Proceedings of the ACM Symposium on Applied Computing*, April 1990.

"NSSDC—Preserving Time with Technological Advances," C. M. Perry, *Proceedings-Evolution in Astrophysics IUE Astronomy in the Era of New Space Missions*, May 29-June 1, 1990.

"The Distribution of Continuously Created Newborn and Pickup Cometary Ions," J. D. Gaffey, Jr., *Physics of Space Plasmas* 9, 245, August 1990.

"Stimulated Emission of Auroral Kilometric Radiation (AKR) in Regions of a Weakly Unstable Electron Velocity Distribution," J. D. Gaffey, Jr. (coauthor), *Journal of Geophysical Research* 95, 12141, August 1990.

"Rendering and Managing Spherical Data with Sphere Quadtrees," G. Fekete, *Proceedings Visualization '90*, October 1990.

"Solar Radio Burst Phenomena and Ring-Beam-Plasma Interaction," J. D. Gaffey, Jr., S. Kainer, D. Krauss-Varban, *EOS, Trans AGU*, 71, pp. 15-17, De-

Astrophysics, *from p. 7*

The Master Directory

Another operational system of general interest to scientists is the Master Directory or MD. This online search system provides brief overview information about NASA and important non-NASA space and Earth science data, archives, and other information. In many cases the directory offers automatic network connections to online information systems at locations throughout the world. The systems to which MD connects provide detailed information and access to the data of interest to the requester. The MD also supports the astrophysics discipline in addition to Earth science data. A more comprehensive astrophysics information system should be available once the Astrophysics Data System (ADC) is operational. At this point, the MD will provide pointer and automatic links to the ADS capabilities as they become available.

MD users may search for data of interest through a variety of methods such as measured parameter, science discipline, location or spatial coverage, overall time period, spacecraft (or data source), sensor, investigator, campaign, or project. For example, in the astronomy science discipline area, MD also supports the subdisciplines of x-ray, cosmic ray, gamma ray, ultraviolet, visible, infrared, and radio. The information displayed by the directory includes a descriptive title, summary abstract, key references, persons to contact, archive information, storage media information, and the values associated with the search keywords mentioned above. If a connection to another system with more detailed information is available, the connection can be invoked through the use of a simple LINK command. The use of the MD system over the last year has been exceptional and growing steadily with several hundred users per month.

Data Acquisition, Archiving, and Distribution

NSSDC has a staff of scientists responsible for interfacing with the science user community and with the various NASA spaceflight missions. Each NASA mission, including astrophysics, must complete a document called the Project Data Management Plan or PDMP. NASA project officials, Headquarters, and the NSSDC review and approve this document designed to describe the mission's data products, the manner in which they will be archived and managed, and the facilities or data centers responsible for the archived data. It is through the PDMP that the NSSDC has a window on the future as to what missions and how much data the NSSDC will be archiving. Over the next several years NSSDC will be receiving data from ROSAT, GRO, COBE, and other important astrophysics missions.

Reviews of the PDMPs are performed regularly by the data suppliers, archiver, and users. Each of these groups plays important roles in the long-term management of any useful archive. The archive must ensure that archived data are safe, usable, and distributable. The scientific community must provide independent evaluation and guidance as to the scientific importance and usefulness of the archived data as well as the level of support and accessibility needed or desired. Finally, the data originators must supply the data and the essential as well as ultimate scientific expertise with respect to the archived data. Regular reviews of these archiving plans help ensure the long-term usefulness of the astronomical archives held at NSSDC.

Advanced planning for data management and handling is fundamental for any archiving effort. A scientist's desire to put data in an archive is only the first of many steps in the process. Immediately, two questions confront the archivist: What data *ought* to be archived and what data *needs* to be archived? The former is a reflection of an obligation to future generations of scientists while the latter derives from the scientific consideration of requirements for properly interpreting archived data.

Next, the practical day-to-day details of the archiving process must be established before data can be properly archived. These details include format of the data, access rights (i.e., are the data designated as public or private and for how long), general use of the data (i.e., who and under what conditions), data storage and delivery to the archive, data distribution, archival data rate, indexes needed, and total size of the data set.

It is important to remember that archives are composed of more than scientific data. Equally important is the documentation describing the scientific data. An archive without good documentation is essentially useless. In its role as archivist, NSSDC tries to help and encourage the data suppliers to produce useful documentation about their data. Traditionally, documentation about archived data has been produced as hard copy manuals. Thus, as the number of archived data sets increases the hard copy documentation becomes more difficult to maintain and distribute to interested scientists. To make these problems manageable, the center is in the process of converting its hard copy documentation to computer-readable forms, to distribute as much documentation as possible for digital data via the same media that it distributes the science data, to keep information about the data with the data.

NSSDC supports the distribution and archiving of astrophysics data through a variety of online and offline services. There are currently over 18 online interactive systems supported (see Green, 1990). The center is work-

see Astrophysics, *p. 16*

CDDIS Begins To Archive Global Positioning Data

The Crustal Dynamics Data Information System (CDDIS) has recently begun the archive of Global Positioning System (GPS) data for the Crustal Dynamics Project (CDP).

The GPS system was developed by the U.S. Department of Defense to provide support for military navigation and timing. There are, however, additional applications in the civilian market, such as local surveying for highway construction, airline, sea, and land navigation, and precise positioning for geodetic purposes.

GPS satellites transmit signals that are modulated by pseudo-random noise and superimposed with broadcast satellite messages, such as ephemeris, clock offsets, etc. The receiver decodes these satellite signals, allowing relatively accurate range measurements and broadcast satellite messages to be recovered. Geodetic measurements can be obtained by using relative positioning survey techniques. In this mode, two or more antennae are positioned with respect to each other and all receivers are operated simultaneously. When the data are post-processed with precise ephemeris data, relative site positions can be derived to a sub-centimeter accuracy.

The CDDIS GPS archive includes several different categories of GPS experiments: local, intercomparison surveys between existing Solar Laser Ranging (SLR) and Very Long Baseline Interferometry (VLBI) monuments, regional surveys, and footprint surveys.

Local surveys between SLR and VLBI monuments can be used for intercomparison of the analysis (e.g., site positions and baselines) derived from space geodetic techniques. A recent GPS experiment was conducted by personnel from the Onsala Space Observatory in Sweden connecting the VLBI antenna at La Silla, Chile (operated by Onsala) and the NASA mobile SLR site at Cerro Tololo, Chile. Three sites were occupied during this three-day survey: La Silla, Cerro Tololo, and Condoriaco, Chile. The La Silla telescope and the Cerro Tololo station are used in the global network of VLBI and SLR measurements.

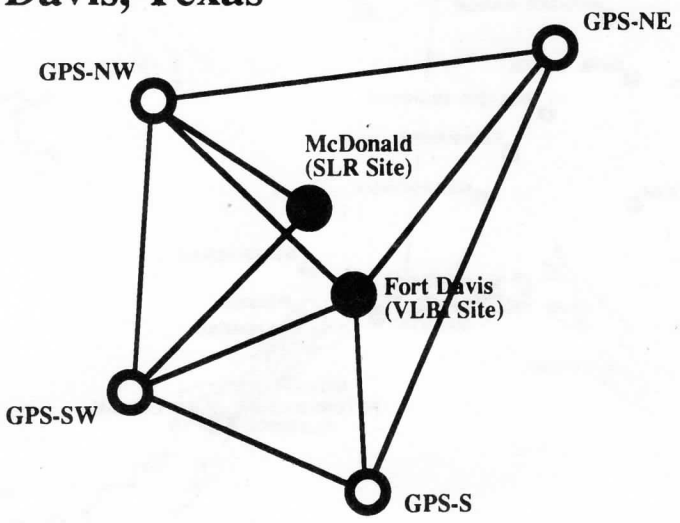
A recent regional survey of Alaska coordinated by NOAA/NGS for the Alaska Department of Transportation occupied nearly 30 sites (see figure) throughout Alaska, Canada, and the northern U.S., including eight mobile VLBI sites and the fixed VLBI site at Fairbanks. Eight NASA-owned receivers (four from GSFC and four from JPL) were loaned to this experiment. The data from this experiment has been transferred electronically from the Gilmore Creek Geophysical Observatory near Fairbanks to the CDDIS using NSI.

During the past summer, CDP GSFC receivers were first used to support studies in the geophysical integrity of the Project's SLR and VLBI sites. Small networks of GPS sites were selected in an approximate 10-20 km radius around the main observing monuments at several of key CDP sites. The measurements taken at these "footprint" sites will allow analysts to estimate the local tectonic stability of the area they encompass, assuring the integrity of the project's space geodetic measurements taken at these critical sites.

In addition to the surrounding footprint sites, measurements are taken at the reference monuments placed at a distance of 50 to 100 meters to the main marker. GPS measurements at the reference monuments will allow analysts to continue to monitor the physical stability of the main observing monuments and provide additional data for the estimation of the regional tectonic stability of the area. A

see CDDIS, *p. 14*

GPS Footprint Survey Fort Davis, Texas



SLR/VLBI Main Measurment Point

GPS Footprint Point

Measured Baseline

Scale: 1" ~= 7.5 miles

CDDIS, *from p. 13*

footprint survey of the Fort Davis VLBI and the McDonald SLR site (see figure) was completed by Bendix Field Engineering Corporation in June; GORF, GSFC will be occupied this fall for footprint studies. Future footprint sites include several key sites in California; Westford, Massachusetts; Haleakala and Kokee Park, Hawaii; and selected VLBI sites in Alaska.

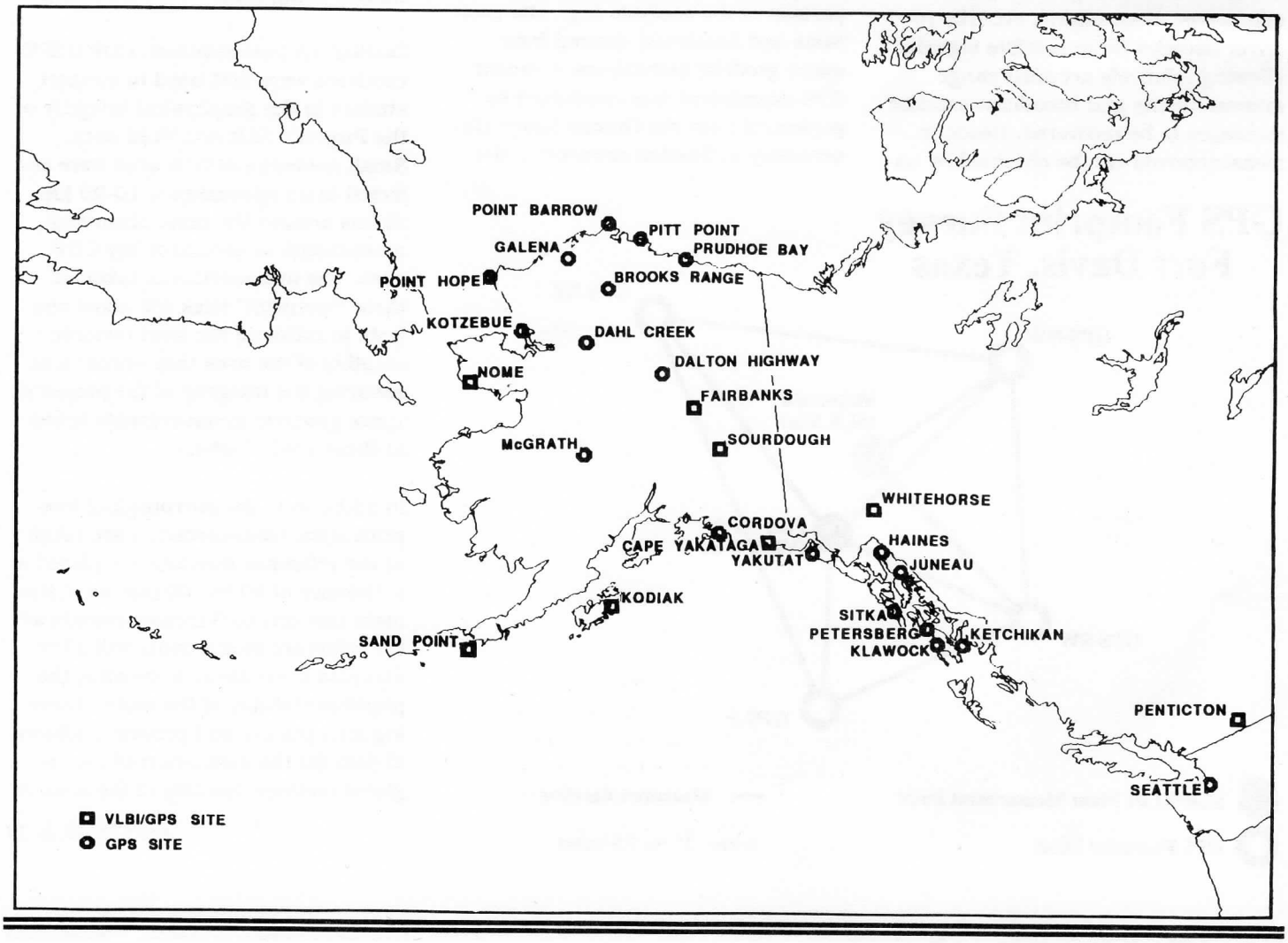
The CDDIS will archive GPS data from all types of the applications described above. Currently, the CDDIS is archiving data in raw, receiver format as well as the approved Receiver INdependent EXchange (RINEX) format. A set of tables in the CDDIS ORACLE data base has been created to track GPS experiment, session, site, and satellite information. Software has been developed to summarize RINEX-formatted GPS data and load the data base. CDP investigators can query these tables by time and location to determine data availability. The data are temporarily archived online to an erasable optical disk for archive processing. At that time, users can access this data and perform remote file copies to their home institutions for further analysis. As more GPS data arrives at CDDIS, older data are archived off line to tape.

NASA first established the CDP to apply space technology to the scientific study of Earth dynamics, tectonophysics, and earthquake mechanisms. The three basic methods of collecting measurements of crustal plate movements are satellite and lunar laser ranging, Very Long Baseline Interferometry, and the Global Positioning System.

A detailed article in the Summer 1988 edition of *NSSDC News* describes how SLR and VLBI methods work. The measurements derived from these techniques are used to accurately pinpoint within several millimeters the position of sites located worldwide. Comparing these measurements over many years allows scientists to monitor the movement of the tectonic plates that make up the Earth's crust.

The CDDIS, managed at NSSDC, is the repository for all of these measurements as well as the data archive for the Crustal Dynamics Project. The CDDIS was designed and implemented from its conceptual stage in 1982 by Carey Noll of the NSSDC. Ms. Noll currently serves as Data Manager for the CDP and continues to direct activities at the CDDIS. The Fall 1989 edition of *NSSDC News* includes a feature article with more information about the Crustal Dynamics Project.

Carey E. Noll



NSSDC Acquires Wide Variety of New ISEE Data

A number of new data sets from the International Sun-Earth Explorer (ISEE) mission have been acquired by NSSDC as part of the on-going effort to archive a large fraction of the data from the three ISEE spacecraft (*NSSDC News*, Fall/Winter 1988).

Routine data submissions during the course of the mission have generated a number of data holdings useful for browse and survey purposes as well as for detailed scientific studies.

For ISEE 1 and 2, these include pool data, ephemeris data, magnetometer summary tapes and plots (one-minute averages), high time-resolution (four seconds) magnetic field plots on microfiche (including selected magnetopause and bow-shock crossings), solar wind plasma data (hourly and five-minute averages for the early part of the mission), electron and proton flux survey plots (32-second averages for the early part of the mission), LEPEDEA energy-time spectrograms, ion composition data, plasma wave spectrum analyzer survey plots, and others; for ISEE3/ICE these include pool data, ephemeris data, solar wind plasma data (hourly and five-minute averages for the early part of the mission), magnetic field data tapes (one-minute averages), plasma wave summary plots (128-second averages), X- and gamma-ray bursts plots (32-second averages), and others.

In addition to the routine data submissions that have taken place since the beginning of the mission, a special effort is being undertaken to preserve and maximize the scientific return from the unique collection of observations of the solar-terrestrial environment represented by the ISEE mission. With the help of advice and input from the ISEE science community a number of time intervals were decided upon as being the most important and fruitful from the point of view of a mostly digital, high time-resolution, high-quality, long-term archive. NSSDC is currently focussing on building an ISEE data archive of particle, field, and wave measurements for the following intervals:

- October 23, 1977, to February 17, 1980 (from ISEE 1 and 2 launch through the first year and a half of operation of all three spacecraft, referred to as the "PRIME" period)
- October 15, 1982, to December 25, 1983 (the geotail phase of the ISEE 3 mission, referred to as the "GEOTAIL" period)
- September 10 to 14, 1985, for ICE (the comet Giacobini-Zinner encounter, referred to as the "GZ" period)
- March 29 to June 16, 1986, for ISEE 1 and 2 (the "PROMIS" campaign period)

Some of the digital data will be stored on nine-track magnetic tapes, while others will be recorded on 12" Write-Once-Read-Many (WORM) optical disk in a self-documenting format with SFDU (Standard Formatted Data Unit) labels.

As part of this effort, a number of new data sets have been submitted (*NSSDC News*, Spring 1989), and additional ones continue to be acquired. The plasma and magnetic field data collection is now almost complete for all four periods and three spacecraft. Typical resolutions for the high time-resolution plasma data (from Los Alamos National Laboratory) are 24 or 48 seconds (ISEE 1, solar wind ion moments); three or 12 seconds (ISEE2, ion moments); and 24, 84, or 168 seconds (ISEE 3 plasma moments, depending on time and whether protons or electrons; electron parameter data are time-continuous through April, 1986).

The magnetic field data time-resolutions are typically four seconds (from 12-second overlapping averages) for ISEE 1 and 2 (from the University of California, Los Angeles), and one minute (time-continuous through 1987), three-seconds (GEOTAIL), or 0.33-seconds (GZ) for ISEE3/ICE (from the Jet Propulsion Laboratory). The ICE GZ plasma and magnetic field data have also been included on the International Halley Watch CD-ROM.

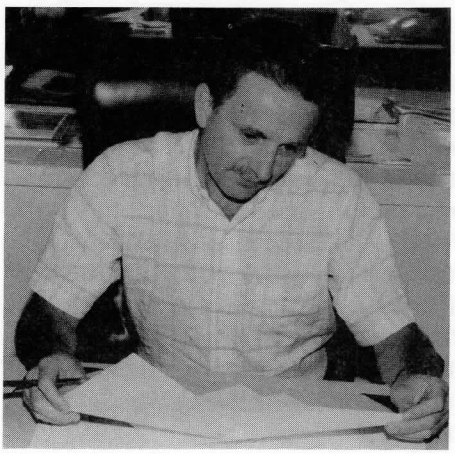
Other high-resolution digital data which have recently been acquired include three-dimensional proton and electron distribution functions (128 or 512 seconds, through January 1979) from the ISEE1 LEPEDEA instrument (University of Iowa); electron and proton fluxes (four seconds, PRIME and PROMIS) from ISEE 1 and 2 (University of Washington); alpha particle parameters (hourly, through 1983) from the solar wind ion composition experiment on ISEE 3 (Goddard Space Flight Center); energetic proton data (32 seconds, Imperial College, London); plasma wave data (0.5 to 8 seconds, TRW); and electron density and temperature (54 seconds, Observatoire de Paris, Meudon) from the ICE GZ comet encounter.

The NASA Master Directory describes many of the current NSSDC ISEE data holdings. A number of other ISEE data sets are in various stages of processing, documentation or migration to optical disk by the various ISEE teams and are expected to be added to the NSSDC archive in the relatively near future.

The Master Directory will continue to be updated with new information as additional data sets become accessible to the community.

Sumant Krishnaswamy

NSSDC Appoints William J. Campbell To Head Code 934



Bill Campbell welcomes new responsibility as head of Code 934.

William J. Campbell recently assumed responsibilities as head of NSSDC's Data Management Facility/Code 934, a position vacated over two years ago by Dr. Paul H. Smith, who left Goddard for a program management position in the Office of Aeronautics and Exploration Technology at NASA Headquarters. Campbell joined Goddard in 1978 and was assigned to the Eastern Regional Remote Sensing Applications Center (ERRSAC) through 1983, where he was responsible for the remote sensing and geographic information systems training program. He received his formal training in physical geography and environmental studies from Southern Illinois University.

Since joining the Space Data and Computing Division in 1983, he has served as deputy Project Manager and System Engineer for NSSDC's Pilot Land Data System, developing the original system concept that led to Goddard's being awarded lead center and having responsibility for overall project management. Campbell also served as the division's Earth Observing System Data and Information System (EOSDIS) System Engineer.

One of Campbell's most fulfilling roles was as creator and Principal Investigator of the Intelligent Data Management Project (IDM). This research enabled him to develop intelligent value-added services and systems that can support a large number of scientists and engineers involved in the management and use of space-derived spatial and symbolic information. The areas of concentration include the development of user interfaces, graphical data representation, advanced data structure design, and automatic data cataloging and characterization using artificial intelligence and neural networks.

Campbell's activities extend beyond the Goddard community. Currently, he serves as Associate Editor for the *Photogrammetric Engineering and Remote Sensing Journal* and as a member of the subcommittee on Comprehensive Epidemiologic Data Resources Information Systems project at the National Research Council of the National Academy of Sciences.

Campbell will be evaluating current activities within the branch and will be closely involved in the EOS-sponsored Data Active Archive Distribution (DAAC) activity that will serve as a level 0 prototype for EOSDIS.

Wendy Ames

Astrophysics, *from p. 12*

ing with the Astrophysics Data System (ADS) program to ensure that the accessibility of its archive holdings will be available through this new data system.

Standards Office

The NSSDC supports the NASA Science Data Systems Standard Office (NSDSSO), which was established to promote and facilitate the space and Earth science communities in developing cost-effective, interoperable data systems. The office has four distinct functional areas: standards administration, library, accreditation, and conformance and support. Briefly, the standards administration effort provides an active interface to other standards organizations within and outside NASA to foster both the exchange of standards information and the development of new standards. The library is concerned with collecting, updating, and disseminating information about existing and emerging standards of relevance to NASA data systems. Finally, the standards conformance and support operation is concerned with providing a variety of support to users utilizing a recognized standard.

An important service of the NSDSSO is its support of the Flexible Image Transport System or the FITS format. The office maintains an online interactive system that containing abstracts of the appropriate documentation on the definition and conformance to the FITS standard format. Within NSDSSO,a FITS standard office, staffed during business hours, has been established to assist requesters in the use of FITS in their products, participate in the evolution of FITS, develop FITS conformance software in consultation with FITS experts. In addition, the FITS Office is currently documenting the current understanding of the FITS to replace some of the existing documentation containing limited examples and ambiguities and to present FITS as a well illustrated and supported standard.

Michael Van Steenberg
James L. Green

NEWSBRIEFS-NEWSBRIE

Jacobs Presents New Database System to DARPA

On Friday, October 5, Dr. Barry Jacobs gave a presentation and subsequent demonstration of the Distributed Access View Integrated Database (DAVID) system to the management of the Software Technology for Adaptable, Reliable Systems (STARS) Program of the Defense Advanced Research Projects Agency (DARPA). The objective of the meeting was to explore the possibility of utilizing the DAVID system in the development of a multi-agency prototype for software managment for the High-Performance Computing Initiative. The demonstration was well received and further discussions and planning sessions are being scheduled for future dates.

In the DAVID system, local area networks of computers are modeled as libraries, and collections of local area networks are modeled as consortiums of libraries. The DAVID software provides uniform access to heterogeneous object type management systems (e.g., database, spreadsheet, manuscript, etc.). In addition, the DAVID system aggregates heterogeneous types of data (e.g., databases, manuscripts, images, etc.) as logical "book" and/or "kit" objects. Collections of software for the High-Performance Computing Initiative will be modeled as "books" and "kits" of software tools which well be cataloged in the DAVID libraries/library consortia.

B. Jacobs

SPAN Disbands, *from p. 8*

be completely phased out with NSI performing all their functions from ARC. The responsible organization for wide area networking at GSFC is the ADFTO, which is headed by Pat Gary. It had been hoped that the SPAN management team could be absorbed into the new management structure; however, this was not possible. For a number of reasons, some key members of the SPAN management team have chosen to move on to other activities within the Agency.

The NSI project at ARC will be calling the DECnet network (formerly SPAN) the *NASA Science Internet DECnet* or *NSI/DECnet*. Technically, this transition will occur by December 15, 1990, when full user support activities at GSFC will be under the AFTO, and the NSI Project Office will be responsible for the management and operations of all DECnet services to the science user community.

This issue of *NSSDC News* is the last in which DECnet networking is referred to as SPAN.

Jim Green and Dave Peters

NSSDC Distributes HST Early Release Observations

In conjunction with the Hubble Space Telescope (HST) project, the National Space Science Data Center (NSSDC) is distributing via network and magnetic tape some of the HST Early Release observations. This data set contains some of the first results obtained with the Hubble Space Telescope cameras, and is available to all interested parties. These data were obtained by the Investigation Definition Teams during August 1990 as part of the Science Assessment and Early Release observations. Further details of these programs can be found in the August issue of the STScI Newsletter. The Hubble Space Telescope project is releasing these data now to facilitate the reassessment of HST observing programs. Accordingly, these data have been distributed to all general observers and guaranteed time observers who have HST time in forthcoming observing cycles.

A second data set containing spectrograph observations will be compiled and distributed once these data are received (expected later this year). The HST project is also compiling a collection of OTA point spread function images for its own analysis of the spherical aberration and plans to have these data generally available in the months ahead.

Scientific investigations utilizing these data are already underway by the Investigation Definition Teams (IDTs). The IDTs will submit the scientific results for rapid publication.

NOTE: Data users should consider the following when inspecting these images: these are early data, and not all the software bugs have been fixed nor all the calibration wrinkles ironed out. In particular, many of the files used to calibrate the data are derived from ground observations that are now inappropriate. In other words, treat the data with care.

Michael Van Steenberg

CALENDAR

Dec. 3-7: American Geophysical Union, Fall Meeting
San Francisco Civic Auditorium, CA
MD/NSI booth will be present

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Jan. 10-11: PLDS Science Working Group Meeting
NSSDC, Goddard Space Flight Center

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Jan. 14-17: American Meteorological Society Annual Meeting
Hyatt Regency Hotel, New Orleans, LA
MD/NSI/NCDS booth will be present

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SPAN Tail Circuits Move to Another Building at Goddard

Approximately 20 Space Physics Analysis Network (SPAN) tail circuits, which link SPAN East Coast tail sites to the SPAN Routing Center at GSFC, have been moved from NSSDC's computer facility in Building 26 to the Local Area Communications Network (LACN) External Interface Room in Building 1. The move was planned and executed in August by personnel from ST Systems Corporation, Boeing, General Electric Corporation, Bendix Field Engineering Corporation, and NASA.

A large amount of computer communications routing equipment was also moved to continue to support SPAN East Coast tail circuits. The new location in Building 1 provides a shorter, simpler interface into Program Support Communications Network (PSCN) facilities and gives the SPAN user community a more robust as well as reliable network service.

Dave Peters

NASA CD-ROMs Displayed at Washington, DC, Trade Show

At the September Federal Office Systems Expo (FOSE) show at the Washington Convention Center, personnel from NSSDC staffed the NASA booth and showed various NASA CD-ROM (Compact Disk/Read Only Memory) disks, each holding about 600 Megbytes of data.

The NASA booth was one of many representing various federal agencies; the coordinated showing was arranged by USGS CD-ROM expert Jerry McFaul. The NASA disks displayed included Voyager planetary image data, International Halley Watch comet data, the GSFC Astronomical Data Center's multi-catalog disk, and the JPL West Coast Time Series of Nimbus 7 Coastal Zone Color Scanner data. Many people visiting the booth requested disks; most of the booth's visitors were professionals in other disciplines, and they seemed to share an interest in and support for NASA activities.

The booth was planned and staffed by the Central Data Services Facility personnel. Key participants included Jordan Gottlieb, Lee Brotzman, Carolyn Ng, and Ed Grayzeck. In addition, Ed Grayzeck gave a 30-minute presentation a general interest session, where agency representatives recounted their experiences with and future plans for CD-ROM. NASA and several other agencies are actively exploiting this technology for the dissemination of various data bases of wide interest.

Joseph King

International Neural Network Society Meets

The Neuroengineering Research Center of Southern Illinois University, in collaboration with the the International Neural Network Society, held its first workshop September 5–7. Over 200 researchers from engineering, the biological and social sciences, and mathematics attended.

Invited speaker William J. Campbell, head of the Data Management Systems Facility, discussed his research in intelligent data management on September 6. Campbell is studying the use of neural networks to characterize and label data that will be generated by the Earth Observing System planned for launch in the late 1990s.

Other talks covered a variety of issues related to the establishment of constructive collaboration for the advancement of neuroengineering research and development. Information technology and machine intelligence, mathematical, computational, and theoretical approaches to understanding brain functions, high energy physics, and sensor fusion were among the subjects discussed.

Funded through a grant from the Illinois Technology Challenge Fund, the international workshop inaugurated the Neuroengineering Research Center's commitment to creating productive liaisons among researchers.

William Campbell

NSSDC Supports Use of Data Format Standards

NSSDC leads NASA's effort in the development of the international Standard Formatted Data Unit (SFDU) standards and also plays an active role in supporting project use of standards. The International Solar Terrestrial Physics (ISTP) Global Geospace Science (GGS) program has adopted use of basic SFDU labeling for data output from its Central Data Handling Facility (CDHF) and the definition of a standard contents identifier to be associated with all output data.

At the same time, NSSDC continues to work with the project to define additional commonality in instrument data formats within the SFDU framework, which would facilitate achievement of ISTP science goals in understanding the global structure and dynamics of Earth's magnetosphere. Such a two-step approach to format standards allows the project to proceed with the CDHF data management design and gives the investigators additional time to further define their requirements and the optimal tradeoffs to meet them. The use of

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SFDU labels and a standard contents identifier to be associated with all ISTP CDHF output data products is expected to significantly improve NSSDC's ability to rapidly ingest and catalog the ISTP/GGS data and to make them available for subsequent access by the space physics community (within appropriate project guidelines).

Many international and NASA projects have adopted the basic data labelling and description approach defined by the SFDU standards. Such projects include the European Space Agencies' Cluster and Eurica efforts as well as NASA's Magellan, Mars Observer, Comet Rendezvous/Asteroid Flyby (CRAF), Earth Observing Systems Synthetic Aperture Radar, Space Infrared Telescope Facility (SIRTF), Dynamics Explorer, Pioneer 10 and 11, Halley Watch, and Upper Atmosphere Research Satellite (UARS).

Robert McGuire and Donald Sawyer

Dynamics Explorer (DE) Data Archive Defined

Sufficient progress has been made in the exchange of the metadata files between the Science Teams and NSSDC, that it is now possible to define the Dynamics Explorers 1 and 2 data files to be archived at NSSDC.

At the DE Science Team Meeting held at GSFC on October 23 and 24, the NSSDC for the first time presented a look at the expected composite data archive. The presentation showed, for each instrument, whether telemetry or geophysical parameters are being archived, their time resolution(s), data files to be archived, software availability, and status in the archiving process. According to present estimates, about 75 optical disks will be archived, along with three tape data sets. The WORM optical disks are being written at the Principal Investigators' sites, and in most cases include both the metadata files and the data files. Specifications for the metadata files were developed jointly by NSSDC, the DE Project, and the DE Science Team. These metadata files, and in some cases software, were generated by the PI teams, reviewed by NSSDC, and finalized by the PI teams.

Richard Horowitz

EXOSAT Moves to NDADS SPAN Node

During the last week in August 1990, the EXOSAT Database System was installed on the NSSDC Data Archive and Distribution Service (NDADS) cluster. The EXOSAT Database System was developed in Europe to provide scientists an access method to the results from the European Space Agency's X-ray observatory EXOSAT (1983-1986). Since then it has become a very popular online information system for the entire high energy astrophysics community. This system provides on-line access to the results and data products (spectra, images, and lightcurves) from many X-ray astronomy missions including EXOSAT and EINSTEIN.

The system offers many tools for evaluating the on-line data, including an imaging package, a spectral fitting program and a browse utility. The browse utility allows users to search the resident data catalogs for particular targets by name, position, and pertinent fields within the catalogs. Users can filter the data retrieved from the searches and look at data samples. Data samples can also be plotted for evaluation by the user.

The EXOSAT Database System is available to users 24 hours a day both at NSSDC (through SPAN and NSI) and at ESTEC. For more information about the EXOSAT Database System, copies of Users' Guides, or general access information, contact:

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Jeanne Behnke and Carol Kanga

Sixth CI Workshop and CCSDS Meeting Held

The sixth Catalog Interoperability (CI) Workshop was held October 1-3 in Silver Spring, Maryland. Master Directories (MD) and CI were discussed by about 100 persons from an ever widening circle of federal agencies and international organizations. This workshop, led by NSSDC's Jim Thieman, identified areas of significant progress as well as the need for a yet more clear statement of the relations among various NSSDC-involved MDs (NASA MD, Global Change MD, CEOS Prototype International Directory); this is currently being developed.

Immediately following CI6, the Consultative Committee for Space Data Systems Panel 2 met. This group, best known for its development of Standard Formatted Data Units (SFDUs), met with representatives of MD/CI efforts to assess whether there was a useful role it might play in the evolution of standards to facilitate interoperability among directories and possibly more detailed level catalogs and inventories. This meeting, led by NSSDC's Don Sawyer, stimulated a useful exchange of views. CCSDS personnel are now developing recommendations pertinent to activities in the MD/CI arenas.

Joseph King

NSSDC Issues Bilitza's New Summary of Geophysical Models

The new document *Solar Terrestrial Models and Applications Software* by Dieter Bilitza (NSSDC 90-19, July 1990) identifies and describes models in several areas that are available to requesters, some of which may be run on NSSDC computers by external researchers.

The principal areas and parameters covered include ionosphere (electron density and temperature, ion temperature, composition, and drift, electric field and current, precipitating particle flux, etc.), atmosphere (density, temperature, winds, etc.), internal- and external-source geomagnetic fields, energetic trapped protons and electrons, and various solar electromagnetic and particle emissions.

Representative models include the International Reference Ionosphere, the Heppner-Maynard-Rich ionospheric electric field model, the COSPAR International Reference Atmosphere, the Tsyganenko geomagnetic field models and Solar EUV Flux model.

In addition to the models themselves, many software packages that are available for use with some of these models are described. Also, sources of geomagnetic and solar activity indices needed to parameterize some of the models are described.

Most of the models and software packages are available from NSSDC on tape, floppy disk, or electronically. The software is typically Fortran and has been run in IBM and/or VAX computers at NSSDC; software/models available on floppy disk have been revised to run on IMB PCs. Some of the items described in the document are available from other sources whose addresses are explicitly given.

Several frequently requested models have been outfitted with an interactive front end, which allows online specification of input parameters and output options. These models are the International Reference Ionosphere (IRI), the Mass Spectrometer and Incoherent Scatter (MSIS) neutral thermosphere model, the International Geomagnetic Reference Field (IGRF), and the AE-8/AP-8 models of the trapped particle fluxes in Earth's radiation belts.

All four of these models can also be accessed and executed on line on the NSSDC Online Data and Information Service (NODIS) account: From a SPAN node, SET HOST NSSDCA, then USERNAME = NODIS; then follow the prompts and menus.

Dieter Bilitza and Joseph King

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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:

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