National Space Science Data Center

NSSDCNEWS

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First COBE Data Products Ready for Access

NSSDC has just ingested initial data products from the Cosmic Background Explorer (COBE) satellite. These data are expected to be electronically accessed both by Guest Investigators funded through NASA's Astrophysics Data Program and by other astrophysicists around the world.

The COBE satellite was developed by NASA's GSFC to measure the diffuse infrared and microwave radiation from the early universe to the limits set by our astrophysical environment. It was launched November 18, 1989, and carried three instruments:

- **Far Infrared Absolute Spectrophotometer** (FIRAS) to compare the spectrum of the cosmic microwave background radiation with a precise blackbody
- **Differential Microwave Radiometer** (DMR) to precisely map cosmic radiation
- **Diffuse Infrared Background Experiment** (DIRBE) to search for the cosmic infrared background radiation

The cosmic microwave background spectrum was measured with a precision of 0.03%. The background was found to have intrinsic anisotropy for the first time, at a level of a part in 10^5, and absolute sky brightness maps from 1.25–240 microns have been obtained to carry out the search for the cosmic infrared background. An initial set of COBE data products is now available. The FIRAS data cover the Galactic plane to an absolute latitude of 15 degrees and provide spectra obtained in the 20–95 cm^{-1} band at 0.8 cm^{-1} spectral and 7-degree spatial resolution. The DIRBE data cover the Galactic plane, at 0.7-degree resolution, to 15 degrees latitude within 30 degrees Galactic longitude of the Galactic center and to 10 degrees elsewhere, in 10 photometric bands ranging in wavelength from 1.25–240 microns. The DMR data include all-sky maps from the first year of observations at 7-degree resolution at each of three frequencies: 31.5, 53, and 90 GHz, as well as calibrated pixel-ordered data. A second data release, in June 1994, will include all-sky DIRBE and FIRAS coverage, DIRBE polarimetry, FIRAS data from the low-frequency band, and the first two years' worth of DMR data. The remainder of the DMR and DIRBE data taken after the cryogen ran out will be ready for release by June 1995.

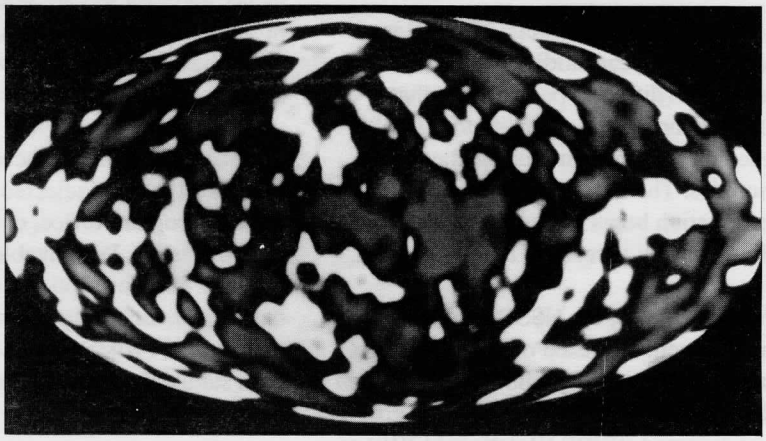
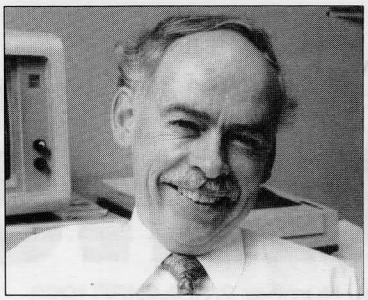


photo courtesy of GSFC

This image represents a microwave map of the whole sky made from one year of data from COBE's DMR. The Milky Way Galaxy horizontally spans the map's center.

see ***COBE Data,*** *p. 2*

inside



Director's Message: Major Information Base Now Remotely Accessible

The Master Directory (MD), developed and maintained by NSSDC for the NASA and global change research communities, has been remotely accessible over the networks for a few years. Built with the intent to identify, describe, and when possible, electronically link to publicly accessible data worldwide, the MD has experienced much usage and much success.

Less known is the fact that NSSDC has had over the years additional information bases with different perspectives that offer important functionality to the NASA research and program management communities. The most important of these information bases has just been made electronically accessible to remote users.

For many years, the NSSDC information environment consisted of a series of files called, as a group, System for Information Retrieval and Storage (SIRS). This group was renamed RSIRS (Relational SIRS) as the files were transformed to relational technology in recent years, and it has just been renamed again as the NSSDC Master Catalog (NMC) for ease of use.

A key component, or partition, within the NMC is the former Automated Internal Management (AIM) file. It is this partition that has just been brought online for remote access, although generally the data base is labeled NMC in the online interface.

NMC/AIM contains information about spacecraft, their instruments, and the data sets therefrom. In its role as the World Data Center-A for Rockets and Satellites, NSSDC keeps track of all launched spacecraft. The NMC/AIM has records for such spacecraft (now numbering about 4600) and also for about 60 prelaunch spacecraft. Of the launched spacecraft, almost 90% are for non-NASA missions. For the most part, data sets described in the NMC/AIM file are those held at NSSDC.

The NMC/AIM data base is now accessible via the same NODIS interface that provides MD access. (SET HOST NSSDCA or TELNET NSSDCA.GSFC.NASA.GOV; USERNAME=NODIS; follow the prompts and menus.) Spacecraft, experiments, and data sets are selectable by any of several query parameters, and users may view much information about selected entities.

For example, at the "spacecraft level," spacecraft may be selected by name, discipline, program office, or certain orbit characteristics. Displayable information includes text descriptions, overviews of data flows, archiving plans/status, orbit parameters, Project Data Management Plan status, associated personnel, instrument complements, etc.

The AIM File has been used in the past to generate NSSDC Data Catalogs, the Report on Active and Planned Spacecraft and Experiments, and a few other reports. Information contained in the AIM file has typically been acquired by NSSDC acquisition scientists via any of several paths. It has proven challenging to maintain the data base complete and current.

We hope that individuals responsible for various spacecraft and experiments will log into this data base, review its content, and leave comments for NSSDC staff updating the information content. Such feedback will constantly increase the data base to a state of ever-increasing utility. Note that the alternative was to defer public access to NMC/AIM until NSSDC staff had more completely updated the data base; this would have delayed access to presently available valuable information, so the judgement was to bring the present data base online even at the risk of complaints about some missing or outdated information.

The information content of NMC/AIM is at a relatively high level, as is also true for the differently oriented MD. NSSDC staff will be working to present a more integrated bundle of high-level information, including NMC/AIM's information on past, present, and future NASA and non-NASA spacecraft and instruments and MD's information on accessible worldwide data.

Joseph King

COBE Data, *from p. 1*

To acquire the presently available COBE data and associated documentation, follow this simple procedure:

1. Log in via ftp to nssdca.gsfc.nasa.gov under username ANONYMOUS.
2. Use your E-mail address as the password.
3. Change to directory (cd) anon_dir:[000000.cobe].
4. Download the file called AAREADME.DOC for further instructions.

The data are presented in FITS binary tables. Alternatively, the data and documentation may be obtained on tape by request to the CRUSO at (301) 286-6695 or via E-mail at request@nssdca.gsfc.nasa.gov.

For further assistance, please contact the author by telephone at (301) 286-0807 or E-mail at leisawitz@stars.gsfc.nasa.gov.

David Leisawitz

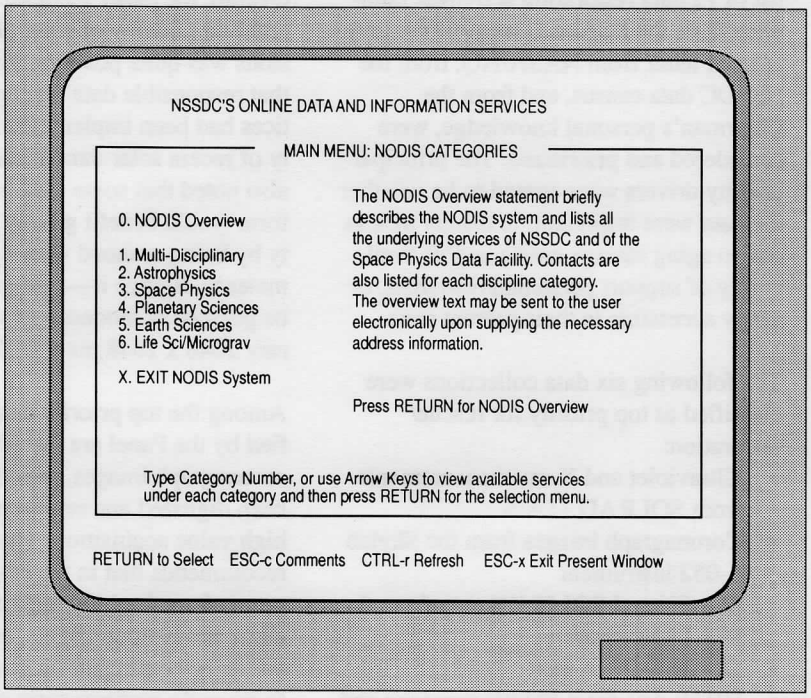
New NODIS Expands Services

Have you noticed NODIS lately?

NSSDC's Online Data and Information Service (NODIS) is an easy-to-use, menu-driven user interface to many of the most important data and services provided by NSSDC and the Space Physics Data Facility to the national and worldwide space and Earth science research communities. After 7 years of excellent service, NODIS not only received a facelift this past June, but it also nearly doubled its available services.

The new NODIS has a dual-interface capability that allows for both the straight ASCII display and the more graphical "windows"

These screens show the main NODIS menu and two of the next-level menus.



Center (SSC), the Coordinated Data and Analysis Workshop (CDAW), and the RSIRS information service. There are also some additional NODIS services with descriptive textual displays, such as the Space Physics Data System (SPDS), the ANONYMOUS account, Deep-Space Heliosphere Data (COHO), and the FITS User Support Office.

For NODIS newcomers, an Overview document lists all services offered and their contacts. This publication can be electronically mailed to users upon request.

How To Access NODIS

Using NSI/DECnet:

Set Host:	NSSDCA
Username:	NODIS

Using Internet:

Telnet:	128.183.36.23
Username:	NODIS

Via Direct Dial:

Set modem to 8 bits, no parity, 1 stop bit

For 300, 1200, or 2400 baud:

Dial 301-286-9000

For 9600 baud:

Dial 301-286-4000 ***or*** FTS 888-4000

At prompt "Enter Number"

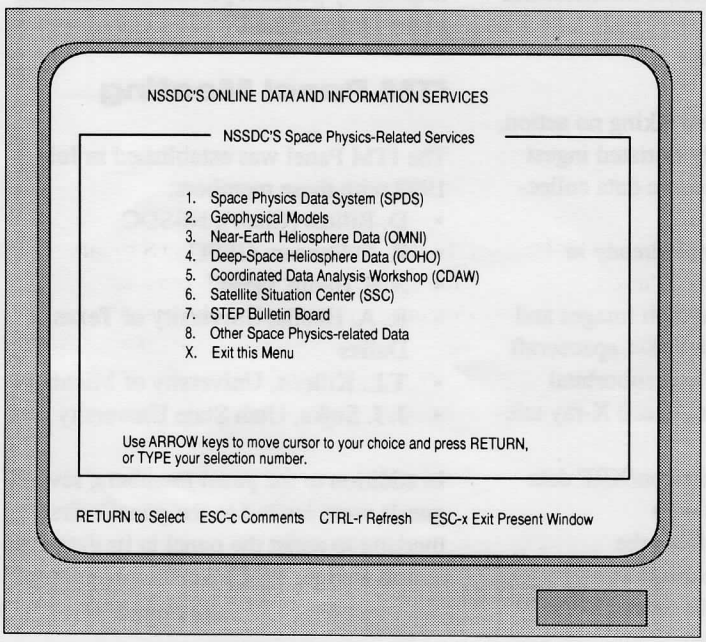
Enter NSSDCA

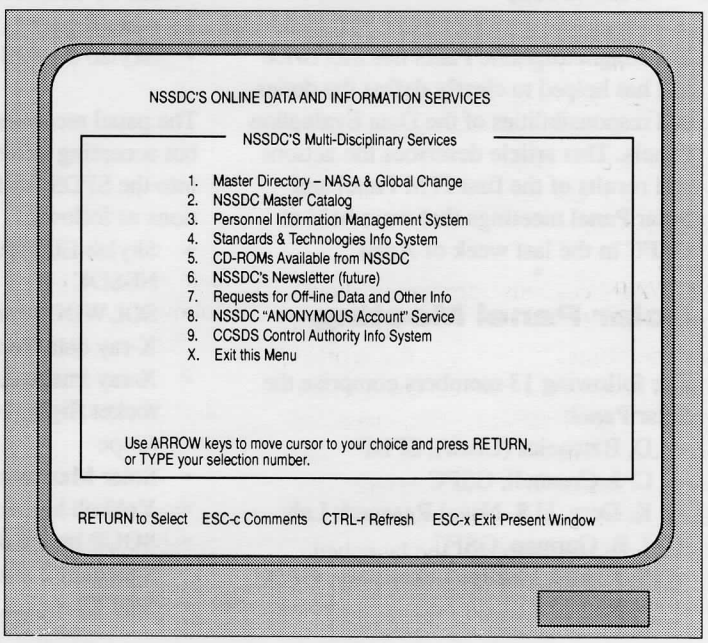
At prompt "Call Complete"

Enter <CR>

Username: NODIS

Nathan James





SPD Solar, ITM Data Evaluation Panels Meet

One of the most important returns from a spacecraft mission is the quantity of data collected. Maintaining these data in a scientifically useful condition is imperative in view of future scientific exploitation of these data and also as a duty to the tax-paying public—the ultimate funding source for these missions. A NASA-HQ Data Management Initiative (started in FY92) addresses two aspects of this task: (1) data restoration, to save data that are in danger of being lost permanently; and (2) discipline data systems, to make data readily available to the science community.

Recognizing the need for community support in identifying, assessing, and prioritizing data restoration projects, J. Willet of NASA-HQ's Space Physics Division, SPD, initiated the formation of Data Evaluation Panels in the Spring of 1992. Four panels and chairs were established to represent the science branches of the SPD, with NSSDC and the GSFC Space Physics Data Facility (SPDF) playing key roles:

- **Solar Panel**–Chairman David Batchelor (SPDF)
- **Ionospheric-Thermospheric-Mesospheric (ITM) Panel**–Chairman Dieter Bilitza (NSSDC)
- **Cosmic & Heliospheric (C&H) Panel**–Chairman Robert McGuire (SPDF)
- **Magnetospheric Panel**–Chairman H. Waite (SwRI)

The Magnetospheric Panel has met twice and has helped to clearly define the duties and responsibilities of the Data Evaluation Panels. This article describes the actions and results of the first ITM Panel and Solar Panel meetings that were held at GSFC in the last week of April.

Solar Panel Meeting

The following 13 members comprise the Solar Panel:

- D. Batchelor (Chair), SPDF
- C. J. Crannell, GSFC
- K. Dere, U.S. Naval Research Lab
- J. B. Gurman, GSFC
- S. Kahler, Phillips Laboratory, GPSG
- S. R. Kane, University of California Space Sciences Lab
- R. Kreplin, U.S. Naval Research Lab
- J. Mariska, U.S. Naval Research Lab
- W. M. Neupert, GSFC
- E. J. Schmahl, GSFC
- R. A. Shine, Lockheed Research Lab
- K. T. Strong, Lockheed Research Lab
- D. Zarro, GSFC

Batchelor also chose two additional members with experience in solar space missions from the late 1960s to the present. A list of 12 data restoration activities, compiled from the responses to an SPDS invitational letter from NASA/HQ, from the NSSDC data census, and from the Chairman's personal knowledge, were considered and prioritized. The principal priority drivers were agreed to be whether the data were important, in danger of loss due to aging storage media and/or availability of support personnel/resources, or easily accessible in their present state.

The following six data collections were classified as top priority for rescue/restoration:

- Ultraviolet and X-ray measurements from SOLRAD 11A/B
- Coronagraph images from the Skylab S-052 instrument
- SOLEX and SOLFLEX data from the P78 1 spacecraft
- Skylab S-082A data
- HRTS data from Shuttle missions and other flights
- Skylab S-082B data

The panel recommended taking no action, but accepting externally initiated ingest into the SPDS for five more data collections as follows:

- Skylab EUV data not already in NSSDC
- SOLWIND coronagraph images and X-ray data from the P78-1 spacecraft
- X-ray image data from suborbital rocket flights of the AS&E X-ray telescope
- Solar Maximum Mission/XRP data
- Yohkoh spacecraft data
- SOUP image data from the Spacelab/2 Shuttle mission
- SERTS rocket flight data

Two data sets were judged insufficiently scientifically important to justify the restoration effort that would be necessary, or they were available in other adequately useful forms (e.g., microfiche at NSSDC); therefore, the following two data sets will be discarded:

- OSO-8 spectra and Shuttle X-ray Polarimeter data (both held at Columbia University)
- Digital data from the OSO-8 Mapping X-ray Heliometer

Overall, the panel's assessment of the archiving quality of solar physics missions was quite positive. The panel noted that responsible data management practices had been implemented in the majority of recent solar data missions. The panel also noted that some data in photographic form would benefit greatly in accessibility by being scanned with a microdensitometer to digitize it—a project that could be pursued at modest cost with contemporary 2048 x 2048 pixel CCD technology.

Among the top priority data sets identified by the Panel are the 10,000 Skylab coronagraph images, which have already been digitized and represent an especially high value acquisition. The Panel also recommends that in the evaluation of proposals for suborbital rocket flight missions and balloon flights, awarding of grants be contingent on good-faith efforts to properly perform permanent archiving of the data returned.

ITM Panel Meeting

The ITM Panel was established in July 1992 with these members:

- D. Bilitza (Chair), NSSDC
- R. F. Benson, GSFC
- A.E. Hedin, GSFC
- R. A. Heelis, University of Texas at Dallas
- T.L. Killeen, University of Michigan
- J. J. Sojka, Utah State University

In addition to the panel members, several guests were invited to the panel's first meeting to assist the panel in its data evaluation charge: W. Calvert (University of

*see **Panels Meet**, p. 5*

Mathews Earns 1993 SSDOO Peer Award

The Space Science Data Operations Office held its Peer Awards Luncheon on July 21, 1993. One award was given this year, an award consisting of a framed certificate of appreciation, a commendation in the employee's personnel file, and a modest cash bonus.

The winner this year was Jason Mathews, an NSSDC computer scientist who has made exceptional contributions to the programming efforts supporting the Common Data Format, the SSDOO's portable, multidisciplinary standard data file format. Mathews developed software for viewing CDF image files on IBM-compatible PCs.

David Batchelor

photo by NSSDC Photo Lab

Jason Mathews (third from right) stands with Peer Awards Committee members (left to right) Michael Van Steenberg, Jeanne Behnke, James Green (SSDOO Chief), David Batchelor, and Marjorie Pasini.

***Panels Meet,** from p. 4*

Iowa) and J. Grebowsky, W. Hoegy, and W. Kasprzak (GSFC). Excellent meeting support was provided by R. Sharma (SAIC) and S. Kayser (NSSDC).

Seven candidate projects for data restoration were evaluated and prioritized during the one-day meeting. These proposed projects were identified through community surveys (1990/91 OSSA/NSSDC Data Census, 1992 informal SPD survey) or through direct submission to the panel chair. In its recommendations to the SPD, the panel gave top priority to two data sets, both of which are of high scientific value and are threatened by imminent destruction:

(1) Alouette and ISIS satellite data include a unique diagnosis of the topside ionosphere. These data, presently in danger of final disposal, cover two solar cycles and will not be reproduced in any future mission. Only about 20% of these data are archived at NSSDC on microfilm and only a few percent on magnetic tapes. A pilot study is recommended to restore a few hundred tapes, selected for scientific value, from analog, low-density format to digital, high-density format.

(2) A unique set of Ion Mass Spectrometer rocket data was collected through the '60s, '70s, and '80s by R. Narcisi and his team at the Air Force Phillips Laboratory. Such in situ sampling of the ion composition as a function of altitude is no longer performed. The ITM recommends that the feasibility of archiving these data be assessed.

In response to two other restoration proposals involving airglow data (OGO 1 to 4, AE-C, -D, -E), the panel recommended that the Airglow Data Analysis Facility at the University of Michigan in Ann Arbor be considered for the evolving Space Physics Data System (SPDS), thus providing the community with access to airglow data and analysis tools.

The panel also identified several existing data sets that are not currently archived and that might still be possible to acquire. These include ESRO 4 mass spectrometer and plasma measurements, OGO 6 visible optical data, SETA 1 and 2 Air Force accelerometer and orbital decay data. Panel members will contact potential data providers and further actions will be discussed at the next panel meeting. To support the identification of scientifically important but not yet archived ITM data sets, a listing of ITM satellites, experiments, and NSSDC-held data sets will be posted for community review on the NSSDC Online Data and Information Services (NODIS) and ANONYMOUS account system. The panel reviewed a preliminary version of the listing generated by NSSDC and provided feedback for the final version.

Finally, a list of ITM magnetic tape data sets at NSSDC was prioritized to assist the ongoing restoration effort at NSSDC. Each data set was categorized as high priority, low priority, not recommended for restoration, or more information required for an assessment by the panel.

The ITM Panel unanimously endorsed the NASA-HQ (SMI/SPD) Data Restoration Initiative as a step in the right direction and strongly supports continuation of this effort. The behavior of the ionosphere, thermosphere, and mesosphere is inseparably linked to that of the magnetosphere, which in turn depends on solar and heliospheric conditions. Therefore, ITM recommends that a balance of funding efforts be maintained among these disciplines.

Following an invitation by Tim Killeen, the next ITM Panel meeting is now planned for early October at the University of Michigan in Ann Arbor.

David Batchelor
Dieter Bilitza

SSC Software Goes Online

The Space Physics Data Facility (SPDF), in conjunction with NSSDC, is pleased to announce that the Satellite Situation Center (SSC) Software System and associated data base are now available online directly to users associated with NASA-related programs. The SSC is a facility operated by NSSDC to fulfill key international responsibilities, such as the SpaceWarn bulletins, and to assist scientists and mission planners in studies of Earth's magnetosphere. The SSC Software System developed by SPDF is one mechanism to provide such assistance. The software is based on models of Earth's magnetospheric regions and magnetic field. Programs generate information listings and trajectory plots for planning spacecraft instrument operations and data analysis. These programs identify the time periods during which a specified spacecraft is in a particular magnetospheric region, allow a choice from a variety of internal and external magnetic field models for field-line tracing options, plot spacecraft trajectories, and perform conversions among geocentric and magnetic coordinate systems.

System Capabilities and Data Base

The core of the SSC Software System consists of three components: Query, Locator, and Calculator.

The Query component provides two query matching options: magnetospheric region occupancy and magnetic field line tracing. The region query lists the entry and exit times during which specified satellite(s) were in particular magnetospheric regions. The trace query identifies either periods when one or more spacecraft are on the same magnetic flux tube of force as a specified lead spacecraft, or periods when one or more spacecraft occupy a field line that traces down to a specified ground station.

The Query user can specify up to nine "conditions," which consist of the spacecraft selections and other parameter selections that define a region occupancy query or a field line tracing query. The current condition number is located at the top of the screen. The trace model selection, as well as the start and stop times, are used throughout all conditions, which may be queried independently or together. Note that for a very long time period, a large number of spacecraft, and a complex query, the execution may be time consuming. Users can interrupt an execution if it takes more time than anticipated.

The Locator component provides tabular and graphical location information. As tabular output, the spacecraft's coordinate location can be listed in a variety of systems, as well as other location-related items, such as magnetic field line footprints; magnetospheric region; distances from the spacecraft to various regions; and the L value, magnetic field strength, and invariant latitude at the coordinate location of the spacecraft. As graphical output, a 3-D plot of the spacecraft's trajectories (in the GSE coordinate system only at this time) is generated. The graphics user may change the view angle and zoom factor, project spacecraft trajectories to a coordinate plane, display selected magnetospheric regions, and label points along satellites' trajectories.

The main screen of the Locator component requires selection of at least one spacecraft and at least one time range for which location information will be printed or plotted for each point in the data base within the given time range(s), unless a data base resolution factor value is specified for a spacecraft. Also note that the graphics capabilities of the Locator component are only available if the user selects X Windows as the terminal type and has X Windows Release 5 with the PEX extension installed on the user's local machine. If only Release 4 is available, or the PEX extension to Release 5 is not installed, the user can use the graphical interface to the software but will NOT be able to run the graphics programs from the Locator component.

The Calculator component tests and displays conversions among coordinate systems used in the SSC Software System. It also calculates coordinate local times, magnetic field line footprints, and magnetospheric region occupancy for individual points.

Other options on the Main Menu include utilities for viewing data base contents, viewing and transferring data files, and viewing Usage Notes.

The SSC maintains updated predictive and definitive ephemeris data for 33 satellites. They are calculated from orbital elements using software provided by the Flight Dynamics Division at GSFC. This option from the Main Menu lists the time range for which ephemeris data are available for each satellite in the SSC data base, together with an indication of whether the ephemeris data are predictive or definitive. Not all of the SSC data base is kept online at this time. Ephemeris data prior to 1991 are offline, so please contact the user support office for help (details follow article).

Access Through NODIS

To access the SSC Software System, log on to the NODIS account and give the information requested (see the NODIS article on page 3 for instructions). Select the NEW NODIS interface when asked for a preference, and then select the Space Physics option from the menu to get a submenu of more options. From this submenu, select the "Satellite Situation Center" option. (Selections are made by highlighting items with the arrow keys or tab key and pressing RETURN.)

Within the SSC option, choose the type of terminal. There are three major types of terminals to choose from: **VT100/VT100** emulators (for character-mode access), the **SUN Shelltool** (also character-mode access) and **X Windows** (to access the 3D graphics). Several specific VT100 terminal emulators are supported with special keyboard configurations, as well as a generic VT100 option. The SUN Shelltool should only be selected from a SUN workstation running OpenWindows. The X Windows option should only be selected when using a workstation running X Windows, an X terminal, or an X Windows emulator on a Macintosh or PC. This option gives users access to graphics and the graphical user interface (GUI).

Navigation and Hints

The TAB key and arrow keys cycle through selectable items in the user

see ***SSC Software System,*** *p. 7*

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interface. The mouse also can be used to navigate through the interface if the GUI is being used. For navigation purposes, some special keys are defined on the status line at the bottom of the screen. Pressing the RETURN key selects an item.

Many items in the user interface have accelerator keys associated with them. Some of the key sequences for these items vary depending on the type of terminal being used. They appear to the right of the item if there is sufficient room, or on the status line at the bottom of the screen. Some accelerators make use of function keys like F1, others are escape sequences, and others are control sequences. When using an escape sequence like "esc h," the escape key is pressed followed by the "h" key. When using control sequences, however, like "ctrl-T" (or "^T"), the control key and the "T" key are pressed simultaneously. **CAUTION:** If the terminal type selected is not the actual terminal type being used, some accelerators may not be correct. In this case, only go through the interface using the TAB and arrow keys.

Other useful key sequences are ctrl-E to return to the previous screen and ctrl-W to refresh the screen. If problems are encountered while running the SSC Software System, pressing ctrl-E several times in succession returns users to the Main Menu. Ctrl-W is particularly useful when local system messages are printed to the screen, overwriting part of the user interface. Regardless of the terminal type selected, these key sequences are always available to the user.

"Help!"

There are two types of Help in the SSC Software System. The first is screen Help, which gives an overview of the currently displayed interface screen. Screen Help is accessed by moving to the button labeled HELP and pressing RETURN, or by using the HELP accelerator key, "esc f." For detailed information about a particular item on the screen, move to that item and press "esc h." These escape sequences for the two levels of Help are the same regardless of the terminal type that was selected.

For More Information

Users' Guides are available upon request. The SSC Software System is an evolving tool for scientific analysis. As such, problems to be solved and features to be implemented still exist. Inquiries, user comments, suggestions, and problem reports are greatly appreciated. Please forward them to NSSDC's Coordinated Request and User Support Office, which you can contact as follows:

Phone: (301) 286-6695
FAX: (301) 286-4952 (until 10/1/93)
(301) 286-1771 (as of 10/1/93)
Internet: request@nssdc a.gsfc.nasa.gov
NSI-DECnet: NSSDCA::REQUEST

Lara Aist-Sagara

Space Physics Data System Planning Workshop Held

A planning workshop for the Space Physics Data System (SPDS) was held at Rice University in Houston, TX, on June 1–3, 1993. Staff of the NSSDC and the Space Physics Data Facility (SPDF) attended to participate in the discussions and give demonstrations of their numerous data, information, and analysis systems that are relevant to the SPDS.

In the absence of significant SPDS-specific funds, the SPDS initially will be created as a consortium of preexisting space physics-relevant facilities and systems. Key elements of NSSDC and SPDF contributing to SPDS will be the NASA Master Directory; the NSSDC Master Catalog; the Satellite Situation Center (SSC); the Coordinated Data Analysis Workshop (CDAW) system; online data such as high- resolution, NDADS-resident IMP, DE, ISEE, and Skylab data; NODIS-accessible hourly "OMNIdata" and geophysical models; and FTP-accessible heliospheric field, plasma, and cosmic ray data (COHO).

The workshop consisted of a few initial overview talks, including one on "lessons learned from other NASA discipline data systems" by Joe King, demonstrations of university-resident and NASA-resident on-line systems, and discussions within four panels (policy, data issues, data system issues, and software issues). NSSDC and SPDF personnel involved in the demonstrations were Lara Aist-Sagara, Dieter Bilitza, and Bob Candey.

Jim Willett, responsible for the SPDS definition/development and for other MO&DA matters at NASA Headquarters' Space Physics Division, attended, and he appreciated the community input. Workshop participants included approximately 70 community members, representing the culmination of the efforts of the SPDS Steering Committee, whose role was to develop the pre-workshop SPDS Concept Document and to assure a successful community workshop. Future evolution of SPDS will be guided by an SPDS "project coordinator" and four "branch coordinators" who map to the four discipline branches of the Space Physics Division. All of these individuals will be named in the near future.

Researcher-attendees discouraged near-term funding of the SPDS by diverting Space Physics Division research funds. It is hoped that after a year or two, the NASA fiscal environment will be sufficiently improved to enable reasonable funding of the SPDS from "new funds." At that time, SPDS would be able to significantly facilitate the ready finding, accessibility, and usability of important space physics data beyond the levels now possible with present systems.

Joseph King
Robert McGuire

Table of New Data

NSSDC ID	SPACECRAFT	EXPERIMENT	CONTACT	MEASUREMENT	TIME SPAN	MEDIA	STATUS
71-063A-02K	Apollo 15 CSM	Panoramic Photography	Howington-Kraus	Hadley Rille digitized topography	07/30/71-08/04/71	magnetic tape	new
78-103A-05D	HEAO 2	Solid-State Spectrum	Holt	HME data base - photon counts	11/13/78-10/22/79	magnetic tape	new
73-078A-07C	IMP-J	Cosmic Ray Nuclear Composition	Murphy	Solar rotation count-rate plots	10/30/73-11/08/89	microfilm	addition
83-004A-01u	IRAS	Infrared Telescope	Wheelock	ISSA Reject File +20 to -20 degrees	02/10/83-11/23/83	8mm tape	new
78-079A-14E	ISEE 3	X-Ray/Gamma-Ray Bursts	Bromund	X-ray/Gamma-Ray data	08/12/78-02/07/87	8mm tape	new
78-079A-14F	ISEE 3	X-Ray/Gamma-Ray Bursts	Bromund	Software for X/Gamma-Ray data	08/12/78-02/07/87	8mm tape	new
78-012A-01B	IUE	UV Spectrograph	Van Steenberg	Spectroscopic image data	04/01/78-05/15/91	magnetic tape	addition
78-012A-01C	IUE	UV Spectrograph	Van Steenberg	European Spectroscopic image data	04/01/78-05/15/91	magnetic tape	addition
78-098A-09D	Nimbus 7	Solar Backscatter Ultraviolet	McPeters	Ozone data (total + profiles)	10/31/78-03/01/88	magnetic tape	addition
72-012A-02B	Pioneer 10	Charged Particle Composition	Lentz	Pulse height analysis data 15 min accumulations	03/03/72-12/31/91	magnetic tape	addition
72-012A-02C	Pioneer 10	Charged Particle Compos.	Lentz	5-min avg. count rate	03/03/72-12/31/91	magnetic tape	addition
72-012A-02D	Pioneer 10	Charged Particle Compos.	Lentz	15-min interplanetary data - SFDU	03/03/72-12/31/92	magnetic tape	new
72-012A-05G	Pioneer 10	Jovian Trapped Particle	Fillius	30-min interplanetary data - SFDU	03/03/72-12/31/90	magnetic tape	new
72-012A-12C	Pioneer 10	Charged Particle Telescope	Lal	6-hr interplanetary data - SFDU	03/03/72-12/31/91	magnetic tape	new
73-019A-02A	Pioneer 11	Charged Particle Composition	Lentz	15-min pulse height data	04/07/73-12/31/92	magnetic tape	addition
73-019A-02B	Pioneer 11	Charged Particle Compos.	Lentz	5-min sectored count rates	04/07/73-12/31/92	magnetic tape	addition
73-019A-02D	Pioneer 11	Charged Particle Compos.	Lentz	15-min interplanetary data - SFDU	04/07/73-12/31/92	magnetic tape	new
73-019A-05H	Pioneer 11	Jovian Trapped Particle	Fillius	30-min interplanetary data - SFDU	04/16/73-12/31/90	magnetic tape	new
73-019A-12D	Pioneer 11	Charged Particle Telescope	Lal	6-hr interplanetary data - SFDU	04/06/73-12/31/91	magnetic tape	new
78-051A-12F	Pioneer Venus 1	Magnetometer	Russell	12 s Magnetic and Electric Field Data at Periapsis	12/05/78-08/25/88	magnetic tape	addition
78-051A-13E	Pioneer Venus 1	Electric Field Detector	Russell	12 s Magnetic and Electric Field Data at Periapsis	12/05/78-08/25/88	magnetic tape	addition
75-075A-01c	Viking 1 Orbiter	Imaging	PDS	Mars images in compressed format		CD-ROM	addition
75-075A-01d	Viking 1 Orbiter	Imaging	PDS	Mars images in browse format		CD-ROM	addition
75-083A-01a	Viking 2 Orbiter	Imaging	PDS	Mars images in compressed format		CD-ROM	addition
75-083A-01b	Viking 2 Orbiter	Imaging	PDS	Mars images in browse format		CD-ROM	additon
89-033B-01A	Magellan	SAR	Arvidson	Basic image data records	09/15/90-09/13/92	magnetic tape	addition
89-033B-01C	Magellan	SAR	Arvidson	Compressed Once image data	09/15/90-09/13/92	CD-ROM	addition
89-033B-01D	Magellan	SAR	Arvidson	Compressed Twice image data	09/15/90-09/13/92	CD-ROM	addition
89-033B-01E	Magellan	SAR	Arvidson	Compressed Thrice image data	09/15/90-09/13/92	CD-ROM	new
89-033B-01F	Magellan	SAR	Arvidson	Full Resolution image data	09/15/90-09/13/92	CD-ROM	addition
89-033B-01N	Magellan	SAR	Arvidson	Compressed Once image data	09/15/90-09/13/92	8x10 b/w negs	addition
89-033B-01O	Magellan	SAR	Arvidson	Compressed Twice image data	09/15/90-09/13/92	8x10 b/w negs	addition
89-033B-01P	Magellan	SAR	Arvidson	Compressed Thrice image data	09/15/90-09/13/92	8x10 b/w negs	addition
89-033B-01Q	Magellan	SAR	Arvidson	Full Resolution image data	09/15/90-09/13/92	8x10 b/w negs	addition
89-033B-01R	Magellan	SAR	Ford	Global Emissivity data	09/15/90-09/13/92	4x5 color negs	addition
89-033B-01S	Magellan	SAR	Ford	Global Reflectivity data	09/15/90-09/13/92	8x10 b/w negs	addition
89-033B-01T	Magellan	SAR	Ford	Global Slope data	09/15/90-09/13/92	8x10 b/w negs	addition
89-033B-01U	Magellan	SAR	Ford	Global Topographic data	09/15/90-09/13/92	4x5 color negs	addition
89-033B-01a	Magellan	SAR	Ford	Altimetry Engineering data	09/15/90-09/13/92	magnetic tape	addition
89-033B-01b	Magellan	SAR	Arvidson	Compressed basic image data records	09/15/90-09/13/92	magnetic tape	addition

New Data Arrive at NSSDC

In each of the last several issues, we have listed data newly arriving at NSSDC. Starting with this issue, we shall also display those data, either newly arriving or promoted from NSSDC's offline archives, that are newly electronically accessible (typically from NDADS).

New Arrivals

New data at NSSDC in the area of space physics include interplanetary data in SFDU format from the University of Chicago Charged Particle experiments on Pioneer 10 and Pioneer 11. NSSDC also received additional magnetometer and electric field data from Pioneer Venus 1. Additional IMP-J count-rate plots from the Chicago Cosmic Ray experiment also were received.

A new solar physics data set consisting of X-ray and Gamma-ray data from ISEE 3 arrived on 8mm tape.

Planetary data arrivals include additional Magellan radar data on CD-ROM and as photo products. Additional CD-ROMs with Mars imagery from Viking 1 Orbiter and Viking 2 Orbiter also were received, as well as a new data set of lunar digitized topography from Apollo 15.

Astrophysical data arrivals included additional spectroscopic data from IUE and additional IRAS data from the IR telescope.

In the field of Earth science, NSSDC received additional ozone data from the SBUV instrument on Nimbus 7.

Newly E-Accessible Data from NSSDC

The following data have been added to NDADS over the past three months. Asterisks indicate data sets initiated with this period.

- OAO 3 (Copernicus) high-resolution UV stellar spectra
- DE 1 Auroral Image (SAI) and Plasma Wave (PWI) data
- Hawkeye magnetometer, plasma wave, and LEPEDEA data
- IUE Final Archive (FA) data and recent data processed with pre-FA algorithms
- ROSAT U.S. (continuing) and German (new) X-ray data
- IRAS Sky Survey Atlas and Faint Source Survey data

You can gain access to data files and to higher-level information about NDADS holdings overall and the individual data sets through the VMS (or Internet) MAIL utility, in adherence to very specific rules. This MAIL-based interface is called the Automated Retrieval Mail System (ARMS). How to use the ARMS is explained in detail in the *ARMS Users' Manual,* which is available in paper by sending your request to NSSDC's Coordinated Request/User Support Office or through the ARMS (see below).

Interactions with the NDADS system begin by SENDing a mail message to NDADSA::ARCHIVES or, over Internet, to ARCHIVES@NDADSA.GSFC.NASA.GOV. The content of the SUBJect line communicates to the system what service or data set is being requested. The message text of the mail is typically left empty, except when specific files of a data set are being requested, in which case the file names should be listed in the message area.

Use of SEND INFORMATION on the SUBJ line produces a high-level catalog of the NDADS-accessible data. Use of HOLDINGS PROJECT gives more detailed information on the data sets associated with the named PROJECT. Use of MANUAL on the SUBJ line results in the electronic transmission of the above-referenced *ARMS Users' Manual.* Use of REQUEST DATASET on the SUBJ line, along with a specification of file names in the body of the message, yields retrieval of the files from the DATASET. The files may be held in NSSDC's ANONYMOUS directory for retrieval or may be directly E-mailed to the retrieving computer, at the user's option.

See front page article for late-breaking news about new availability of COBE data!

Joy Beier
Jordan Gottlieb

Here's How

To discuss the archiving of data at NSSDC, contact:

Joseph H. King, Head
NSSDC, Code 633
NASA, Goddard Space Flight Center
Greenbelt, MD 20771

To request data or information from NSSDC, contact:

NSSDC (for U.S. requesters) or ***WDC-A-R&S (for non-U.S. requesters)***
both at:

Coordinated Request and User Support Office
NSSDC, Code 633
Goddard Space Flight Center
Greenbelt, MD 20771 U.S.A.

Telephone: ***(301) 286-6695***
FAX: ***(301) 286-4952****
Internet: ***request@nssdca.gsfc.nasa.gov***
NSI/DECnet: ***NSSDC::REQUEST***

To access NSSDC's online services (NODIS):

TELNET: ***128.183.36.23***
Username: ***NODIS***

***Effective 10/1/93, the number will be (301) 286-1771.**

First Joint CI/NSI Workshop Held in San Diego

The Spring Catalog Interoperability/NASA Science Internet (CI/NSI) Workshop was held in San Diego, CA, on April 26–29, 1993. This workshop joined members of the CI Working Group with the NASA Science Internet Users' Working Group for the first time. Other attendees included members of the Catalog Interoperability advisory group, scientists, data managers, and system engineers representing U.S. and international organizations and projects. They discussed recent progress on the Master Directory (MD) effort, as well as other directory/catalog/inventory efforts and network aspects of data system interoperability. The meeting featured status reports from the CEOS/IDN MD nodes, technical sessions on data base and networking technologies, and exhibits demonstrating current data base and information system development.

The first day featured a meeting of the operations and development staffs of NSSDC and the advisory group to discuss progress in the MD effort over the past six months. During that time, the operations staff generated 340 new data set entries, increasing the total number to over 2,000, while adding seven new remote data systems to the network, bringing the data systems total to 72. Discipline coordinators continue to work with Federal agencies in gathering information, while they also concentrate on the seven major areas of the U.S. Global Change Research Program (USGCRP)—namely Climate and Hydrologic Systems, Biogeochemical Dynamics, Ecological Systems and Dynamics, Earth Systems

*see **CI/NSI**, p. 11*

Astrophysicist Joins SSDOO/ADF Staff

The Astrophyics Data Facility (ADF) of the Space Science Data Operations Office (SSDOO) welcomes its newest astrophysicist, David Leisawitz.

Dave is assisting the COBE Science Working Group in all aspects of data management and dissemination. He oversees the establishment of the COBE guest investigator (GI) facility and testing analysis software, as well as proposes changes to improve the functionality of the GI facility. He played the key role in bringing initial COBE data to NSSDC (see cover article).

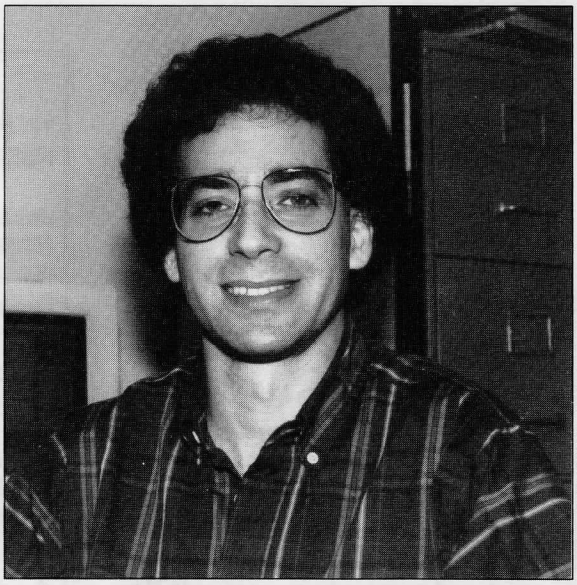


photo by NSSDC Photo Lab

In his role as one of NSSDC's acquisition scientists, Dave specializes in astrophysical data at wavelengths longer than 1 mm.

Dave is acting as NSSDC acquisition scientist for all astrophysical data at wavelengths longer than 1 mm, pursuing the archiving of complementary ground-based data, contacting team members affiliated with future missions, acquiring new IRAS data products and related documentation from IPAC, and establishing a hard-copy library of relevant mission and data product documentation.

From 1990 until he joined the SSDOO staff, Dave served as a research associate with the department of astronomy and astrophysics, Pennsylvania State University. Before that, 1989–90, he worked as a research scientist with the University Space Research Association (USRA) at Goddard's Laboratory for Astronomy and Solar Physics. From 1987–90, Dave worked as a research associate with the astronomy program, University of Maryland. His first involvement with Goddard's Laboratory for Astronomy and Solar Physics came during the period from 1985–87, when he served as a National Research Council res· ·rch associate. During the summers o1 ·8 and 1979, Dave worked in the nuclear and astrophysics research group of Grumman Aerospace Corporation.

Throughout his career, Dave has published widely, has been invited to give numerous lectures, and has received several grants. In addition to his professional work, Dave was a volunteer college algebra tutor at Pennsylvania State University; a volunteer lecturer at Houserville Elementary School, Houserville, PA; a volunteer lecturer at Reading Junior High School, Reading, PA; a volunteer teacher for the New York City school system; and a volunteer mathematics and science tutor for the city of Greenbelt, MD.

Dave received his Ph.D. in 1985 and his M.A. in 1981, earning both degrees in astronomy from the University of Texas, Austin, TX, where he worked as a research assistant and a teaching assistant. His thesis was entitled "Molecular Clouds Associated with Young Open Star Clusters." In 1979, Dave graduated *cum laude* with a B.S. in Physics from Rensselaer Polytechnic Institute, Troy, NY, where he worked as an National Science Foundation (NSF) summer student in physics.

NSSDC is pleased to welcome David Leisawitz aboard and to present him to the readership. His talents, skills, and training will help the SSDOO better serve the scientific community.

Kenneth Silberman

CI/NSI, from p. 10

History, Human Interactions, Solid Earth Processes, and Solar Influences.

The development staff implemented the new MD2 client interface in January 1993. Usage has been increasing, and MD2 users now outnumber the MD1 interface users. Overall usage statistics show that roughly 1,300 sessions take place per month. The staff also is developing a client application for X Windows and working with other agencies and groups in system development and interoperability.

The second day of the workshop featured a briefing by Jim Thieman on the status of the International Directory Network, during which he mentioned other groups around the world that will be participating in the future. Christine Falsetti then presented an overview of the NSI project office's current activities and future plans. The first technical session of the afternoon focused on case studies and practical applications for providing access by subject to data catalogs and information data bases. The speakers included professionals who have developed subject-domain thesauri and controlled vocabularies, an expert in semantic networking, and a system developer for an electronic thesaurus development maintenance and system. Participants demonstrated the thesaurus development and maintenance tool, a compact disk (CD) product containing a bibliographic data base and retrieval system, and a text retrieval system that uses semantic networking technology.

The third day started off with a technical session about evolving networking infrastructure and technologies. Infrastructure topics included the growing network in Japan, Europe, Russia, and South America. The network technologies portion covered the complex multiagency effort to provide a network link to Antarctica, new software development in support of Wide Area Appletalk, and cutting edge technology used by researchers working on virtual reality projects. The afternoon session focused on various search technologies and security issues.

The morning session of the last day focused on the extraction and visualization of catalog and metadata. The first part of the session discussed recent developments in fully or semi-automatic extraction. The second part dealt with the recent advances in visual presentation of hierarchical information.

The afternoon session was centered on the Master Directory and the International Directory Network (IDN), with discussion about the real user population of the MD, population strategy, constructing abstracts or data set descriptions, and software tools in the creation of DIFS. The second part included an overview of the IDN, brief status reports from the U.S., European, Japanese, and Canadian nodes, IDN node expansion, and IDN networking problems.

The next CI/NSI workshop is being planned for the Spring of 1994. If you wish to participate, please contact Jim Thieman at (301) 286-9790.

John Scialdone

Participants in the first joint CI/NSI workshop gather on the steps of Horton Plaza in San Diego for a group photo.

CDAW Goes Public, With Data from CDAWs 6, 7, and 8

The Coordinated Data Analysis Workshop (CDAW) program is operated by the Space Physics Data Facility (SPDF) and NSSDC as an effort to further the development and use of tools and techniques implementing large-scale collaborative scientific research. Using simultaneous data from many investigators, the program aims to attack significant physical problems of global scale that may not be otherwise addressable.

Typically a CDAW series begins when interested members of the science community decide there is an appropriate study topic and study period for a CDAW. Specific event periods within that period then are defined and a call for data is issued, requesting that relevant data be submitted to the CDAW program. These data are converted to a common format and held in a combined data base that is (initially) proprietary to the workshop participants and governed by a set of "Rules of the Road" that define appropriate and allowed uses of the data.

The operating CDAW program is distinguished by its combination of a "traditional" workshop format with assembly of a digital data base where the data and relevant models have been cast into a common format. Supporting software and graphics devices during the workshops allow participants direct interactive graphic display and data analysis. SPDF/NSSDC serve as a focus for the organization and logistics of the workshops. Access to the data base between workshop meetings is supported over electronic networks such as NSI/DECnet and NSI/TCP-IP.

The latest step in CDAW evolution is to make the display system and the currently nonproprietary data bases publicly available online as an option of the "NODIS" account on the NSSDC VAX cluster (see NODIS article on p. 3). Public access was initiated just prior to the AGU Baltimore meeting in late May and the early June workshop meeting of the Space Physics Data System (SPDS) and was demonstrated in both places. The CDAW system will remain available as one part of the early SPDS distributed system of data access, display, and analysis capabilities. NOTE: the nodes of the "pre-SPDS" are listed and accessible under the SPDS entry of the NASA Master Directory, itself an option of NODIS.

Over the past 15 years of the CDAW effort, there have been nine workshop series, all of which have involved the solar-terrestrial and space physics communities. The important CDAW data bases now are those connected with:

- **CDAW 6,** which includes two events from March 1979, selected as unique combinations of interesting magnetospheric phenomena and simultaneous coverage by numerous spacecraft and ground stations.
- **CDAW 7,** which includes two events from the period April–May 1979, selected to facilitate comparison of specific differing models of magnetospheric substorms.
- **CDAW 8,** which includes eight events from the period January–June 1983, during the time when ISEE 3 was transiting the deep magnetotail, with one focus a search for "plasmoid" signatures and including DE 1 auroral imaging data.
- **CDAW 9,** which includes five events from the period April–May 1986 during the Polar Regions Outer Magnetosphere International Study (PROMIS) observational campaign period, including conjugate auroral imaging data from both DE 1 and Viking. During the PROMIS period, an international effort was made to gather simultaneous solar-terrestrial observations toward the goal of an improved understanding of the relation between polar phenomena and physical processes in the magnetosphere as a whole.

Currently, the public CDAW system allows users access to the CDAW 6, 7, and 8 data bases. The CDAW 6 and 7 data bases were extracted and reformatted from their original form (on the now-retired NSSDC Modcomp system) with some files still being converted at this time. CDAW 9 data is currently available only to the registered participants in CDAW 9, but this data base is expected to become public within a few months and will join the others in the open-access system. At about that same time, SPDF/NSSDC anticipates a new issue for public distribution of a CD-ROM containing the CDAW 9 data base and formatted in the style and with data standards consistent with those to be followed by ISTP (International Solar Terrestrial Physics program) and IACG/IASTP (InterAgency Consultative Group Solar-Terrestrial Physics initiative) in their future common data products.

Please refer to the box below if you would like more information about any aspect of CDAW.

Robert McGuire

For More Information

CDAW Users' Guides are available upon request. The CDAW System and its follow-on implementations are an evolving tool for scientific analysis. As such, there are still problems to be solved and features to be implemented. Inquiries, user comments, suggestions, and problem reports are greatly appreciated. Please forward them to:

Coordinated Request and User Support Office (CRUSO)

voice: (301) 286-6695
FAX: (301) 286-4952 (now)
(301) 286-1771 (10/1/93)
Internet: request@nssdca.gsfc.nasa.gov
NSI-DECnet: NSSDCA::REQUEST

National Space Science Data Center
NASA/Goddard Space Flight Center
Code 633
Greenbelt, MD 20771 U.S.A.

Presentations, Demos Given at Baltimore Spring 1993 AGU Meeting

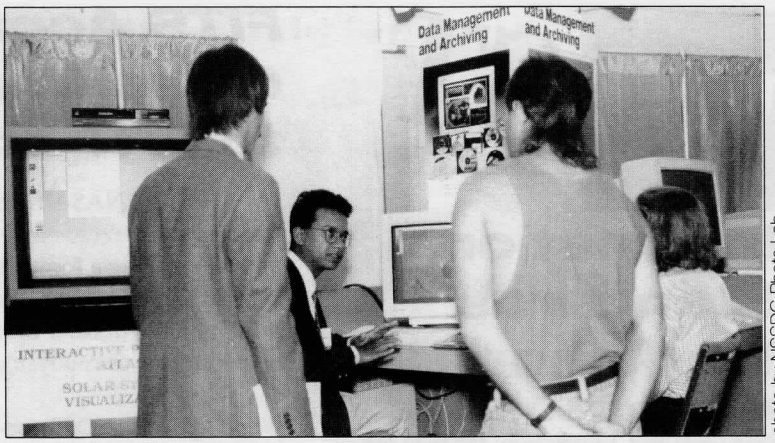


photo by NSSDC Photo Lab

At AGU/ Baltimore, NSSDC's Syed Towheed shows Magellan CD-ROM data to visitors at the NSSDC exhibit.

Programs and members of the Space Physics Data Facility (SPDF) and NSSDC participated in the Spring 1993 meeting of the American Geophysical Union (AGU) that was held in Baltimore May 24–28 (see photo, right). The effort included both an extensive series of papers and an ongoing set of system demonstrations in NSSDC's part of the NSI/NASA booth area.

Of particular note were papers included in the special session on Advanced Data Handling and Visualization in Space and Atmospheric Sciences that included the Coordinated Data Analysis Workshop (CDAW) and Satellite Situation Center (SSC) systems/data bases that were just made publicly accessible under the NSSDC "NODIS" account, as well as posters on the Solar-Terrestrial CD-ROM now under preparation by NSSDC and a joint SPDF/ISTP SPOF (Science Planning and Operations Facility) paper on new IDL-based visualization software. Authors of papers in the special session have now been invited to contribute written manuscripts to become part of a special AGU publication later this year.

Systems demonstrated included NODIS, CDAW, and SSC, as well the NASA Master Directory (including the demonstration of Space Physics Data System entry and links) and the newly publicly accessible NSSDC Master Catalog information system (discussed in the Director's Message on p. 2), which includes descriptions of international scope on spacecraft and experiments and detailed descriptions of NSSDC data holdings. The presentations and demonstrations were uniformly highly successful and very well received.

Joseph King
Robert McGuire

CDF news

MD Version 2.4 and CDFEdit Are Ready To Go

By the middle of August, the common data format (CDF) staff expects to release CDF Version 2.4, which is described in detail in CDF 2.4 Release Notes. E-mail requests for the notes can be sent via the Internet to CDFSUPPORT@NSSDCA.GSFC.NASA.GOV, or via NSInet to NSSDCA::CDFSUPPORT, or by calling the user support office at (301) 286-9884.

In addition to the new features provided by the CDF library, a new utility will be released called CDFEdit, which will replace the CDFBrowse utility. CDFEdit will provide all the functionality of CDFBrowse and allow all the contents of a CDF to be displayed and/or modified interactively. A prototype of the CDF Windows Imaging Tool (CWIT) is under development in C++ for IBM PC compatibles running under the Microsoft Windows V3.1 environment. This prototype can select variables from 2-dimensional CDF data sets; display the data on a globe model of the Earth using azimuthal, orthographic, and moliweide projections; display coast and fiducial lines; load/modify 256-color palettes; display histograms and perform four types of equalization functions; crop and flip images; copy selected regions to the clipboard; and save images to bitmapped (.BMP) files. Future capabilities may include drawing tracking stations, similar to those of the popular X Windows release (CXIT). For beta testing, this tool soon will be available upon request.

The CDF staff continues its support and development efforts in providing high-quality scientific data management software products to the user community. In May, each member of the CDF staff received a Goddard Space Flight Center (GSFC) Group Achievement award for his or her contributions in the development and success of International Solar Terrestrial Physics (ISTP) Central Data Handling Facility (CDHF). On June 3, the CDF staff participated in "Space Day" celebration at Dunbar High School by giving a demonstration of the CDF Macintosh Imaging Tool (CMIT) software to many students and teachers from Dunbar and neighboring schools (see separate article, p. 15).

Gregory Goucher coauthored an article published in the May/June issue of *Computer and Physics* with Stewart A. Brown (Lawrence Livermore National Laboratory), Mike Folk (National Center for Supercomputing Applications), and Russ Rew (University Corporation for Atmospheric Research). The article is entitled "Software for Portable Scientific Data Management," and it highlights and briefly compares CDF, HDF, netCDF, and PDB.

Greg Goucher

NOST notes

International Standards Workshop Held

The NSSDC's NASA/Science Office of Standards and Technology (NOST) led the NASA delegation to the international Consultative Committee for Space Data Systems (CCSDS) Panel 2 workshop in Frascati, Italy, from April 16–23, 1993.

Major accomplishments included completion of panel review of all agency comments on the Control Authority Procedures Red Book and a plan to request CCSDS Management Council approval for Blue Book status in May. Also completed was a thorough review and update to the Control Authority Data Structures White Book, which is a draft recommendation for user packaging of data descriptions for registration with Control Authorities and for subsequent Control Authority disseminations.

Particularly noteworthy was the establishment of a new Panel 2 work package dealing with data description requirements and project testing of related Panel 2 draft recommendations. This will address needs identified both by CCSDS and by the Committee for Earth Observing Satellites (CEOS) Formats Subgroup in the use of Data Description Languages and Data Entity Dictionaries, with both unique formats and with standard formats such as Common Data Format (CDF), Hierarchical Data Format (HDF), and the Flexible Image Transport System (FITS).

NOST will be coordinating project participation and has already identified efforts involving ESA/ESRIN, ESA/ESOC, CNES, ISTP/GGS, and NSSDC. Others wishing to participate should contact the author (please refer to the listing at right).

Don Sawyer

FITS Accreditation Panel Gives Unanimous Approval to FITS Standard

The NSSDC's NASA/Science Office of Standards and Technology (NOST) has been developing a formal specification of the Flexible Image Transport System (FITS) for the transfer of information in support of the astrophysics community.

Working under NOST procedures, a FITS Technical Panel led by Bob Hanisch of STI developed a draft FITS standard to remove certain ambiguities present in the literature papers that are commonly understood as the basis for FITS and to provide a single document that projects could use in conforming to FITS.

Because of the need to eventually obtain international approval of this standard, the several reviews were widely advertised throughout the astronomical community. After completing this work, the Technical Panel proposed the standard to the NOST FITS Accreditation Panel for acceptance as a NOST standard.

The Accreditation Panel, composed of the NOST executive board and an outside member from the astrophysics community, reviewed the process followed by the Technical Panel and its handling of reviewer comments. Approval of the NOST "Definition of the Flexible Image Transport System (FITS)" was unanimous, and the outstanding effort of the Technical Panel was noted. This standard will now be submitted to the IAU for its approval, with every expectation that it will quickly become the internationally recognized specification for FITS.

Don Sawyer

How To Contact the NOST Office You Need

DONALD SAWYER

NSSDC, Code 633.2
NASA/Goddard Space Flight Center
Greenbelt, MD 20771 USA

E-Mail: **Internet:** sawyer@nssdca.gsfc.nasa.gov
DECnet: NCF::SAWYER
Phone: (301) 286-2748
FAX: (301) 286-4952*

NOST STANDARDS LIBRARY (Standards Information, Document Requests, and NOST Workshop Information)

E-Mail: **Internet:** nost@nssdca.gsfc.nasa.gov
DECnet: NCF::NOST
Phone: (301) 286-3575
FAX: (301) 286-4952*

FITS SUPPORT OFFICE

E-Mail: **Internet:** fits@nssdca.gsfc.nasa.gov
DECnet: NCF::FITS
Phone: (301) 513-1634
FAX: (301) 513-1608

SFDU SUPPORT OFFICE

E-Mail: **Internet:** sfdu@nssdca.gsfc.nasa.gov
DECnet: NCF::SFDU
Phone: (301) 513-1693
FAX: (301) 513-1608

SOFTWARE SUPPORT (STIS or CAOIS)

E-Mail: **Internet:** garrett@nssdca.gsfc.nasa.gov
DECnet: NCF::GARRETT
Phone: (301) 513-1692
FAX: (301) 513-1608

***Effective 10/1/93, the number will be (301) 286-1771.**

Inner City Students Learn Through Space Day Program

Dunbar High School in Washington, DC, held its Second Annual Community Space Day Celebration on Thursday, June 3, 1993. It attracted students from its cluster, grades 4 – 12. A new addition to the celebration this year was a space sciences exhibit, in which the Space Science Data Operations Office staff joined others in the GSFC Space Sciences Directorate to introduce the students to the exciting new thrusts in space science. The exhibit consisted of the following presentations/demos:

- Space Exploration (video) – Claudia Brevard
- Electromagnetic Spectrum (demo) – Joseph Alexander, Valerie Thomas (SSDOO)
- Images of Solar Activity (demo) – David Batchelor (SSDOO)
- Impact of Solar Activity on Earth and Elsewhere: Significance of ISTP (presentation) – Mona Kessel (SSDOO)
- Suppose You Had Gamma Ray Vision: What Would You See in the Sky? (presentation) – David Thompson
- The Origins of the Universe (presentation) – Rich Isaacman
- CDF Macintosh Imaging Tool (demo) – Greg Goucher (NSSDC)
- NASA Space and Earth Science Data on CD-ROMs (demo) – Syed Towheed (NSSDC)
- Photo Tour of the Planets, an Asteroid and A Comet (presentation) – Marla H. Moore

"Science in Space, Shedding New Light" was the title of this collection of activities. The unifying theme was the electromagnetic spectrum, and the activities were related to different features that can be seen in the universe through various parts of the spectrum. The students were introduced to the electromagnetic spectrum and shown features that are observable on the sun using X-ray data and in the universe with gamma rays, and they heard how scientists can study the heat from the "Big Bang" explosion using infrared data from the Cosmic Background Explorer (COBE). They also learned about the characteristics of the planets in our solar system that can be seen in visible light.

Students watched a video with a time-lapsed solar cycle in which the solar flares were very pronounced. As part of the presentation on the magnetosphere and the electromagnetic forces that connect the Earth and sun, they had an opportunity to see a video on the aurora. In addition, they saw demonstrations of the different space data that are available on CD-ROMs and software for the personal computer that can be used to visualize the satellite data.

According to one participant, Dr. Eva Rousseau, the Space Day celebration "promotes excellence in math, science, and technology among our young people by involving them in exciting educational activities relating to America's Space Program .... [It's] also a day to recognize our students' academic achievements and our education partners' contributions to Dunbar High School's space science and technology program, the Enterprise Mission."

The Enterprise Mission is a collaborative effort of the District of Columbia Schools, the Washington Space Business Roundtable, NASA, the U.S. Army Corps of Engineers, the University of the District of Columbia, and PEPCO. Its objective is to prepare students with the necessary technical skills to help solve tomorrow's technological problems. It brings together educators, technical and other experts, and policymakers to enhance and develop a curriculum with a space science and technology focus.

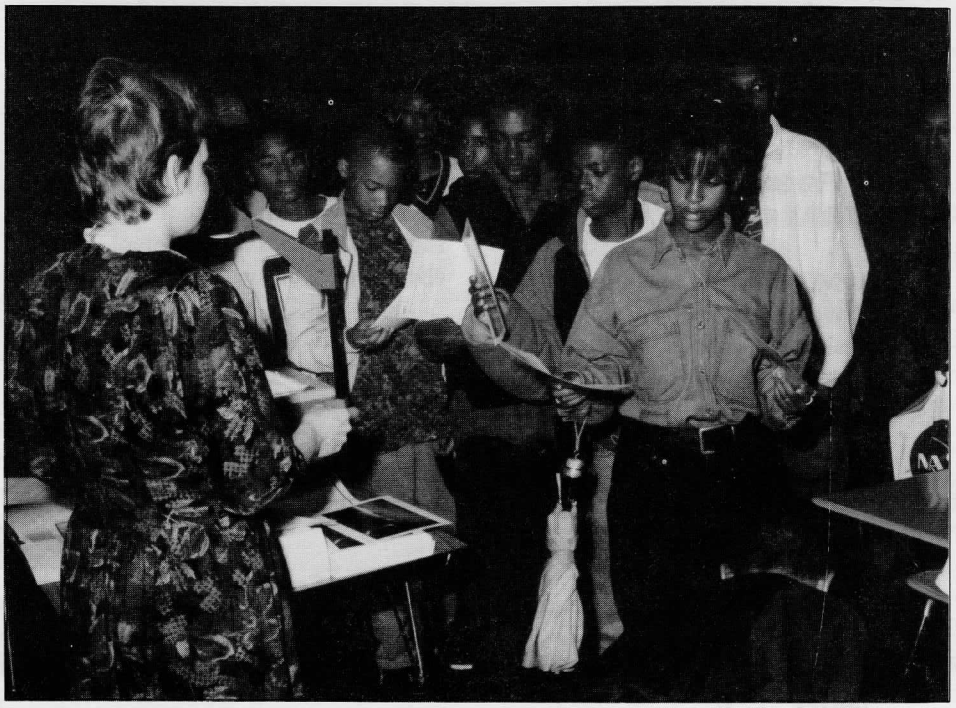


photo by NSSDC Photo Lab

Students had lots to look at and think about, and no one came away empty-handed as SSDOO's Mona Kessel distributed photos and images created from data gathered in space.

Approximately 200 people, ranging from elementary to high school students to teachers, came to see and participate in these activities. A number of representatives from the community, NASA Headquarters, industry, and other organizations attended as well. Feedback on the space sciences activities from teachers and students has been very positive.

Valerie Thomas

MD news — New Interface Offers Many Enhancements

Throughout the life cycle of the Master Directory (MD), the system and interface have evolved through interactive dialog among system developers and science users. Initially, the MD system was developed based on requirements constructed by the Catalog Interoperability Working Group. This design and implementation included a data base structure to store directory information, a data loader, and a user-friendly, menu-driven interface. Subsequent development tasks included a redesign of the user interface and underlying data base access to support a client-server architecture.

New Features of the MD JAM Client

The new MD client has many enhancements that offer extended capabilities over Version 1. The MD2 interface was developed using JYACC's Application Manager (JAM) and supports VT100 and higher terminals. This JAM client provides pull-down menus, automatic help and valids, session output, user information profile and session preferences, as well as a GOTO function. Titles resulting from a query may be sorted by one of several available attributes. The information display is presented on six "index cards" each containing a section of the directory entry. These cards may be zoomed to full-screen display for easier viewing.

Currently, the MD development staff is working on the design and implementation of an X Windows client. This client is being developed using UIM/X on a Silicon Graphics workstation and will support the Motif look and feel. This client should be available in the fall.

The new MD interface is accessible from the NODIS menu. Choose the Master Directory option and answer yes to the question "Would you like to try the new interface?"

How To Access the MD, Where To Get Help

To access the MD, follow these steps:

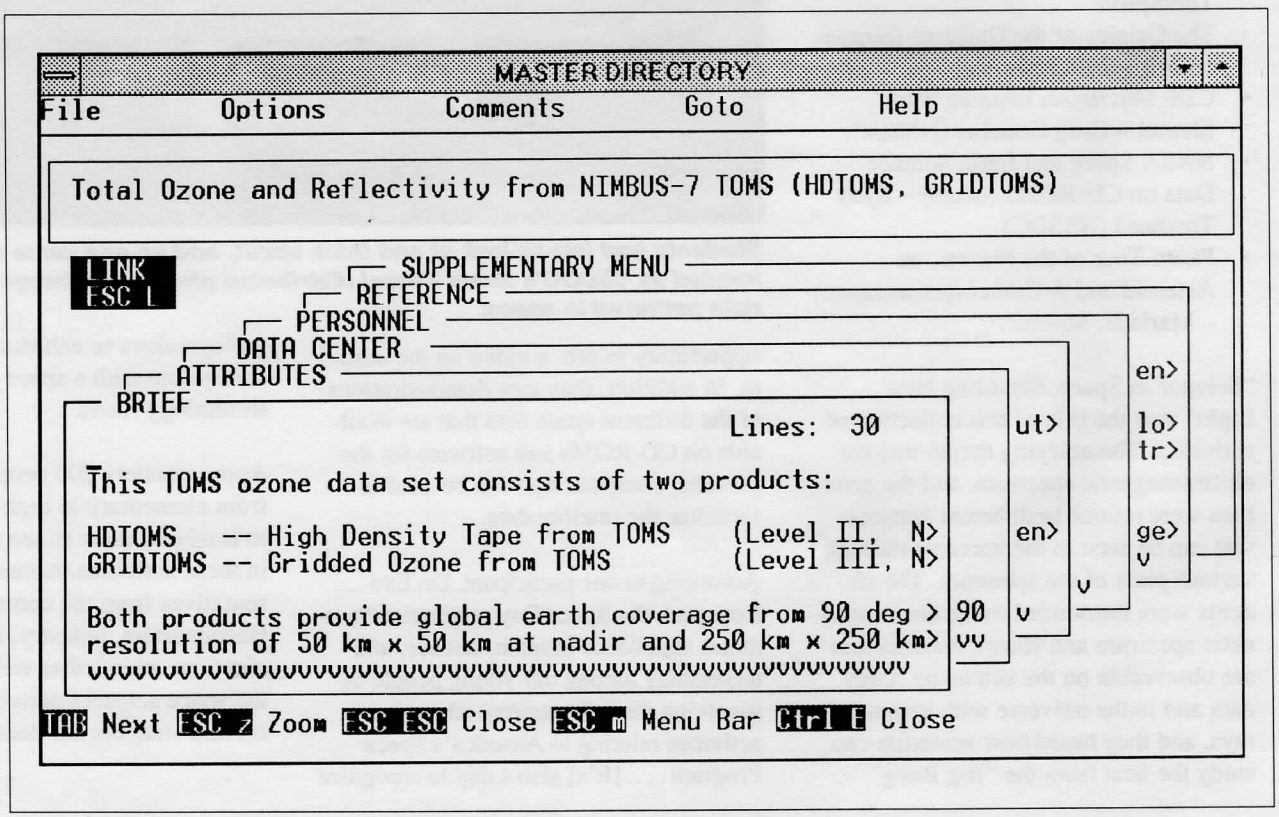
1. Login to NODIS via DEC/net or Internet
2. Set Host NSSDCA Username: NODIS
3. Telnet 128.183.36.23
4. Username: NODIS

Contact the MD User Support Office (MDUSO) for help on any aspect of the MD via one of the following:

NSI/DECnet:	NCF::MDUSO
Internet:	MDUSO@nssdca.gsfc.nasa.gov
Phone:	(301) 513-1687
FAX:	(301) 513-1608

The MDUSO will direct you to the appropriate MD team member who can answer your questions about using the MD, the specific contents of the MD, how to prepare new data entries, and how to establish LINK connections.

Patricia Bailey
Janis Shipe



This is an example of a screen in the Master Directory's new interface (MD2).

Olsen Joins Global Change Master Directory Effort

Lola Olsen will play a key role in guiding the evolution of the Global Change Master Directory (GCMD). Her data management experiences as both pioneer and project manager of the National Climate Data System (NCDS) and as an active participant of the Earth science community make Lola an ideal candidate to work with NSSDC's Jim Thieman to establish the GCMD within the NASA Master Directory. She will spend approximately half of her time with NSSDC and will continue to spend the rest of her time with the Goddard Distributed Active Archive Center (DAAC).

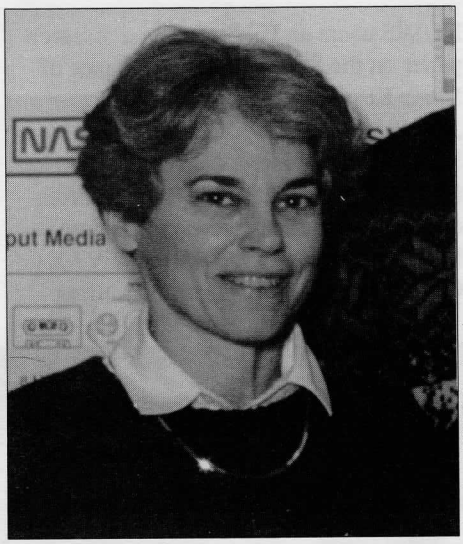


photo by NSSDC Photo Lab

Lola Olsen specializes in climate data.

Olsen is a member of the newly formed Environmental Task Force, which is commissioned to declassify climate-related data that formerly were classified. Declassified data sets will be labeled as such, and they will be available for access through NASA's MD.

Olsen first worked as a contractor for Hughes STX with NSSDC in 1986, working on the development of the Pilot Climate Data System. That system became operational (thanks, in large part, to her efforts) and was renamed the NCDS in 1989; the following year NSSDC hired Olsen directly as the project manager for the NCDS. In 1993 NCDS became part of the Goddard DAAC.

Olsen's interest in the climate was first sparked by her experiences as a pilot, which influenced her choice of discipline. She earned her Master's degree in Geography/Earth Science from the University of North Carolina. She taught at their Charlotte campus and later completed her Ph.D. coursework in climatology at UNC, Chapel Hill.

photo by NSSDC Photo Lab

Getting Settled In

NSSDC's Marie Dowling makes herself at home in her new office, where she works as part of the team that fulfills users' requests for data.

As reported in the cover story of the Spring *NSSDC News,* the Data Center moved the entire Goddard-resident portion of its data archive and 19 of its support staff members from Goddard's Building 26 to a newly constructed section of Building 28.

NSSDC Organizes Life Science Data Archives

A meeting of NASA Headquarters, JSC, ARC, and GSFC/NSSDC personnel involved in the definition of the Life Science Data Archive (LSDA) was organized by and held at the NSSDC on June 10-11, 1993.

The primary focus of the meeting was to assess the suitability of NSSDC Master Catalog (NMC) for use in providing LSDA's Master Catalog (MC) functionality. This is at a level of detail deeper than that provided by the NSSDC-managed NASA Master Directory, which will also be used by the LSDA. (See the *Director's Message* on p. 2 for discussion of the newly-online NMC.)

After much discussion and demonstration, including a detailed comparison of the almost-finalized LSDA MC requirements and the evolving NMC functionality, and after a consideration of the alternatives, use of the NMC as LSDA's MC emerged as the most attractive option. A final decision to use the NMC, at least as a prototype LSDA MC, will be made by Headquarters Code UL shortly.

In addition, the ability of the NSSDC to serve as the central archive and dissemination center for appropriate data from Life Science missions was also discussed favorably. In such scenarios, Project Offices at JSC and at ARC would be responsible for interactions with Principal Investigators and for preparing data/metadata "bundles" for archiving at, and disseminating from, the NSSDC.

Key NSSDC individuals who participated in this meeting were Joy Beier, Ed Bell, and Joseph King.

Joseph King

SSDOO Summer Staff Enjoy Learning, Making Contributions That Count

This year the Space Science Data Operations Office (SSDOO) employs a record number of summer staff members: 15 students (including high school, undergraduate, and graduate) and two faculty members. The summer staff, as indicated below, are from 12 different colleges/universities from across the country and three local high schools.

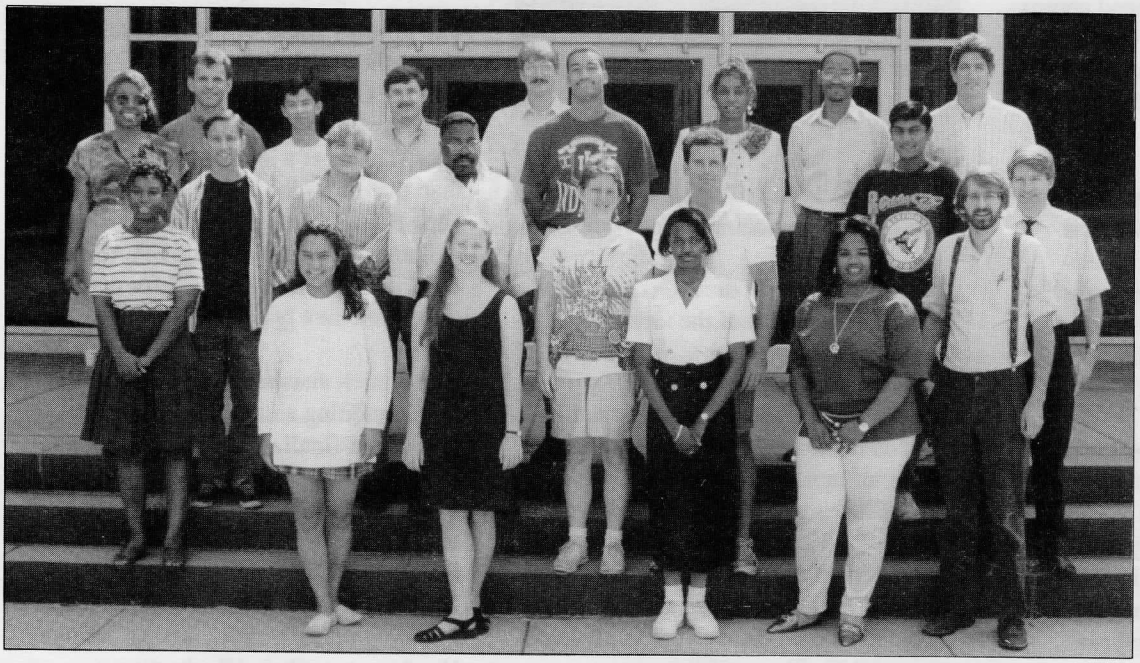


photo by NSSDC Photo Lab

Summer students stand with their mentors on NSSDC's front steps. (Feet are the key to who's who in this photo!) From left to right, beginning on the ground level are: Sarah Stewart, Jennifer Yost, Sabrina Sowers, Terri Anne Martin, and Robert Candey; on the first step up are: Nicole Fikes, Mona Kessel, Richard Burley, and David Batchelor; on the middle step: James Sweeney, Theodore Johnson, Reginald Bush, and Mehul Shah; on the top step, (including people both in front and behind on that level) are: Valerie Thomas, Gyorgy Fekete, Allen Chen, Michael Van Steenberg, Charles Nicholas, Quincy Stokes, Kasandrah Baynes, Nathan James, and Chuck Higgins.

Three high school students are working on a wide range of activities, including clerical work, software development, computer operations, and engineering support. **Nicole Fikes** (Duvall High School) is working with SSDOO secretary Margie Pasini, providing clerical support and learning about the computer technology that is used to support the SSDOO. **Kasandrah Baynes** (Oxen Hill High School) is helping Nathan James develop the nongraphical user interface to NODIS to accompany the present JAM user interface and populate the IRAND data base with input from new NODIS users and is preparing a research paper on the Sun, with the assistance of Mona Kessel and David Batchelor. **Jennifer Yost** (Bishop Ireton High School), whose mentor is Jeanne Behnke, is obtaining experience in several different areas. She has been spending time learning to be an operator for the VAX Cluster by mounting tapes and pulling printouts; studying what an engineer does, with hands-on experience testing network ports; and learning about software tools for analyzing system performance.

Allen Chen (Cornell University) and **James Sweeney** (Davis & Elkins College) are both working closely with Gyorgy Fekete on network security activities. Ron Tencati, Valerie Thomas, and James Green also served as their mentors. Chen is building an archive of publicly available UNIX security software and information; performing proactive security tests on the GSFC computer network; and writing the bulk of the main program to Swatch-Mon, the precursor to a general UNIX security program that will be completed in the future. Sweeney is helping to collect UNIX security toolkits, network monitoring packages, and various other software packages from the Internet. He installs these packages, examining their functionality and writing brief descriptions for each.

Three of the undergraduate students support NSSDC. **Marvin Herbold** (Gallaudet University) is working with the Astronomical Data Center (ADC). His responsibilities include updating and enhancing the ADC's General Validation Program, writing brief descriptions for catalogs, and helping to convert LaTex documents to ASCII. His mentors are James Gass, Gail Schneider, and Nancy Roman. Student **Sarah Stewart** (Harvard University) is working with a team to design and implement a new version of the Flexible Image Transport System's (FITS) Product Conformance Tester (FPCT). Its purpose is to ensure compliance with the requirements and recommendations developed by the NASA/Science Office of Standards and Technology (NOST). Stewart reviews and tests the upcoming "Control Authority Data Structure" recommendation that will be released this Fall by the Consultative Committee for Space Data Systems (CCSDS). Her mentor is John Garrett. **Rameka Gant** (Florida A&M) is compiling statistics on the Master Directory (MD) usage from the MD Daily Logs to help debug those logs and

*see **Summer Students**, p. 19*

Summer Students, from p. 18

to get a first look at what this powerful new tool is telling us. Her mentors are David Irvine and Angelia Bland. **Mehul Shah** (Massachusetts Institute of Technology) is working with the CDF staff, testing and debugging the CDF library, tools, and utilities; writing an online help facility for the CDF Windowing Image Tools (CWIT) for the IMB PCs; and developing testing programs. His mentor is Greg Goucher.

The Space Physics Data Facility has three undergraduate students—**Terri Anne Martin** (Lemoyne-Owen College), **Sabrina Sowers** (University of the District of Columbia), and **Quincy James Stokes** (Morehouse College). Martin, whose mentor is Robert Candey, is developing routines for input and color spectrogram display of the Voyager 1 and Voyager 2 Planetary Radio Astronomy (PRA) instrument data (full resolution and averaged) using the Interactive Data Language (IDL). These routines also will be useful for displaying other particle and wave data. Sowers is developing a tool that, when given a CDF file that complies with ISTP guidelines, will automatically generate a detached SFDU label for the CDF. This label, written in the C language, facilitates data management and is portable to any of the platforms supported by the version 2.4 CDF library. Her mentor is Richard Burley. Stokes is working on two projects: populating the NSSDC Master Catalog data base with information for Geotail and WIND, and writing subroutines as part of a CDF validation package for ISTP CDFs. This is being done in conjunction with ISTP's prime contractor, who designed the overall structure using guidelines set up by Stokes and others. Mona Kessel is his mentor.

Three graduate students, **Reginald Bush** (Bowie State University), **Leonard Garcia** (University of Florida), and **Chuck Higgins** (University of Florida), support both the SSDOO and the NSSDC. Bush, whose mentor is Jeanne Behnke, is improving the SERVICES tools that allow users to electronically submit problem reports, engineering task orders, and demo requests so that those utilities can also be used for the UNIX platforms. He has rewritten the routines that run on the VAX so that they also will run on UNIX platforms. Bush is transferring data for these routines between the UNIX and DEC platforms and is now finishing a MOTIF version of SERVICES to run on the VAX, SUN, and Silicon Graphics systems. Garcia is working with SSDOO Chief James Green on the analysis of Hubble Space Telescope (HST) observations of the Jovian aurora. He is determining whether a correlation can be established between discrete auroral events as observed by HST and decametric radio observations as observed at the University of Florida Radio Observatory. Garcia visited the Space Telescope Science Institute and worked with archivists and other researchers there. He is working with researchers at GSFC in developing software to convert FITS image format HST data to CDF image format files. Higgins is working on planetary radio astronomy in the hectometric wavelength band. He hopes to help NSSDC staff finish at least one paper before he leaves in August.

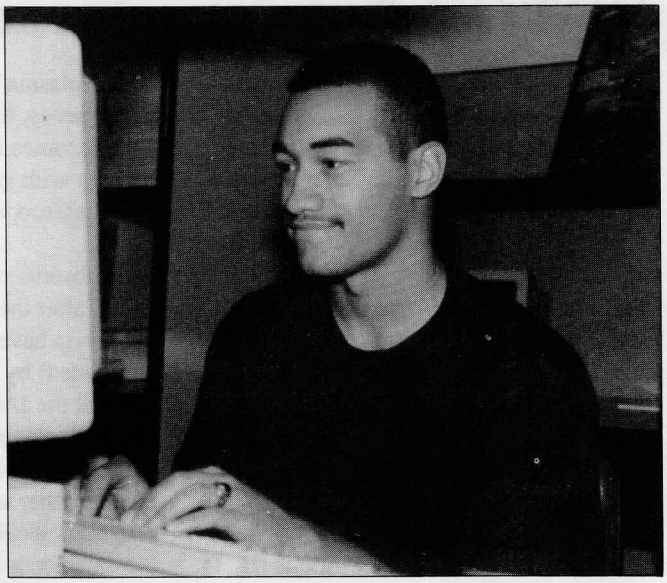


photo by NSSDC Photo Lab

Quincy James Stokes populates the NSSDC Master Catalog data base and writes subroutines as part of a CDF validation package for use in ISTP CDFs.

The two summer faculty staff members are **Theodore Johnson** (University of Florida) and **Charles Nicholas** (University of Maryland, Baltimore County). Johnson is looking for patterns in NSSDC Data Archives and Distribution System (NDADS) data requests, frequency of use, and space allocation on NDADS as the basis for a mathematical model of the NDADS mass storage system. The mathematical model will help resolve some questions about NDADS, such as: the adequate amount of disk cache required, the peak usage, the volume of data transferred during various time periods, and the effectiveness of NDADS data stored in a declustered versus clustered environment. His mentor is Jeanne Behnke. Nicholas is working with the STELAR project to adapt Hypertext and the World-Wide Web for use in information discovery and distribution. He produced a white paper plan for an Agency-Wide Web and identification of specific enhancements to the World-Wide Web technology. His mentor is Michael Van Steenberg.

The staff has gotten off to a good start, and working at the SSDOO this summer should provide a valuable experience for them and a very productive summer for the SSDOO.

Valerie Thomas

German TV Visits NSSDC

A team from the new German TV station Deutsche Welle (German Wave) briefly visited GSFC on July 23. The one-year old station is trying to establish a German language equivalent to CNN (the 24-hour news channel). During its visit, the team shot mostly footage for future space-related news. The team interviewed Dieter Bilitza (HSTX, NSSDC/SPDF) in German about data at NSSDC from joint U.S./German space missions.

Dieter Bilitza

2nd IACG Campaign Workshop Held in Austria

The 2nd IACG campaign planning workshop was recently held in Graz, Austria (April 13-15, 1993). The Graz workshop was organized by Dr. Rudi Schmidt of ESTEC and the project scientist on the ESA CLUSTER mission.

To stimulate the discussions, the workshop began with invited review papers on the bow shocks (G. Zastenker and A. Nozdrachev), the magnetopause (B. Sonnerup), current sheets (E. Priest), particle acceleration (D. Baker), mission-oriented theory (M. Abdalla), the European Plasma Simulation Network (A. Roux) and ground observations (H. Opgenoorth). The attendees were then split into four panels:

- The Bow Shock, under S. Schwartz and M. Scholer
- The Magnetopause, under G. Paschmann and C. Russell
- Current Sheets, under L. Zelenyi and E. Antonucci
- Particle Acceleration, under T. Terasawa and K. Kudela

These panels met to decide how the available spacecraft missions and ground-based facilities could be coordinated to maximize the scientific return in each of their scientific areas. Within the panels, a common procedure was to identify spacecraft constellations or configurations that were ideally suited to address particular objectives, keying on the location of one spacecraft crossing a plasma boundary.

Workshop participants presented draft reports in plenary sessions to all the participants. Roger Bonnet, the director of scientific programs at ESA, also attended the plenary session and expressed his personal satisfaction with the progress of and science community interest in these IACG campaigns.

During the meeting, an important suggestion put forward by Paschmann was to implement a formal proposal phase in the detailed campaign planning process. If the proposal concept wins approval, the campaigns defined are in many ways making the IACG fleet of spacecraft, together with the ground observations, into a "plasma boundaries observatory." In this sense, the suite of IACG spacecraft becomes an observing facility in analogy with ground-based or space-based telescopes.

The "observatory" proposals would be issued after the ideas put forward at the workshop have been substantiated (or eliminated) by appropriate orbit analyses, once all the IACG spacecraft have been launched. Proposals would be reviewed by a small group to be appointed by the IACG. Other key features of these brief proposals would be to: define precisely the data needed (mission, instrument, type, resolution, time interval) and how they are being obtained (generation and distribution); state any special requirements on instrument modes or payload operation; discuss the analysis methods and tools to be used; and list the investigators to be responsible of all phases of the campaign. This would ensure that only those potential opportunities are being carried over into the operational campaign plans for which proven interest and capabilities exist, and that the studies would have the participation (and support) of knowledgeable people from the various missions and instruments involved, as well as ground-based observers and theoretical support, if applicable.

Schmidt and Paschmann are preparing an integrated report about the workshop, which should be available shortly. Paschmann will present the 2nd campaign report to the space agency science heads at the next IACG meeting in the Crimea for approval in early Fall. Once approval has been obtained, each of the agencies will try to accommodate any special requirements on their missions to facilitate the campaign without sacrificing the individual mission science objectives. The main phase of the 2nd campaign will occur in the 1996 time frame, after the launch of the ESA CLUSTER spacecraft. It is expected that a lead coordinator for the 2nd campaign will be chosen from interested ESA scientists.

The 1990s will be characterized by the frequent launches of spacecraft by many nations and by the establishment of numerous new ground-based facilities dedicated to the study of our solar-terrestrial environment. In some cases, properly correlated data from individual spacecraft missions and an extensive set of ground-based instruments will be able to advance our understanding of global solar-terrestrial structure and dynamics in a unique way. The current purpose of the IACG for Space Science is to achieve international coordination of the collection and use of space data in order to optimize the return on the worldwide investment in space missions and capitalize on this unique opportunity.

Background

The IACG is composed of key members from the European Space Agency (ESA), Intercosmos (IKI) of the former USSR and Eastern European countries, the Institute of Space and Astronautical Science (ISAS) of Japan, and NASA. The IACG was established during the Haley encounter period to maximize the scientific return of these missions. Based on the early success of the Haley encounter, the IACG has continued to coordinate the scientific space program.

The latest thrust of the IACG is to coordinate the scientific spacecraft contributing to the International Solar Terrestrial Physics Program. To do this, the IACG scientists are planning the following three "campaigns:"

1) Magnetotail and Substorm campaign
2) Boundaries in Collisionless Plasmas campaign
3) Solar Disturbances and Effects campaign

For more details about how these campaigns were chosen, please refer to the article on page 4 of the January 1992 issue of *STEP International.*

IACG campaigns are being planned to take advantage of all of the core IACG spacecraft (GEOTAIL, WIND, POLAR, INTERBALL, SOHO, and CLUSTER) and are also meant to use extensively the

see ***IACG,*** *p. 21*

NSSDC Demonstrates Speech Technology for the Blind

The Southern Maryland Chapter of the National Federation of the Blind (NFB) sponsored a demonstration of assistive technology for the blind on Saturday, May 22, 1993 in Clinton, MD. Braille reading and writing tools; the white cane for effective travel; tape recorders; magnifiers; talking items such as computers, clocks, and calculators; and more were presented by Volunteers for the Visually Handicapped, Silver Spring, MD, and the NSSDC.

Kenneth Silberman, a blind NASA engineer with the NSSDC, demonstrated synthesized speech software and hardware, specifically designed for the blind. He installed Vocal-Eyes screen-review software—produced by GW Micro, Fort Wayne, IN—on a standard IBM-compatible 80286 notebook computer and used a Braille 'n Speak (BNS) pocket computer—produced by Blazie Engineering, Forest Hill, MD—as an external speech synthesizer. The screen-review software provided screen access and control. The Braille 'n Speak's built-in speech synthesizer provided the phoneme-generating firmware and hardware necessary for synthetic speech.

The Vocal-Eyes software allows a blind person to have access to ASCII text on an IBM-compatible personal computer. It reads data from the ROM BIOS and converts the information to an ASCII stream that when sent to a synthesizer produces the desired speech. Vocal-Eyes can send this data stream to a synthesizer board, a serial port, or a parallel port.

Vocal-Eyes does not merely read the screen (it would be of little use if it only spewed out text), but it also provides commands that allow the user to track the cursor; read any desired part of the screen; or automatically read special features such as dialog boxes, pull-down menus, and command lines. Vocal-Eyes is only one of several professional quality screen review programs on the market today.

The Braille 'n Speak is a pocket-size computer that is controlled from and data are entered through a seven-key Braille keyboard. Information is reported to the user through a built-in speech synthesizer. BNS also can print to either a regular printer or a Braille printer. In addition, this machine can serve as a text editor and as a dumb terminal. BNS has built-in file transfer protocols and an external disk drive for data storage. And of course, it can function as an external speech synthesizer. Just as in the case of screen-review software, Braille 'n Speak has competitors.

The demonstration was extremely successful, and many blind people learned about assistive technology, including speech access to the world of computers. Some of those in attendance will use speech and others will not, but all of them know that it is available if they need it. And while this is not NASA technology, NASA is doing its part to spread the word about computerized speech for the blind.

Kenneth Silberman

IACG, from p. 20

many complementary satellites and ground-based facilities that can be brought to bear from the international space science community. The campaigns will make full use of the IACG spaceflight mission resources and will seek to achieve the planning for data mode adjustment, mission coordination, ground observation, and theoretical modeling that can only be coordinated through high-level, interagency cooperation and commitment.

The science planning for the first campaign was held at a workshop in June 1992 in Airlie House, VA. The results of this workshop are reported in the document entitled, *Towards a New Era of Global Solar-Terrestrial Research: The First Inter-Agency Consultative Group (IACG) Campaign: Magnetotail, Energy Flow and Non-Linear Dynamics* (available from E. C. Whipple at NHQ-VAX::EWHIPPLE or from J. L. Green at NSSDCA::GREEN). James Green (GSFC) is the 1st campaign coordinator. For more details of the IACG's 1st campaign, please see the article by Whipple on page 11 of the July 1992 issue of *STEP International.*

Dan Baker
James Green

NSSDC Helps in CD-ROM Pricing Study

NSSDC played a vital role in the recent Government Accounting Office's CD-ROM pricing study. Cited in the August 2, 1993 *Federal Computer Week,* the purpose of the study was to analyze how government-produced CD-ROMs are priced, and how those prices compare among various government agencies that sell CD-ROMs.

NSSDC provided the GAO with prices for NASA CD-ROMs for the study. The study confirms that NASA's CD-ROMs (including those distributed by NSSDC) are among the lowest priced CD-ROMs available from a government agency.

Honorary Ph.D. Conferred

Valerie Thomas, asssistant chief of the Space Science Data Operations Office, was recently awarded an honorary doctorate degree by Monmouth College (New Jersey) in recognition of her dedication to public service and because of her work as a proponent of higher education in science and technology.

NSSDC's Major Media Choices for

The NSSDC is a repository for data and information spanning the range of scientific disciplines in which NASA is involved. These include astrophysics, lunar and planetary science, solar physics, space plasma physics, and Earth science.

NSSDC's data holdings are preserved on a variety of media types. The predominant media type is 9-track magnetic tape. Lately, the NSSDC has also received data on CD-ROM and other forms of optical disk and magnetic tape. In most cases, the NSSDC backs up its archive to 3480 magnetic cartridge media. There are many aspects to the development and maintenance of the archive, but the basic mission is to accept and distribute data. The NSSDC accepts data on different media and in many formats. The data are logged, copied, and stored in the data center. In its classical mode of operation, the NSSDC provides requesters with duplicates of data as formatted by the submitting scientist, with format statements and other supporting information to facilitate use of the data. NSSDC archive data are distributed on a variety of media, such as 3.5" floppies, CD-ROM, computer networks, and several types of magnetic tape, including 9-track round, 3480 cartridge, 8mm, and 4mm. In many cases, data distribution is provided to the requester, at his request, on a different media type than that on which it was originally submitted. This article reviews the media types in use at the archive and how they are used at the NSSDC.

3.5" Floppy Disk

Probably the most popular kind of medium for interchanging small amounts of data and software among personal computers and many desktop workstations is 3.5" floppy disk (or diskette). Industry standards have evolved that make it possible to format, read, and write a floppy on many platforms. These diskettes are packaged in a hard plastic shell that make them easy to store and transport. The two most popular and widely available densities are 720 kilobyte (KB) and 1440 KB, which are called "High Density." Floppy drives from Apple support 400KB (single sided) and 800 KB (double sided) densities, in addition to 720KB and 1440KB, but Apple's densities are not generally recognized by non-Macintosh drives. The NSSDC uses 3.5" diskettes for the distribution of many of the software systems that are archived at the data center, for example, the IMDISP program, an imaging display software tool from NASA.

CD-ROM

CD-ROM (Compact Disk, Read-Only Memory) disks are 120-mm-diameter, single-sided digital storage versions of audio CDs. CD-ROM drives are available on most platforms, usually connected by SCSI interface. Standard CD-ROM format with error-correction holds about 550 MB. The drives have an average access time of up to 1 second, but recent double speed drives have an access time of around 200 ms—still considerably slower than hard disks. Transfer rates for reading are on the order of 150-300 KB/second. CD-ROM easily has become one of the most popular media for distributing data. CD-ROM drives are now available for less than $600, and commercially-mastered disks are available for $1–$2 each when purchased in large quantities. Hardware systems for creating single CDs have recently become available and are known as CD-Write Once. These systems are now under $6000 with the write-once disks now dropping to $25 each. The NSSDC has a collection of almost 200 CD-ROM titles available from its archive, including JPL's MAGELLAN and GALILEO data set series and SAO's EINSTEIN data set.

Network Access

The NSSDC has been distributing data over wide-area computer networks since 1987, and data have been accepted for ingest into the NSSDC archives by network since 1990. The largest wide-area network, the Internet, is actually more of a "network of networks," all talking to each other with a single, simple protocol suite called Transmission Control Protocol/Internet Protocol (TCP/IP). As of this writing, more than 10,500 computer networks are connected to the Internet, serving perhaps as many as a million individual computers. NSSDC is connected to the Internet through the NASA Science Internet (NSI) backbone, using a "T3" (45 megabits/second) link. The other major protocol suite supported by NSSDC is NSI/DECnet, formerly known as SPAN. DECnet is functionally equivalent to TCP/IP, and it provides session management and file transfer services primarily for VAX computers running VMS, although the DECnet protocol has been implemented on a variety of other platforms. The NSSDC uses two methods for making data available through the network: ANONYMOUS FTP and the NDADS Automated Retrieval Mail System (ARMS). When users request data from NSSDC, the data are placed into the ANONYMOUS directory accessible on the NSSDC VAX Cluster. The requester then retrieves the data directly from the ANONYMOUS directory. Requests are made through individual contact with the NSSDC support office or via a MAIL message request through the ARMS system.

9-Track Magnetic Tape

The 9-track magnetic tape has been around since the early 60's. Standard digital 9-track magnetic tapes are 1/2" wide and are contained on 10 1/2" reels. A full reel contains approximately 2400 feet of useable tape. When 9-track tapes were introduced, they supported a density of 800 bpi (bits per inch). Density was subsequently upgraded to 1600 bpi and then to 6250 bpi. The size of the records and files is a very important factor in determining the capacity of a tape, but typically a tape will hold at most 200 MB. The data tape has been the standard medium for long term archive, so it is still almost universally supported. It is inexpensive (about $.07/MB) and ages gracefully. Magnetic tape is a sequential access medium, which requires more time for data access than a random access

*see **Media Choices**, p. 23*

Managing Data

Media Choices, from p. 22

medium. Any type of magnetic tape can be formatted in a variety of ways by using many different programs, including the UNIX TAR format, the ANSI labeled and unlabeled format, and DEC's VMS Backup format. Most of the NSSDC archive is stored on 9-track magnetic tapes located at GSFC or the U.S. Federal Records Center. Examples of the NSSDC archive on 9-track magnetic tape include data from the Apollo mission, ISEE missions, and the IMP missions. Many of NSSDC's incoming requests are for data sets on 9-track magnetic tape.

Rotary Head Digital Audio Tape

In 1983, the DAT Conference established a framework for hardware development of Rotary Head Digital Audio Tape (R-DAT or simply DAT). The DAT format is based on a helically scanned metal particle tape that is 3.81mm wide (more commonly known as 4mm), packaged in a protected VCR-like shell 73mm x 54mm x 10.5 mm. DAT has become a popular medium for storage and distribution of computer data. SCSI bus drives are available for most computing platforms, and the medium is readily available, cheap, and has certain performance advantages over the more popular 8mm, or Exabyte, tape. Four-mm tapes come in two lengths, 60 minutes and 90 minutes, and store approximately 1.3 GB and 2 GB, respectively. Access to DAT tape drives is completely analogous to access of 8mm and or other tape devices on various computer systems. Drivers for DOS and Macintosh personal computers are commonly available. Current market prices are approximately $1000 for a drive and about $10 for a 4mm tape. NSSDC has seen only a few deliveries of this tape format to date. One of the most notable is the University of Iowa's HAWKEYE mission, which the NSSDC has archived on 15 4mm tapes and backed up on the NDADS optical platters. Because of the high performance of this medium, however, more deliveries and requests for this media type are expected in the future.

8mm Helical Scan Tape

Another tape medium enjoying widespread use in the science community is the 8mm helical scan tape system. This tape subsystem is manufactured by Exabyte Corporation and is available on all types of SCSI platforms. This recording medium is unique because of its high-density features that are comparable to disk devices. Low-density 8mm drives record 2.5 GB on an 8mm tape and high density drives record 5 GB. The recording limits change when compression techniques are applied. The tape drives are inexpensive, costing about $2000 at most. The media can vary, but the 8mm drive gives its best performance when using "data grade" media (about $10 each) rather than the more common "video grade" media. Average transfer rates for a 2.5 GB drive is about 246 KB/second, and on a 5GB drive, it is about 500 KB/second. Eight-mm tape has become a very popular data distribution medium for the NSSDC, but it does not have a high enough reliability factor to become an archive media. Some data sets that have been acquired at the data center on 8mm include IRAS and IUE. Because of their high capacity and small size, 8mm tapes are used to transfer data to and from the NSSDC. These data and most others in the data center are available to the community on 8mm tape.

3480 Tape Cartridges

In the 1970s, 3480 tape cartridges were introduced for longitudinal data recording. The 1/2" machines manufactured by IBM, StorageTek, and others operate with a Federal Information Processing Standard-60 (FIPS-60) interface. The MEMOREX and IBM 3480s are tape cartridge systems consisting of magnetic tape in a plastic cassette cover. Cartridges are small and lightweight, with a data transfer rate of approximately 3MB/second. The read/write time for a full tape is 1.5 minutes. A full tape can store up to 200MB. SCSI bus drives are available for many platforms, and the cost per cartridge is approximately $6.65. One well-known data set archived at the NSSDC in the 3480 medium is the Nimbus data set. It was originally created on IBM computers in this format; however, NSSDC customers most often request to have this data delivered on 9-track tape. This is a good example of the service NSSDC provides for tape conversion. The data center also uses the 3480 medium as a backup for many of its important data sets. Often the initial data set is stored on 9-track tape, and the backup archive set is made on 3480.

Write Once Read Many Optical Platters

The NSSDC has a long history in the use of 12" WORM (Write Once Read Many) optical platters. Although NSSDC does not distribute data on WORM platters, this medium is used for archival at the NSSDC. In the early 80's, the NSSDC and several NASA missions investigated the use of the OPTIMEM system as an optical archive. Each side of the optical platter stores 1 GB on an Optimem and has a rapid data transfer speed. NSSDC's most notable data set on this particular drive is the Dynamics Explorer Project. DE instrument files were delivered on Optimem platters. By the late 80's, the NSSDC acquired SONY second generation WORM drives as part of a optical jukebox procurement. The SONY platters store 3.35 GB per side and have access speeds averaging 1MB/second. NSSDC has two CYGNET optical jukebox library units, one with a storage capacity of 51 platters (330 GB) and one with a capacity of 131 platters (858 GB). These units form the basis of the NSSDC Data Archive and Delivery Service (NDADS). Many different data sets are located on the platters for easy access by the worldwide user community through the wide area network medium. Some of the NDADS data sets include IUE, IRAS, ROSAT, and IMP 8. The WORM medium costs $250 per platter, and the drives, also SCSI, cost approximately $10,000.

For more information on data media and the NSSDC, please contact the author, Code 633, (301) 286-8340.

Jeanne Behnke

Support Provided for ISTP/Cluster Use of CDF

The International Solar-Terrestrial Physics Program (ISTP) is a multispacecraft, multinational program whose objective is to promote further understanding of Earth's complex plasma environment. The first ISTP spacecraft, the Japanese-U.S. Geotail spacecraft, is now in orbit. Two NASA spacecraft, WIND and POLAR, are slated for 1994 launches; two IKI spacecraft, Interballs Aurora and Polar, are planned for 1993-1994 launches; two ESA missions, Cluster and SOHO, are scheduled for 1995 launches. Also, ISTP is taking advantage of existing missions including IMP 8, GOES spacecraft, and LANL DOD spacecraft, as well as ground-based measurements to complement the new launches.

Much data sharing and data analysis will be needed to ensure the success of the overall ISTP program. For this reason, there has been a special emphasis on data standards throughout ISTP. One key tool will be the Common Data Format (CDF), which was developed and is maintained by NSSDC, with the set of ISTP implementation guidelines specially developed for space physics data sets at the Space Physics Data Facility.

On April 19–20, 1993, Mona Kessel conducted a CDF training workshop at Rutherford Appleton Laboratory in the U.K. for experimenters from the various Cluster instruments. Like the IACG CDF workshop given at GSFC in January for the Russian Interball investigators (reported in the winter '92/'93 issue of *NSSDC News)*, this one also focused mainly on education in CDF and the ISTP guidelines, with emphasis on hands-on training.

The workshop began with discussion of GGS/ISTP activities and future plans, followed by a round table discussion to address particular concerns of Cluster. Cluster is a fleet of four spacecraft that will orbit Earth in a tetrahedral pattern with a primary mission to study plasma structures in three dimensions. Cluster is providing summary parameters from one spacecraft at approximately 1-minute resolution—analogous to the ISTP Key Parameters and Prime Parameters, which are four essentially identical data sets from four basically identical spacecraft, at spacecraft spin resolution (approximately 5 seconds). Cluster also will define merged vector products from the four spacecraft. The plan is to store all of this data in CDF making use of the ISTP guidelines plus some additional TBD guidelines. Cluster has particular concerns because of intercomparisons between the four spacecraft and because of the volume of data in the Prime Parameter data base.

The ISTP guidelines were developed to facilitate searching, plotting, merging, and subsetting of data sets. At the workshop, the usefulness of the guidelines was highlighted, particularly as applied to the Cluster problem. Some hands-on time was spent constructing Cluster skeleton tables—the specially formatted ASCII text file that contains the information about the data set, and upon which the CDF data set is constructed. Simple CDF programming and tools were discussed and the CDF tools were demonstrated, with hands-on time afterwards. Finally, demonstrations were given of NSSDC's online Data Archive.

The workshop was a forum for learning about CDF and the ISTP guidelines and for opening communication lines for future interactions. It has paved the way for easier and more effective data sharing and use among Cluster and ISTP scientists.

Mona Kessel

Mona Kessel (front row) stands with workshop participants at the Rutherford Appleton Lab. Workshop organizer Ted Golton is in the top row, 3rd from right.

NSSDCNEWS

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