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NASA's National Space Science Data Center

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More Data Restored to New Media

In 1988 NSSDC began a Data Restoration Program (DRP) to move data from the tapes constituting its important, older data sets onto new media, to assure the continued accessibility of such data to support future research endeavors. Although this effort has been discussed in previous NSSDC newsletters, this issue presents a collection of articles that highlights various aspects of the DRP.

When the Data Restoration Program (DRP) started, NSSDC held about 80,000 unique tapes, grouped into about 1,500 separately identified data sets covering the disciplines of space physics, Earth science, lunar and planetary science, astrophysics, and solar physics. Data sets ranged in size from one tape to a few thousand tapes. NSSDC received these tapes between 1966 and the current year.

Some data sets were more important for their potential to support future scientific research than others, and hence their future accessibility was more important. Science community involvement was needed to help NSSDC make judgements about data sets' potential.

The science community has participated in the DRP's data evaluation process since then, and this involvement is separately reported in a companion article.

When the DRP was initiated, NSSDC had to determine which media type to use for new data volumes. While there was some advocacy of 12-inch Write-Once Read-Many (WORM) optical platters, NSSDC took the more conservative approach of using 9-track, 6250-bpi magnetic tape and 3480 tape cartridges (in pairs, backing each other up). These media types, accommodating 160 to 200 MBytes/volume, were standard and had known longevity characteristics. NSSDC has no present plan to switch away from these media types prior to the end of its DRP, although in a follow-up phase of data preservation, NSSDC will reassess the by-then-optimal media to use. (JPL is about to start a major data restoration program and expects to use Compact Disk-Write Once as its output medium.)

see Data Restored, *p. 4*

From left to right, Kathleen Moreland, Angelia Bland, Syed Towheed, Nathan James, Joseph King, and James Thieman accept a Federal Leadership Award, presented to NSSDC's Online Data and Information Service group. See page 3 article.

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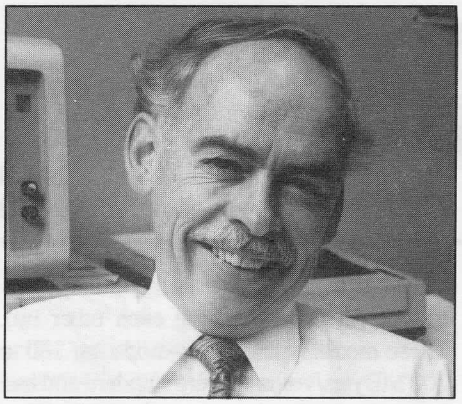


Director's Message

Saving the Right Data

The unifying theme of this issue of the *NSSDC News* is the Data Restoration Program (DRP) being pursued at NSSDC. This editorial casts NSSDC's DRP into the context of NASA's data archiving program and discusses decisions about data retention and disposal. Separate articles explore the facts and status of the NSSDC's DRP, the systems and approaches used at NSSDC to pursue this program, and the history of interactions with the scientific community for assessing and prioritizing data sets for restoration. A feature article profiles our NSSDC staff members who carry out the program.

The objective of the NASA data archive environment, of which NSSDC is a principal element, is to assure the long-term preservation, accessibility, and usability of the right NASA mission data, and, to a limited extent, certain non-NASA data that are needed for the NASA research endeavor. Aspects of what makes up the right data and documentation were addressed in the last newsletter.

In principle, data/documentation packages are created for data archiving, as per prelaunch plans. Once archived, these packages are then carried indefinitely into the future; however, this requires resources, and the science value of some of these packages decreases with time. We need to make sure that we are not expending more resources on the preservation of data sets beyond that justified by their potential to support future scientific research.

It is useful at this point to imagine a 2 x 3 matrix. On one axis we distinguish between data from older missions and data from future missions. On the other axis, we distinguish three factors affecting data accessibility and usability: durable error-free (or error-recoverable) media; sufficient documentation (including software, ancillary data, etc.) to make the data correctly usable; and formats/structures in which to capture data and documentation to facilitate convenience of data exchange and use.

The key difference between data from older and future missions is that, for the latter, data/documentation packages will be built to specifications given in a Project Data Management Plan, in adherence to well-thought-out NASA-wide and/or discipline-wide standards. This will enable the construction of effective data/documentation packages prior to archiving by Projects, Principal Investigators, or other providers of packages to the NASA archives. Then, carrying such packages into the future will primarily mean occasional migration of data/documentation to new media.

For older missions, no standards were in place when data archive packages were planned and implemented. Therefore, the quality of documentation supporting presently archived data is quite diverse. In many cases the documentation content is right; in other cases it may be insufficient; and in virtually no two cases is it formatted uniformly.

For recently ended and currently active missions, there is nonuniformity of implemented or planned archival data/documentation packages in terms of the level of adherence to emerging standards for content and formats.

Thus, the big picture is that NASA, in planning for future missions (and for several current missions), is taking steps to enable the easy and cost-effective preservation of well built data/documentation packages. However, NASA is in a transition period during which some old-mission data/documentation packages, which are optimally adherent to emerging data management standards, are being created as needed. The use of "optimally adherent" rather than "fully adherent" implies that projected use of the data may justify the cost of creating (or upgrading) a data/documentation package that will enable correct data use but does not justify the greater cost of full adherence, which would enable more convenient data use.

NSSDC's DRP has been focused on NSSDC-archived data from older missions; of the three factors affecting data usability (see discussion of the 2 x 3 matrix above), migration of data to new media has been the almost total focus of our DRP. In addition, various extra-NSSDC data restoration efforts have been initiated recently on a discipline-specific basis, involving both the Information Systems Branch (which provides NSSDC's support) and the various Discipline Divisions of NASA's Office of Space Science and Applications. The largest such effort is a JPL institutional effort, involving mostly planetary data, wherein the focus will be on moving data to new media, as at NSSDC. Other efforts, such as those of the Astrophysics Data Program and of the Planetary Data System (PDS), place relatively greater emphasis on upgrading documentation and on casting data and documentation into formats that adhere to discipline-adopted standards (FITS for astrophysics, PDS labels for planetary).

A key trade-off is that, for a given amount of resources, one can bring a given number of data/documentation packages into full adherence to relevant standards, or a greater number of data sets into partial ("optimal") adherence. It should be understood that if insufficient documentation exists to enable the correct use of data, and such documentation cannot be created because needed expertise is lost or because resources do not (and likely will not) exist to support its creation, then the migration of such data to new media is an unwarranted expense. However, it should also be recognized that the process of assessing the sufficiency of data set documentation itself requires resources. In recognition of this, NSSDC has migrated data to new media for many smaller data sets without fully assessing documentation quality.

When NSSDC started getting community input on the priorities for restoration of the older NSSDC-held data sets, we asked for restoration priorities on a scale of 0 to 10. The implication was that we'd march through all the data sets in priority sequence, discarding only those our advisors explicitly told us to discard. However, when given the choice of rating a data set as low priority for restoration vs. making a recommendation that a data set should be discarded, scientists usually opt for the former.

In light of the increasing obsolescence of hardware needed to read 7-track tapes, it is no longer feasible to count on the indefinite availability of 7-track tape drives. We are finalizing our plans for the restoration of 7-track data sets. We will work with the community (as described in the article on page 4 of this issue) to determine which older NSSDC-held data sets should not be restored. It would not be a wise use of public funds to restore all old data sets, at an NSSDC DRP-averaged cost of $20 per input tape for just the bit migration phase of restoration. As data sets are identified for releasing, we will advertise them to the community via appropriate vehicles.

We will not retire our 7-track capability before any possible support needed by extra-NSSDC NASA elements, most cost-effectively provided by NSSDC, is in fact provided.

Joseph King

NODIS Wins 1992 Leadership Award

NSSDC's Online Data and Information Service (NODIS) is an easy-to-use, uniform computerized interface to many of the most important data and services provided by NSSDC to the national and worldwide space and Earth science research communities. NODIS was recently selected to receive a 1992 Federal Leadership Award co-sponsored by the Federal Open Systems Conference Board and the *Federal Computer Week* newspaper.

The award recognizes federal programs that have made an exceptional contribution to the federal information technology community on three levels: improved service to the public, lower cost to government, and greater agency effectiveness.

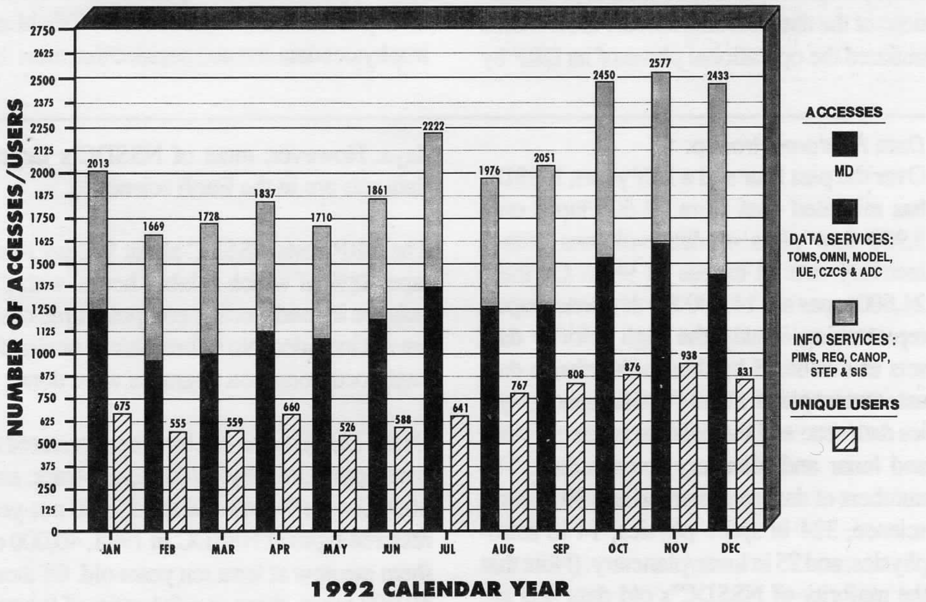
During the award ceremony, keynote speaker Franklin Reeder, Assistant Director of Office of Management and Budget, singled out NODIS as being one of the few systems that allow the public to directly access science data and information without the requirement of assistance by government personnel. At the conclusion of the ceremony, the distinguished panel of award judges acknowledged the NSSDC staff and presented them with a plaque in recognition of NODIS' achievement. Nathan James, manager and lead developer of the NODIS system, accepted the plaque on behalf of the NSSDC staff.

The following NODIS-accessible systems and their support staffs contributed greatly to NODIS's recognition for such an award: NASA and Global Change Master Directory, Astronomical Data Center, Personnel Information Management System, Solar-Terrestrial Energy Program Bulletin Board, Geophysical Models, *CANOPUS Newsletter,* Interplanetary Medium Data (OMNI), Standards and Technology Information System, Nimbus 7 TOMS Data, NSSDC Data Request Service, CZCS Image Request, IUE Data Request, Planetary Science and Magellan Project, and CD-ROMs Available.

Special thanks go to Robert Kilgore (McDonnell Douglas) and Syed Towheed (Hughes STX) for their technical support.

Nathan James

NODIS OPTIONS ACCESS



Scientists Provide Vital Evaluation Input

The accumulated archive of data from NASA's past missions represents a national asset for the pursuit of increased understandings of the Earth, solar system, and universe. However, some fraction of this archive may have reached a point at which its potential for supporting future research does not justify the cost of restoring the data, in terms of documentation upgrades, reformattings, or even the migration of bits to new media.

While data management professionals may provide estimates of data restoration costs, only members of scientific research communities are in a position to estimate the future likelihood and value of scientific use of any given data set.

In order to wisely spend public funds for data restoration, the scientific community must provide an assessment of current data sets and prioritize them for restoration. In fact, the NSSDC Data Restoration Program (DRP) was initiated by the 1987 convening of a carefully selected panel of five scientists expert in Earth atmosphere data. This discipline area was chosen because it represented a large fraction of NSSDC's tapes in a small number of its data sets. Assessment was done on a data set basis (adequacy of documentation, whether the data had been superseded, etc.). The panel provided NSSDC prioritizations of the data sets addressed. NSSDC then initiated the operational phase of its DRP by restoring the data sets that were rated as top priority by this panel.

NSSDC did not immediately convene equivalent panels in the other disciplines whose data it held. Rather, the data center started using data set access histories and its in-house scientific expertise to prioritize other data sets. NSSDC then interspersed these prioritizations with the community-provided Earth science data set prioritizations in pursuing a more discipline-balanced Data Restoration Program.

In the past year or so, discipline-specific community data assessment/prioritization activities have been initiated; they have addressed NSSDC-held data in addition to data held elsewhere.

An annual Astrophysics Data Program Research Announcement calls for, among other things, proposals for support of data reformatting/archiving. Proposals received are peer-reviewed and selectively funded. In FY92, six such proposals were supported, primarily at university sites. For one of these six, restoration of about 660 tapes has been effected at NSSDC prior to the proposer's reformatting of the data. In addition to this activity, the Astrophysics Science Operations Management Operations Working Group reviewed the list of NSSDC-held astrophysics data sets and decided that most did not have the potential to justify significant restoration support.

In space physics, four data assessment panels are being established corresponding to the four branches at NASA/HQ (cosmic and heliospheric, magnetospheric, upper atmosphere and ionosphere, and solar). Of these, the magnetospheric panel, chaired by Hunter Waite, met in late October. As part of its first meeting, this panel gave retain/discard/need follow-up judgements to NSSDC on several of its larger magnetospheric data sets. The remaining three panels are headed by NSSDC staffers—Dieter Bilitza for atmosphere/ionosphere, David Batchelor for solar physics, and Bob McGuire for cosmic/heliosphere. The first two of these panels have performed some initial data set assessments by mail.

In Earth science, each of the new EOSDIS Distributed Active Archive Centers (DAACs) has a science advisory group that assesses the importance of older data sets. NSSDC is presently working with the Goddard DAAC's advisory group in transforming low prioritizations of the 1987 panel discussed above to binary retain/dispose judgements.

Finally, the planetary community, through the nodes of the Planetary Data System, has recently made priority recommendations on many NSSDC and extra-NSSDC lunar and planetary data sets. NSSDC is using these recommendations in its current activities.

Joseph King

Data Restored, from p. 1

Over the past four and a half years, NSSDC has migrated data from 24,600 tapes onto 3,900 new pairs of data volumes with a recovery rate in excess of 98%. Of these 24,600 tapes are 14,400 Earth science tapes, representing mostly the high priority data sets as evaluated by the Earth science data assessment panel; about 9000 are space physics data sets; and the balance is astrophysics and lunar and planetary science data. The numbers of data sets restored are: 39 in earth science, 324 in space physics, 14 in astrophysics, and 25 in lunar/planetary. (Note that the majority of NSSDC's old data sets are space physics, largely because NASA flew a preponderance of such missions in its early days. However, most of NSSDC's largest data sets are in the Earth sciences.)

The DRP costs NSSDC about $20 per input tape, 88% of which is labor hours, with the balance in media costs; computer time costs are not included. No reformattings or significant documentation upgrades were done.

Of the 24,600 tapes that have been restored to date, approximately 7,700 were 7-track, and 16,900 were 9-track. Of the 55,000 not-yet-restored tapes at NSSDC in 1988, 40,000 of them are now at least ten years old. Of these 40,000 tapes, there is a 2:1 ratio of 9-track tapes to 7-track tapes.

NSSDC's average restoration rate over the past four years, has been only slightly in excess of 100 tapes per week. A combination of system problems and tape problems had made it difficult to significantly improve on this rate. However, very recent system and procedural changes described in a companion article on page 5 of this newsletter have yielded a doubling of the restoration rate.

After the DRP is completed in two years or so, NSSDC will embark on an ongoing data preservation program, whereby some fraction of NSSDC's data holdings is migrated annually to new media to assure the continued accessibility of important data.

Joseph King, Ralph Post

Systems and Procedures Used in NSSDC's Data Restoration Program

This article is a companion to four other articles in this issue addressing NSSDC's Data Restoration Program. It specifically discusses the hardware and software systems used as well as the operational procedures followed by NSSDC in this program.

From an operational perspective, the purpose of the Data Restoration Program (DRP) is to migrate data from some tens of thousands of old 7-track and 9-track magnetic tapes onto new tapes. DRP-output tapes come in pairs, with output data being written to both new 9-track 6250-bpi tape and to new 3480 tape cartridges.

When the DRP program started in 1988, NSSDC used a combination of its (then general purpose) MODCOMP computer and an IBM/3081 computer of the NASA Space and Earth Sciences Computing Center (NSESCC, since renamed the NASA Center for Computational Sciences, NCCS, with an IBM 9021 having replaced the 3081). Both systems had 7-track and 9-track capability, although both added new or reconditioned 7-track drives to support the DRP.

The NSSDC DRP continues to use both the (now DRP-dedicated) MODCOMP and the NCCS's IBM/9021. However, because of MODCOMP-associated hardware problems and problems with IBM-resident software, the rate at which 7-track tapes were being restored was below target rates.

In order to accelerate the rate of 7-track tape restoration, NSSDC designed a scenario for a low-cost, efficient system. NSSDC bought a 80386 MS/DOS host computer, custom Pertec-to-SCSI conversion hardware, tape processing software, and a new 9-track tape drive, and added to these elements the 7-track drive that was purchased for the MODCOMP two years ago. This system creates 9-track tapes in which 7 tracks replicate the input tapes, and the remaining two tracks are unused—thus, the output tapes are "padded." This system became operational in January 1993.

The MODCOMP computer continues to be NSSDC's primary system for handling "sticky tapes"—that is, for many tapes with a mid-1970s heritage from a specific vendor with the characteristic of causing excessive debris buildup on tape-read heads. For the MODCOMP, which runs at lower tape-read speeds, this buildup is less a problem than it is for the other systems available. NSSDC expects to be able to retire the MODCOMP computer this spring.

From a procedures perspective, NSSDC management has identified and prioritized a series of data sets for restoration. For each such data set, the original tapes and the backup tapes are gathered from the NSSDC archive and/or from NSSDC's holdings in the Washington National Records Center (WNRC).

Tapes are first copied onto new tapes on a one-to-one basis. Then, after all the tapes of a data set have been so copied, the tapes are concatenated onto smaller numbers of full 9-track tapes. Then the 3480-cartridge backups are created. After the new tapes' content and quality are verified, the older tapes are recycled. Entries are made into NSSDC's information file regarding the new tapes, including which older tapes led to each new tape. Finally, one member of each new pair of data volumes is sent to WNRC for safe offsite storage, and the other is assigned space in the NSSDC archive area.

One procedural change that NSSDC has just made is to decouple the processes of creating the one-to-one output tapes that were generated from the DRP-input tapes and of stacking these tapes onto the tapes to be saved. This decoupling will enable certain systems and personnel to be dedicated to the migration of data off the old tapes, thereby accelerating the migration process. The combination of this procedural change and the use of the new system discussed above has yielded a data restoration rate of 200 tapes per week over the last few weeks.

Jordan Gottlieb, Joseph King

ROSAT, GRO Data Come to NSSDC

The U.S. Roentgen Satellite (ROSAT) Public Data Archive (USRPDA) was officially opened on November 1, 1992. The X-ray data from the 1990-launched German-American satellite are hosted physically on the NSSDC Data Archive and Distribution Service (NDADS) for public access. The USRPDA, whose contents mirror those of the German and U.K. ROSAT Public Data Archives, contains the housekeeping information, photon event lists, and non-background-substrated images (in FITS and PostScript formats). ROSAT observation data enter the public archive 54 weeks after they were sent to the principal investigator. NSSDC receives weekly releases of public data from the ROSAT project for ingest into NDADS.

There are three ways to access the USRPDA electronically: through the NDADS Automated Retrieval Mail System (ARMS), through the HEASARC Online System, or through the ROSAT Mission Information and Planning System (MIPS). Requests for data transfer on magnetic media can be sent to the NSSDC Coordinated Request and User Support Office.

NSSDC received the first delivery of the Compton Gamma Ray Observatory (GRO) Oriented Scintillation Spectrometer Experiment (OSSE) Spectral Data Base (SDB) files from the Compton Observatory Science Support Center (COSSC) in November. These data comprise the OSSE observations of the Crab and PSR1957+20 during the first GRO viewing period. The data are in a special SDB FITS format. NSSDC also received a redelivery of the gamma ray burst data in FITS format from the Burst and Transient Source Experiment (BATSE). These data will be ingested into NDADS for public access, pending review of the FITS format standards. Meetings were held with the staff of the COSSC and the decision has been reached to archive the GRO data only in FITS format, with software available for conversion back to native format.

Cynthia Cheung

Data Restoration Program: Meet the People Who Make It Happen

Several articles in this *NSSDC News* address various technical, historical, and management aspects of NSSDC's Data Restoration Program (DRP). However, just as a finely architected building must have highly skilled bricklayers and other artisans for its implementation, the success of NSSDC's DRP is highly dependent on, and due to, the dedicated and skillful efforts of several NSSDC "data techs," whom we would like to introduce to our readers.

The team working on the DATA Restoration Project consists of task leader Sharlene Rhodes, Elizabeth (Liz) Ramey, Allison Lopez, and Nelson Cheung. A data center employee for eight years, Sharlene is married and has two children. She enjoys ceramics and folk art painting.

Senior data technician Liz has worked at Goddard for the past 24 1/2 years. When weather permits, Liz, her husband, and her son like to relax on the water. The Rameys have a johnboat and spend their summer weekends crabbing.

Alison has worked at Goddard for three years. She is married and has one son. Cooking, reading, and playing with her son top the list of Allison's favorite activities.

Nelson has been at the data center since 1987. Later this year he will receive a B.S. in computer and information science with a concentration in information systems management from the University of Maryland.

Four additional NSSDC staff members are also playing key roles in the restoration program, two of whom operate the DRP-dedicated systems that are described elsewhere in this newsletter.

Dave Guell first joined NSSDC seven years ago, and he has recently returned to NSSDC as an associate programmer/analyst after a two-year hiatus as a case worker and teacher in a children's home in Macon, Georgia.

These are the staff members who restore NSSDC's data to new media. They are, left to right in the back row: Liz Ramey, Rodney Raney, David Guell, and Ralph Post; in the front row, Alison Lopez and Sharlene Rhodes.

Rodney Raney is a data analyst with three years of study of Applied Physics at Hampton University, and he is now pursuing a B.S. degree in Computer Science at the University of Maryland.

Ralph Post, with 22 years' experience at NSSDC and with lead responsibility for the NSSDC tape archive and for supervision of related staffers for most of those years, has played an overall role in DRP; he also served as a valued mentor for co-worker Sharlene Rhodes.

Ron Blitstein, Ralph's supervisor, has contributed significantly to the DRP, particularly at the conceptual level.

This group is helping to maintain valuable data in a usable format that will be used by scientists around the world for years to come.

Kenneth Silberman

NDADS Supports Space Physics Effort

NSSDC's Data Archive and Distribution Service (NDADS), comprised of network-accessible optical disk jukeboxes front-ended by VAX computers, represents NSSDC's principal thrust in making the more important data in its archives electronically accessible to its scientific customer community.

This article highlights the benefits of NDADS to the space plasma and solar physics communities at this time. Note that it is still quite early in the transition from having a primarily off-line archive to a primarily on-line archive. Principal space physics data sets now on NDADS are IMP 8 and ISEE 3 magnetic field data and Dynamics Explorer auroral imagery, electric field, plasma wave, and ion mass spectrometry data. Solar X-ray images from the Skylab mission are also contained in NDADS.

From IMP 8, 15-second resolution magnetometer data for 1973 to mid-1991 are included. Data consist of field magnitude, cartesian components and direction angles, ephemeris data, and other parameters. The data are accessible in one-day files, and are included for both solar wind and magnetosphere orbital phases of IMP 8.

From ISEE 3, 1-minute resolution magnetometer data for 1978–1987 are included. This represents ISEE's upstream libration point, deep geomagnetotail, and distant heliosphere phases. The data include field magnitude, field components and direction angles, and ephemeris data. The data are held in one-day files.

Raw images (and software) from the spin-scan auroral imagers (SAI) on DE 1 are available at various visible and UV wavelengths (120-630 nm) and time resolutions of up to 12 minutes for 1981–1986. From the Vector Electric Field Instrument (VEFI) on DE 2, five types of AC and DC data are available at various time resolutions (from 1 to 16 samples per second) for the whole mission (1981–1983). The DE 1 Plasma Wave Instrument (PWI) data sets include AC electric (1 Hz to 2 MHz) and magnetic fields (1 Hz to 400 kHz), narrow band spectra (100 Hz to 400 kHz), DC electric field, and phase angle for 1981–1984. Ion composition data (1 to 40 amu) are available from the Retarding Ion Mass Spectrometer (RIMS) on DE 1 with a time resolution of 0.5 seconds.

From Skylab, full-disk solar images in the 2–60 A X-ray band, made with exposure times ranging from fractions of 1 second to 256 seconds, are available. These data were collected from May 1973 until February 1974 on film and later digitized.

For the future, NDADS's usefulness will improve with the addition of more high-interest space plasma and solar data sets. NSSDC expects that NDADS will become a key element of the future Space Physics Data System. In addition, it will be used to support the ISTP/GGS endeavor by holding (at least) its key parameter data on line for ISTP science team access during proprietary phases.

To extract information and/or data from NDADS over DECnet, use the VMS Mail facility. Send a mail message to NDADSA::ARCHIVES, and let your subject line be HOLDINGS. No text in the message body is required. In reply, you will receive an electronic mailing of a high-level overview file that contains information with which you can proceed further.

Over Internet, the procedure is to send mail to archives@ndadsa.gsfc.nasa.gov with the same subject, HOLDINGS.

David Batchelor, Dieter Bilitza

Memorandum of Understanding Signed: NSSDC and OGIP Plan Collaboration in High Engery Astrophysics

The Memorandum of Understanding (MOU) between the NSSDC and the Office of Guest Investigator Programs (OGIP) of Goddard's Laboratory for High Energy Astrophysics regarding data management and archiving in the High Energy Astrophysics Science Archive Research Center (HEASARC) collaboration was formally signed at NASA Headquarters on December 2, 1992.

The HEASARC effort is a new direction that brings NSSDC into a more active role in support of astrophysical research. The mission of HEASARC is to provide specialized user support expertise and rapid access to data from past high energy astrophysics missions for the scientific community.

The NSSDC will have primary responsibility for managing the nearline (jukebox-based) and permanent physical archives, and for providing routine access and bulk data distribution. The OGIP will have primary responsibility for providing scientific expertise and on-line access to the data. Both organizations will coordinate in data acquisition and verification, and in the development of the multi-mission catalog The MOU was distributed to the members of the HEASARC Users' Group at their biannual meeting on December 4, 1992.

Cynthia Cheung

An Update on the Status of ISEE 1, 2, & 3 Data Archiving

On October 22, 1977, the International Sun-Earth Explorers (ISEE) 1 and 2 were launched into 23-Re-apogee, eccentric, geocentric orbits to study the earth's magnetospheric environment. ISEE 1 and 2 re-entered the earth's atmosphere on September 26, 1987.

The ISEE 3, later re-named ICE (International Cometary Explorer), was launched on August 12, 1978, to monitor the solar wind from the sunward (L1) Lagrangian point about 235 Re upstream of the earth. Subsequently it underwent a number of other major mission phases, including deep magnetotail exploration and observations of cometary environments, and continues to make deep-space solar wind measurements.

The ISEE project was a cooperative venture between the European Space Agency and NASA, and together the instruments on the three spacecraft provided a wealth of information about the solar-terrestrial environment and interactions.

Over the course of the last several years, a systematic effort has been underway at the NSSDC to archive a significant fraction of high-quality, high-time resolution, digital data from the ISEE missions (refer to articles in *NSSDC News,* Fall/Winter 1988, and *NSSDC News,* Fall 1990). The goal of this effort is to supplement or supersede the existing data holdings, to maximize the scientific return from a unique constellation of spacecraft by consolidating archivable data, and thus to facilitate continued support of future research tasks.

As a result of this endeavor, much useful data have been archived. This article describes the status of the ISEE archive at NSSDC and also addresses where such information was available, data that may be of importance to the scientific community but are as yet unarchived.

The primary emphasis of this archiving effort was on the following time intervals during the mission:

- October 23, 1977 – February 17, 1980 (from ISEE 1 and 2 launch through the first year and a half of operation of all three spacecraft, referred to as the "PRIME" period)
- October 15, 1982 – December 25, 1983 (the deep tail phase of the ISEE 3 mission, referred to as the "GEOTAIL" period [not to be confused with the ISTP GEOTAIL mission])
- September 10–14, 1985, for ICE (the comet Giacobini-Zinner encounter, referred to as the "GZ" period)
- March 29, 1986 – June 16, 1986, for ISEE 1 and 2 (the "PROMIS" campaign period)

Thus, the primary archival periods for ISEE 1 and 2 were "PRIME," "GEOTAIL," and "PROMIS," and the primary

Table 1. ISEE 1 NSSDC Digital Data Special Archive Summary

PI	Parameters	Time Res.	Time Period(s)
Anderson	e,p fluxes	4-sec	PRIME, GEOTAIL, PROMIS
Cattell	2 E, 3 B-comp s/c potential waves (3 ch.); waveform data	3s	PRIME
Frank	3-d distr. fns. e,p	128s 512s	PRIME
Gosling	ions n,V,T, flow az. & lat. alpha/proton	24/48s	PRIME, GEOTAIL (solar wind data only)
Gurnett	Rcvr. outputs (DECOM data)	1s, 0.25s	PRIME, GEOTAIL, PROMIS
Heppner	2 E-comp 3 B-comp	3s	PRIME
Hovestadt	count rates	16s, 64s	PRIME, GEOTAIL, PROMIS
Lennartsson	moments & en. spectra	2-17min	PRIME
Ogilvie	electron moments	9s/18s	PRIME
Russell	Bx,By,Bz 1-min:	4s: 1980-83	PRIME, GEOTAIL, PROMIS
Williams	3-D distr. fns. (WAPS)	36s	PRIME

Table 2. ISEE 2 NSSDC Digital Data Special Archive Summary

PI	Parameters	Time Res.	Time Period(s)
Anderson	e,p fluxes	4-sec	PRIME, GEOTAIL, PROMIS
Paschmann	FPE ions n,V,T, flow azimuth	3s/12s	PRIME (data not valid in the solar wind)
Russell	Bx,By,Bz	4s: 1min:	PRIME, GEOTAIL, PROMIS 1977-79, 1984-87

Table 3. ISEE 3/ICE NSSDC Digital Data Special Archive Summary

PI	Parameters	Time Res.	Time Period(s)
Anderson	X-ray count rates	1-sec	
Gosling	e,p moments	24s (p), 84s (e), 168s (e)	PRIME, GEOTAIL, GZ (In combination, data are time continuous to 6/92)
Greenstadt	E & B spectra	2s	GZ
Hovestadt	counts	128s 512s	PRIME, GEOTAIL, GZ
Hynds	counts	32s	GZ
Ogilvie	He++ n,V,T	1-h	PRIME
Smith	Bx,By,Bz	1-min, 3-s (TAIL) 0.33s (GZ)	PRIME, GEOTAIL, GZ (Time continuous to 12/90)
Steinberg	Ne, Te	54s	GZ tail traversal
Stone	fluxes H,He,Z>2	1-h, 15-min	PRIME
von Rosenvinge	fluxes	2-h, 15-min	PRIME, GEOTAIL, GZ

archival periods for ISEE-3/ICE were "PRIME," "GEOTAIL," and "G-Z." The focus on these time periods was not meant to exclude data from other time intervals, but rather to optimize the return possible with available resources; in fact much data outside these periods have also been archived as a result of this effort.

There were 14 experiments on ISEE 1, eight experiments on ISEE 2, and 14 experiments on ISEE 3. Thirty-eight new data sets have been archived to date as a result of the special effort (16 from ISEE 1, six from ISEE 2, and 16 from ISEE 3/ICE).

The spacecraft were instrumented to make in situ measurements of plasmas, electric and magnetic fields, plasma waves, and energetic particles, as well as electromagnetic emissions (radio waves, X-rays, and gamma rays). Most submissions have been on tape (mostly 9-track, two on Exabyte), a few have been on 12" Write-Once Read-Many (WORM) optical disk. Some earlier analog (non-Pool) data submissions were also made.

The three tables accompanying this article summarize the state of archiving from each of the ISEE instruments. More details about the archiving data from each instrument are published in a new NSSDC report that was created in conjunction with this article. You may order a copy of the detailed ISEE Data Archive Status report through NSSDC's Coordinated Request User Support Office (as specified on the back page of this newsletter).

The efforts of all who participated in this endeavor are greatly appreciated. Please contact NSSDC's Head, Joseph King, (KING@nssdca.gsfc.nasa.gov) for further details.

Sumant Krishnaswamy

SPDS Community Workshop Scheduled

At the direction of the NASA Space Physics Division (HQ/Code SS) and in response to concerns expressed by the science community, an effort has been underway for some time to define the form and implementation of a new Discipline Data System to serve the space physics community. This "SPDS" is proposed to meet urgent data requirements presented by upcoming new missions while helping to better preserve and improve access to critically important data from both past and present missions.

As a part of this effort, an SPDS Steering Committee (SPDS/SC) was formed and has now completed an initial version of an "SPDS Concept Document," which discusses the need for SPDS and the proposed objectives and management philosophy and which presents a strawman proposal for implementing SPDS. The SPDS will serve all four science disciplines of the NASA Space Physics Division (SPD)—cosmic and heliospheric physics; ionospheric, thermospheric, and mesospheric physics; magnetospheric physics; and solar physics.

The Steering Committee feels that the data sets derived from past, present, and future SPD missions are a capital asset, and that it is imperative to preserve, distribute, and support the analysis of these data. Given today's rapid technology changes and the very limited resources available, the system philosophy proposed is that a successful SPDS will have to evolve incrementally from and within the science community. This management and implementation approach was used with great success in the development of the Space Physics Analysis Network (SPAN).

A major challenge in forming this system is the presently austere NASA fiscal environment. To fit within this constraint, a demonstration "pre-SPDS" is to be formed as a "confederation" of systems that now exist in the space physics community and either serve or are capable of serving (at minimal incremental cost) a broad constituency of general space physics science users. The NASA Master Directory (NMD) will operate as a common "front-end" to the early system.

An urgent requirement for the early system will be to involve the broad user community in defining what services are of greatest immediate need and what SPDS should really be. In that light, the SPDS/SC decided that a "community workshop" is needed and that this demonstration (pre-SPDS) system should be then shown as a working whole to help focus discussions of the desired configuration and evolutionary directions. This workshop will be hosted by Rice University in Houston, Texas, and will be held June 1-3, 1993.

Both active research scientists and data technology/data systems experts are encouraged to attend. Participation will be open but limited by physical facility constraints to the first 60–100 registrants. Contributed (poster) papers and demonstrations will be possible. Goals of the workshop will be to gain community reactions and constructive comments on the proposed concept, to introduce the community to the capabilities already demonstrable in the pre-SPDS, and to begin the SPDS Users' Working Group (SPDS/UWG).

For a copy of the Concept Document and/or information and workshop registration materials, please contact:

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Science Applications International Corp.
400 Virginia Avenue SW, Suite 810,
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Telephone: (202) 479-0750 (Voice)
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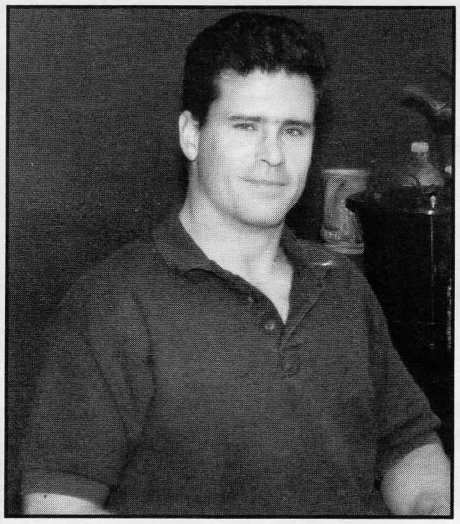
Robert McGuire
Raymond Walker (UCLA)
James Willett (NASA/HQ)

Burley Joins SSDOO Common Data Format Team

In September 1992, Richard (Rick) Burley joined the Space Science Data Operations Office (SSDOO). He works in the Space Physics Data Facility, a sister organization of the NSSDC within the SSDOO, developing and enhancing suites of Common Data Format tools for the International Solar-Terrestrial Physics (ISTP) Program.

Rick is currently working on a tool to "generate CDF files from flat ASCII files." He adds, "I will be developing a merging and subsetting tool to operate on CDF files."

From 1985 until September of last year, Rick worked for the Systems Development Branch of the Flight Dynamics Division at Goddard. He developed attitude support systems for COBE, GRO, UARS, EUVE, SAMPEX, WIND, and POLAR. Attitude support includes mission planning, attitude determination, orbit determination, and spacecraft dynamics simulation. He wrote software primarily in FORTRAN and Ada.



Rick Burley's efforts support ISTP.

Rick graduated with a B.S. in computer science from Bowling Green State University, Ohio, in 1985. His minor was engineering.

Rick is originally from the Cleveland area. He is a starting fullback for the Severn River Rugby Club of Annapolis, Maryland.

Kenneth Silberman

Version 2.3 and New IDL Software Offer Advantages

The Common Data Format (CDF) software continues to play a major role in the scientific community as a tool for managing, storing, and accessing large volumes of data for the purpose of textual browsing, visualization, and statistical analysis applications. CDF version 2.3, which was released on October 1, 1992, features the following improvements:

- support of zVariables
- ability to read any host encoding on any computer
- option to build the CDF distribution in a read-only mode
- port to the NeXT computer
- interface for use at the IDL command line
- shareable version of the CDF library

Please note that at this time, the last two improvements listed above are only available for VAX/VMS, Sun/SunOS, HP9000/HP-UX, and IBM RS6000/AIX.

ZVariables are intended to improve handling in single CDFs of physical variables having differing "dimensionalities"—as, for instance, a three-component magnetic field vector and an eight-component particle flux "vector" whose components are fluxes at each of eight energy steps.

In addition to the NSSDC IDL interface, Research Systems Incorporated (i.e., the developer of IDL) has included the CDF library as part of the IDL package and written its own interface to the CDF library. This new version of the IDL software was released in January 1993 and is available via the network for all IDL users.

The CDF staff continues its commitment to providing a high-quality product backed by equally high-quality support.

Greg Goucher

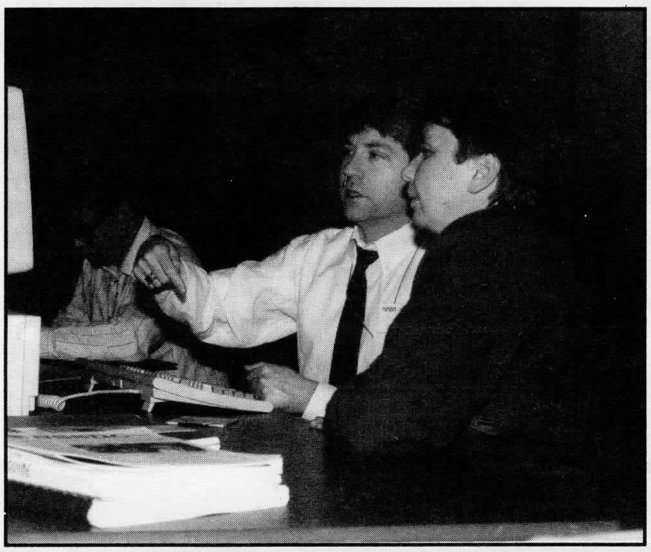
IACG Workshop Facilitates Data Sharing

Participants in the IACG workshop pause for fresh air and a photograph. On the ground level, left to right, are Alexy Sokolov, Elena Gavrilova, Andzey Ananjev and Jim Green. Standing on the first step is Mona Kessel. On the middle step are Bill Mish, Natasha Papitashvili and Bob McGuire. Rick Burley, Jason Mathews, Greg Goucher, Mauricio Peredo, H. Kent Hills, and Dieter Bilitza are on the top step.

During the week of January 25, 1993, the CDF staff held an IACG workshop at NSSDC. Headed by Mona Kessel, the workshop was designed to educate Russian scientists who are associated with the Interball space physics spacecraft about CDF software, how it is used with respect to the ISTP project, and how it is used with various visualization packages.

The workshop organizers had intended to follow the original outline, which was set up before the meetings began. However, the discussion sometimes deviated from the plan so that speakers could address a number of in-depth technical questions and issues. The visitors had thoroughly prepared themselves for the week's agenda by studying the CDF documentation prior to the workshop. Both host and guest participants said that, because of the learning and communication fostered by the workshop, they now look forward to significantly easier data sharing and use among scientists associated with the INTERBALL Spacecraft.

Greg Goucher



Kent Hills works in the background, while Dave Batchelor answers a question from Russian scientist Natasha Papitashvili.

New Data Received at NSSDC: October – December 1992

NSSDC received many new data sets during the October-December 1992 time period. These new data arrivals (including extensions of existing data sets) are listed in the accompanying table on the opposite page.

The highlights of recent planetary acquisition were the arrivals of 24-volume CD-ROM sets of data from the International Halley Watch program, and five-CD-ROM sets containing images of Venus, the Earth, and the Moon from the Jupiter-bound Galileo spacecraft. NSSDC continued to receive more Magellan radar data on CD-ROM and as photo products. Magellan arrivals also included global/compressed maps in chronoflex format and a computer animated videotape. Photo products of Viking 1 and 2 Orbiter images were also received.

New astrophysics data included ROSAT pointed observations and calibration data, and image data from the IUE UV spectrograph. Other new arrivals in astrophysics include ASTRO 1 photo products from the Far UV and Near UV imaging telescopes, and ASTRO-C (Ginga) quick-look data sets in FITS format from the X-ray proportion counter.

Space physics data arrivals extended many existing data sets at NSSDC, including plasma data from Pioneer Venus, IMP 8, and ISEE 1 spacecraft and DE 2 magnetometer data. Please refer to the new data table on page 13 for more detail.

In the Earth science discipline, NSSDC continued to receive Nimbus 7 ozone data and ERBS data from the SAGE II instrument. Photo products from the Topex/Poseidon radar altimeter were also received.

Joy Beier

Letter to the Editor

Dear Editor:

As a frequent user of and contributor to the archives of the NSSDC, I feel that the data sets stored there are too often insufficiently documented. The problem is no less severe with the data I have contributed than the data of other groups. In part the problem is the serious underfunding experienced by the NASA MO and DA effort over the last decade. The money is being put in the pipeline but is leaking out before it reaches the experimenters. However, part of the problem is also that there is no careful review and feedback on the documentation submitted. Busy (underfunded) people will generally submit a minimum of documentation and often may forget to discuss issues such as the limitations of the data set or assumptions made in the processing. Thus, I would urge the NSSDC to make it a high priority to review documentation and give the experimenters feedback as soon as possible. I recommend that the first datasets to be reviewed be the datasets with high utilization. The standards developed here will initially benefit the greatest number of users and can be used as a guide for future submitters.

One pet peeve of mine is that few data submitters describe what the time word means that is included with their time series data. Does it mean the start of the average, the middle of the average, or the end of the average? Are the data an average, an instantaneous sample, or an average over a short period within a larger interval?

Another pet peeve concerns the submittal of data originally obtained by another group. I have given data to a number of groups for correlative purposes. These groups, when they archived their data, included the correlative data I had given them. This is fine, but to date none of them has asked me to verify the accuracy of the data they submitted to see if they agree with my "archival" values. Nor have they described how they obtained the values from the raw data I provided. Again, this problem stems partially from the lack of resources. Nevertheless, in a situation in which many copies of the same data exist, each with different heritage, careful and complete documentation is a must.

Sincerely,

Chris Russell
Institute of Geophysics and Planetary Physics
UCLA

NSSDC Welcomes Newcomers

The Space Science Data Operations Office (SSDOO), NSSDC's parent organization at Goddard, welcomes two newcomers to the Space Physics Data Facility: Ramona Kessel and Robert Candy. She supports the International Solar Terrestrial Physics program, and he arrives in early March to support NSSDC's contributions to the Space Physics Data System and other related efforts.

Richard Fink and Dave Leisawitz are also new to the SSDOO; Fink works on the ASTRO-D data system, and Leisawitz will work on the COBE data system. Both systems are supported in the Astrophysics Data Facility.

NSSDC ID	Platform	Instrument	Contact	Measurement	Time Span	Medium
ASTRO 1-03A	ASTRO 1	FUV Camera	Stecher	Far UV imaging telescope photos	12/2/90-12/11/90	70mm bw neg
ASTRO 1-03B	ASTRO 1	NUV Camera	Stecher	Near UV imaging telescope photos	12/2/90-12/11/90	70mm bw neg
87-012A-01A	ASTRO-C	X-ray Proportion Counter	Makino	Ginga Quick Look		mag. tape
87-012A-01B	ASTRO-C	X-ray Proportion Counter	Makino	Ginga Quick Look (FITS)		
81-070B-01C	DE 2	MAG-B	Slavin	Magnetometer data		optical disk
84-108B-02A	ERBS	SAGE II	McMaster	unprocessed solar radiance w/ ephem & meteo.	11/1/84-7/31/92	mag. tape
84-108B-02B	ERBS	SAGE II	McMaster	ozone density & volume mixing ratio	11/1/84-11/30/90	mag. tape
84-108B-02D	ERBS	SAGE II	Maddrea	Nitrogen Dioxide (sunsets)	11/1/84-11/30/90	
89-084B-10A	Galileo	SSI	PDS	B/W press release		4x5 bw neg
89-084B-10B	Galileo	SSI	PDS	Color press release		4x5 color neg
89-084B-10C	Galileo	SSI	Waino	Cruise Imaging (Earth)		CD-ROM
73-078A-01C	IMP-J	Tri-ax. magnetometer	Lepping	15 sec. avgd. mag. fld. plots	10/30/73-7/20/91	Microfilm
73-078A-01J	IMP-J	Tri-ax. magnetometer	Russell	5 min mag. fld. & plasma	10/30/73-7/21/91	mag. tape
73-078A-02H	IMP-J	"Solar Plasma, Fara. Cup"	Russell	5 min. mag. fld. & plasma	10/30/73-7/21/91	mag. tape
73-078A-10D	IMP-J	"Plasma, Electro. Analyzer"	Gosling	"hr. avgd. solar wind density, speed & temp."	1/12/79-12/31/91	mag. tape
73-078A-10F	IMP-J	"Plasma, Electro. Analyzer"	Gosling	2 min. proton & alpha particle moments	11/4/73-12/31/91	mag. tape
73-078A-10G	IMP-J	"Plasma, Electro. Analyzer"	Russell	5 min. magnetic field & plasma parameters	10/30/73-7/21/91	mag. tape
77-102A-03G	ISEE 1	Hot Plasma	Huang	proton & electron 3-D distribution func.	11/1/77-6/4/80	mag. tape
78-012A-01B	IUE	UV Spectrograph		Image data	4/1/78-5/15/91	mag. tape
78-012A-01C	IUE	UV Spectrograph		European spect. image data	4/1/78-5/15/91	mag. tape
89-033B-01C	Magellan	SAR	Arvidson	C1 MIDR		
89-033B-01D	Magellan	SAR	Barlow	C2 MIDR		
89-033B-01F	Magellan	SAR	Arvidson	Full res MIDR		
89-033B-01N	Magellan	SAR	Arvidson	C1 MIDR		
89-033B-01O	Magellan	SAR	Arvidson	C2 MIDR		
89-033B-01P	Magellan	SAR	Arvidson	C3 MIDR		
89-033B-01Q	Magellan	SAR	Arvidson	MIDR full res		
89-033B-01W	Magellan	SAR	Morrison	computer animated Venus flight		video tape
89-033B-01Z	Magellan	SAR		global/compressed maps		chronoflex
78-098A-06B	Nimbus	SAM-II	McCormick	Beta-Aerosol No Den Arch	11/1/78-10/31/91	mag. tape
78-098A-07A	Nimbus	ERB	Jacobowit	ERB Master Archival Tape	11/16/78-9/30/92	mag. tape
78-098A-07B	Nimbus	ERB	Stowe	Solar & Earth Flux Data	11/1/78-8/2/92	mag. tape
78-098A-08A	Nimbus	SMMR	Gloersen	Antenna Temp. Tape	10/25/78-6/29/88	mag. tape
78-098A-09C	Nimbus	BUV/TOMS	Krueger	Total Ozone Data Tape	10/31/78-4/30/92	mag. tape
78-098A-09E	Nimbus	BUV/TOMS	Krueger	Raw Units - TOMS	10/31/78-10/31/92	mag.tape
78-098A-09F	Nimbus	BUV/TOMS	Heath	Raw Units - SBUV	10/31/78-10/31/92	mag.tape
78-098A-09R	Nimbus	BUV/TOMS	Krueger	Daily Grid TOMS	10/31/78-3/31/92	mag. tape
72-012A-02C	Pioneer 10	Charged Particle Comp	Lentz	5 min. avgd. count rate	3/3/72-12/31/90	mag. tape
72-012A-09D	Pioneer 10	Celestial Mechanics		intermediate data records		
73-019A-09D	Pioneer 11	Celestial Mechanics		intermediate data records		
78-051A-18E	Pioneer Venus 1	Plasma analyzer	Gazis	hourly avgd. plasma data		
78-051A-18F	Pioneer Venus 1	Plasma analyzer	Gazis	plasma summary data		
90-049A-01A	ROSAT	High Resolution Imager	Corcoran	pointed calibration observ.		
90-049A-02A	ROSAT	Pos Sensitive Proport. Cntr.	Corcoran	pointed calibration observ.		
92-052A-01A	Topex/Poseidon	Radar Altimeter	Van Der Woude	color neg of wave ht.		4x5 color neg
92-052A-01B	Topex/Poseidon	Radar Altimeter	Van Der Woude	color neg of ocean topography		4x5 color neg
92-052A-01C	Topex/Poseidon	Radar Altimeter	Van Der Woude	color gen of ocean variability		4x5 color neg
69-046E-06B	VELA 5B	Cosmic X-rays		time-ordered cosmic X-ray		
75-075A-01C	Viking 1 Orbiter	Orbiter Imaging	Carr	Images - EDR v1	7/23/76-5/13/77	5x5 bw pos
75-075A-01D	Viking 1 Orbiter	Orbiter Imaging	Cantrell	Images - EDR v2	6/18/76-3/3/77	4x5 color pos
75-083A-01A	Viking 2 Orbiter	Orbiter Imaging	Carr	Images - EDR v1	10/16/75-6/17/78	4x5 bw pos
75-083A-01B	Viking 2 Orbiter	Orbiter Imaging	Martin	Images - EDR v2		4x5 bw pos

News from the NOST

NSSDC/NOST Hosts International Standards Meeting

The NASA/OSSA Office of Standards and Technology (NOST) hosted the international Consultative Committee for Space Data Systems (CCSDS) Panel 2 fall meeting in Rockville, Maryland, from November 6–13, 1992. The CCSDS is an international organization of space agencies that was first formed in January 1982. It provides a forum for space agencies interested in mutually developing standard data handling techniques to provide cross-support, including space research, conducted exclusively for peaceful purposes. The CCSDS is currently composed of about 25 national and joint-nation space agencies.

Panel 2 of the CCSDS is the Standard Information Interchange Processes (SIIP) Panel. It has the primary responsibility within CCSDS for the development of techniques that will both facilitate and promote the interchange and use of space-related information.

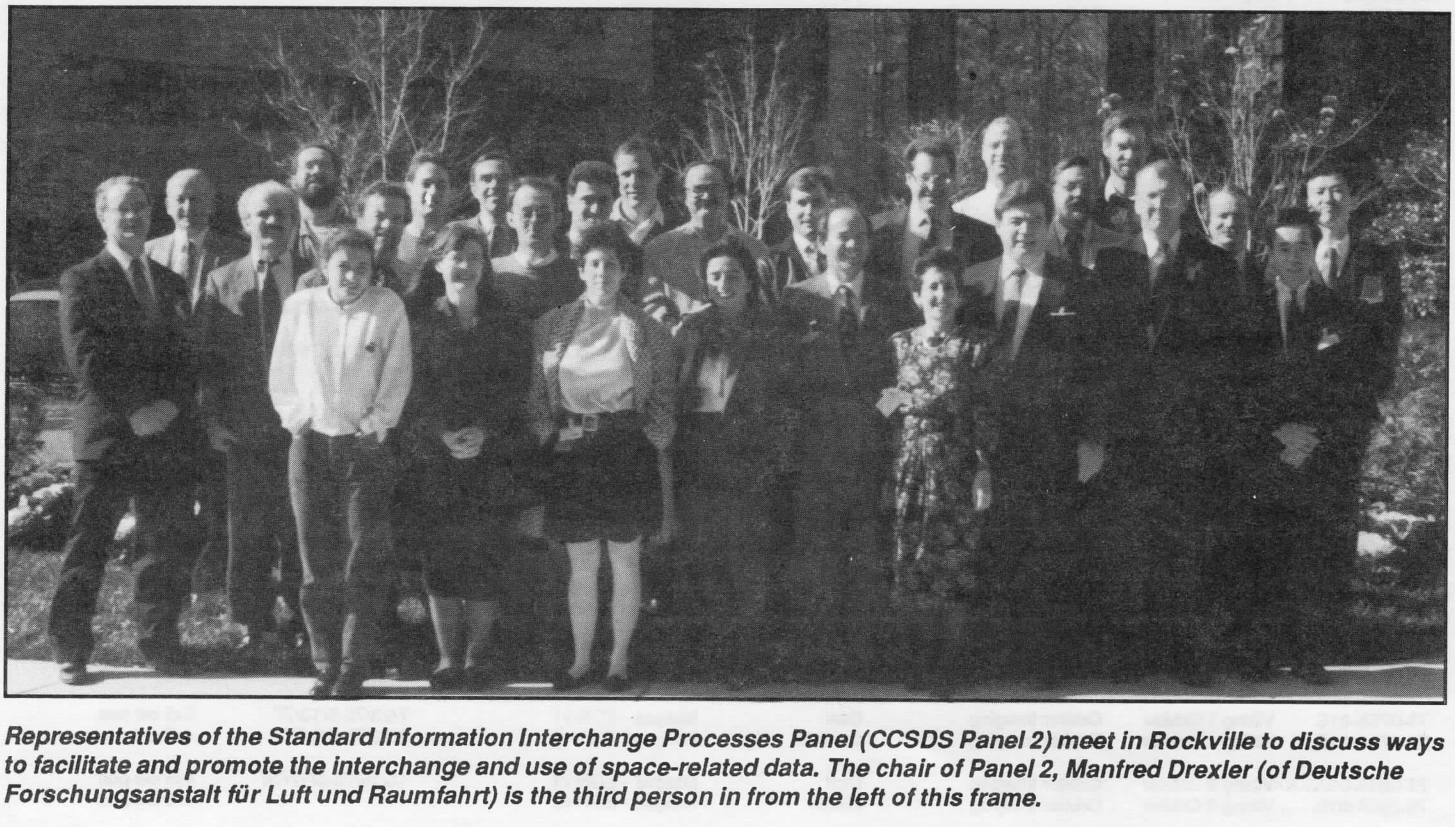
These biannual meetings provide a forum for the representatives of the various agencies to discuss, face-to-face, the many technical problems inherent in establishing standard information interchange interfaces that can be used throughout the world and over many years.

This meeting consisted of several plenary sessions and separate meetings of Panel Management, the System Requirements Working Group, the Data Administration Working Group, and the Structures and Languages Working Group. The working groups are the forums where participants attack the technical details to achieve consensus and try to work the recommendations into a form that will be approved by all Member Agencies and their constituents. This meeting also included an Implementers' Workshop where agencies and individuals describe their experiences in putting CCSDS Recommendations into practice. Staff members from NOST's Standard Formatted Data Unit (SFDU) Support Office demonstrated the prototype Control Authority Office Information System (CAOIS) mentioned in the last issue of this newsletter. The Implementer's Workshop was well received and there was discussion of expanding it to a full day at the spring meeting with the inclusion of more experiences of SFDU use by projects.

Many of the participants in this fall's meeting felt that it was one of the most productive Panel 2 meetings in terms of reaching consensus on the technical issues discussed. Following are brief summaries of several major accomplishments that resulted from the meeting.

- The ASCII Encoded English Recommendation was approved as a Blue Book.

see NOST, p. 15



Representatives of the Standard Information Interchange Processes Panel (CCSDS Panel 2) meet in Rockville to discuss ways to facilitate and promote the interchange and use of space-related data. The chair of Panel 2, Manfred Drexler (of Deutsche Forschungsanstalt für Luft und Raumfahrt) is the third person in from the left of this frame.

NOST, *from p. 15*

This book defines the "Natural English Language" in digital form as a method of expressing information in the SFDU environment.

Note that in the CCSDS scheme of documents, White Books are preliminary drafts of CCSDS Recommendations or Reports. Red Books are drafts of Recommendations that describe the technical consensus of the panel members. Red Books then undergo an extensive and formal review process by CCSDS Member Agencies. A Blue Book is an approved technical Recommendation and represents the technical consensus of all Member Agencies approving the document.

- All agency issues on the Control Authority Procedures Red Book were resolved with the exception of a NASA concern on the scope of the content. This book describes the Control Authority structure responsible for registering and archiving SFDU-associated data descriptions. It also details the services provided to the end users. Agencies will soon be formally reviewing the updated document, and Panel 2 expects to be able to approve it as a Blue Book at its spring meeting.

- Significant agreements were also made on the Data Entity Dictionary White Book. It is being updated for the spring meeting.

Standards Just Keep On Coming

The NOST Standards Library is continually receiving new and updated copies of standards documents and other documents that describe new and developing data systems technology. Since the last issue of *NSSDC News*, the standards librarian has added about 50 documents to the shelves and has incorporated their catalog information into the Standards and Technology Information System (STIS). The NOST office is always open to receiving new documents and identifying new sources of information. If you are a member of a standards developing group or simply have information about new or emerging technology, please share your experiences with the NOST group.

Don't Have FITS! Help Is On The Way

The NOST FITS Support Office is currently busy putting the final touches on the *Proposed NOST FITS Definition* and the *FITS User's Guide*. Check out this column in the next issue of this newsletter for information on obtaining these documents. Or, if you can't wait that long, watch for an announcement of their availability on the Usenet newsgroup sci.astro.fits..

John Garret, Don Sawyer

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

E-Mail: Internet: nost@nssdca.gsfc.nasa.gov
DECnet: NCF::NOST
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FAX: (301) 513-1608

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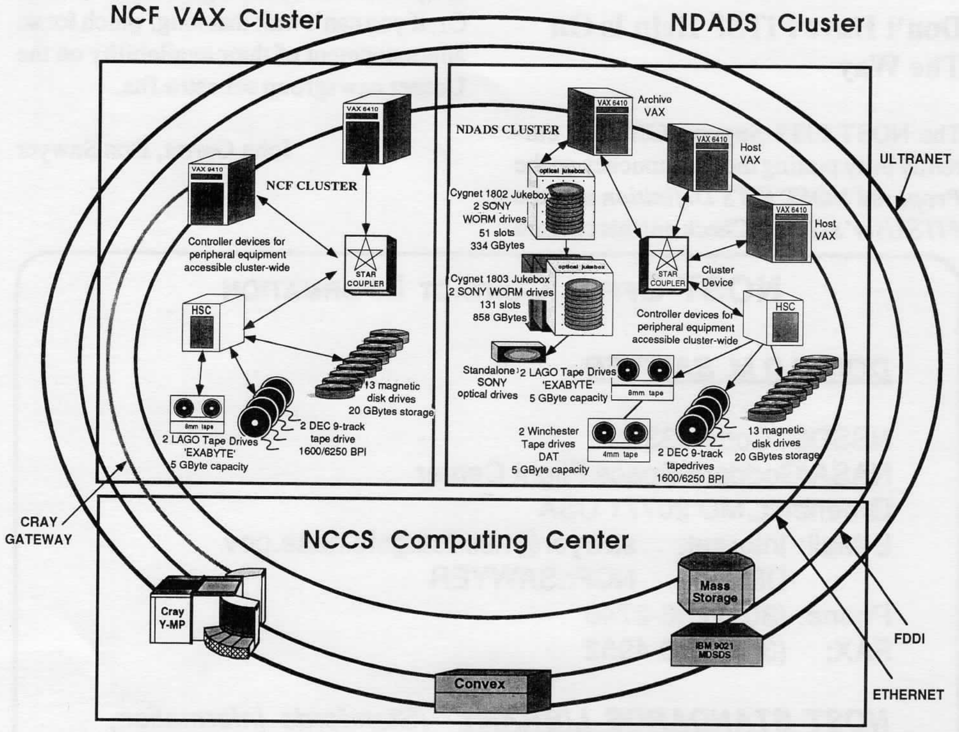
DECnet: NCF::GARRETT
Phone: (301) 513-1692
FAX: (301) 513-1608

NSSDC Uses Variety of Computer Systems and Support Groups



The NSSDC Computing Facility (NCF) is a heterogeneous, distributed computer system serving the operational requirements of the data center. The NCF was upgraded in 1984 with the procurement of a VAX 11/780 and in 1985 with the procurement of the Modcomp Classic. A VAX cluster system grew from the procurement in 1986 of the VAX 8650. In 1990, an additional computing facility was put into place with the procurement of the NSSDC Data Archive and Distribution Service (NDADS) cluster. The latest acquisition was a VAX 9410 procured in January 1991 to replace the old VAX 11/780. In February 1993, the two clusters were combined into the one cluster of VAXes designated as the NSSDC Computing Facility or the NCF Cluster.

NSSDC's principal resources are a VAX 9410, three VAX 6410s, a VAX 8650, MicroVAXes, a Modcomp Classic computer, the Britton-Lee IDM 700 data base server, and a few DEC, SUN Microsystems, and SGI UNIX workstations, as shown in the accompanying figure. In addition, the NCF supports various devices, such as optical disk storage, CD-ROM pre-mastering, publication-quality printer stations, and dozens of MS-DOS and Apple Macintosh workstations. Most of the small personal computing stations and printers are located on desks of employees. The VAX computing cluster is located in Building 28 in a computer facility that is shared with the NASA Center for Computational Sciences (NCCS). The CPUs, disks, optical jukeboxes, and other similar equipment are located in Building 28 in close proximity to NCCS' CRAY. The peripheral equipment, such as tape drives and computer consoles, is also located in Building 28.

The NSSDC has two contracted tasks, one with NYMA and one with Hughes/STX, to manage the NSSDC computer systems. Both tasks are monitored by Jeanne Behnke. The NYMA task supplies operations personnel to manage the computing equipment located in Building 28.

The computer operators perform such tasks as mounting/dismounting media on drives, doing system backups and reboots, changing paper, ribbons, toner, etc. The operators also respond to user requests and monitor system performance and status. Roger Pearson (who has been with the data center for 20 years!) is the lead operations analyst. The operations supervisor is Angie Majstorovic. Operators with whom computer users interface on a regular basis during various shifts include Bill Wood, Maurice Reid, Rusty Hall, and Gloria Robinson.

Hughes STX supplies the systems management services for the NSSDC. This task supplies the personnel to maintain the existing hardware and system-level software to ensure the optimal performance and utilization of the computing resources. These contractors also integrate new hardware and system-level software into existing systems to achieve upgraded capabilities.

Finally, the systems group provides users with the necessary documentation, training, and assistance so that NCF resources are fully utilized. The task leader for the HSTX systems group is Mike Garner. Chuck Davis and Eric Scanlan support the device-level usage of the NDADS cluster—for example, installing and modifying hardware devices and fixing hardware failures. Kelly Gygax supports the general user applications such as queues and software upgrades. Terri Shaffer and Scott Barnes provide user support services for account management, fixing user problems, tracking user requests for services, and general accounting. On the UNIX side, Jim Williams supports the UNIX workstations located at the data center. Dan Clark is the systems group contact for the support of personal computers, including Macintoshes and MS-DOS systems as well as printers located in Building 26. Finally, Russ Dunlap is the computer engineer who does all of the necessary cabling and hardware fixing required to get and keep users going with their computing equipment.

For more information, a brochure on NCF Services is available, or call the NCF User Support Office at (301) 286-9794.

Jeanne Behnke

Continuous Measurable Improvement of Data Set Documentation

NSSDC is committed to satisfying scientific users' requirements for quality service and products. To this end, continuous measurable improvement (cmi) techniques are employed to ensure that accurate and sufficient documentation is delivered to requesters of data and information. The objective is to enable correct and independent use of the data.

NSSDC staff members currently measure the data center's response to requests for data and documentation in several ways. First, request services technicians perform 100% inspection of outgoing packages for necessary documentation that accompanies data on tapes, disks, or film. Procedures are being developed to allow acquisition scientists to inspect documentation and data that are requested for the first time.

In addition, NSSDC has assigned Carolyn Ng to a new quality control position. With both data acquisition and user support experience over the past several years, Ng concentrates on assessing and improving the quality of data set documentation. Currently, a few outgoing packages are randomly selected each day to check for the comprehensiveness of documentation. Statistics on the number of data packages checked and corrective actions taken are captured and reported on a monthly basis.

NSSDC solicits comments on the quality of data set documentation by sending users a survey approximately two weeks after they receive the data. The results of user satisfaction are tracked and circulated weekly among NSSDC managers. Based on these statistics and responses, managers can identify and tackle problem areas.

Besides evaluating the outgoing documentation packages, NSSDC is also designing a systematic review of all other archival data set documentation. Furthermore, guidelines are being developed for both the acquisition scientists and the data ingest technicians to bring in appropriate and sufficient support documents and to populate the metadata files in the NSSDC information data bases.

On a broader level, there is a new sensitivity in the NASA data management environment to the need to create and archive the right documentation (and supporting software, ancillary data, etc., as appropriate) at the time of data archiving. As guidelines for the right documentation (etc.) are developed, promulgated, and adhered to, the need to review NSSDC's outgoing data/documentation packages should fade away.

In summary, NSSDC has stepped up its efforts to inspect documentation packages, check quality, and evaluate recipient survey responses. Through the application of cmi, NSSDC is committed to improving the quality of data set documentation and subsequently its users' satisfaction.

Carolyn Ng

Meetings Promote Wide Use of International Directory Network

NSSDC's Connie Li and Computing Center Director Cui Jun Zhi of the Chinese Academy of Sciences stretch between sessions at the CODATA meeting in Beijing.

In October, Jim Thieman took advantage of the juxtaposition of several meetings in the Eurasian area to acquaint several groups with the International Directory Network (IDN) and to make plans for future participation with other organizations. The IDN is sponsored by the international Committee on Earth Observations Satellites (CEOS) but also contains descriptions of both ground- and space-based data in the Earth and space sciences. It consists of at least 12 active directory nodes contributing information that can be viewed by all users, usually through the three main coordinating nodes. NSSDC operates one of these three coordinating nodes and has been one of the main organizations involved in the creation of the IDN, especially through the development and distribution of the Master Directory (MD) software that is

see IDN, *p. 18*

IDN, *from p. 17*

used by the coordinating nodes (as well as many other nodes).

In early October the Asian Conference on Remote Sensing was held in Ulaan Baatar, Mongolia. At this meeting the Japanese National Space Development Agency (NASDA) and the Remote Sensing Technology Center (RESTEC) organized the second Asian IDN workshop. Attendees represented a variety of countries, such as Mongolia, Malaysia, Pakistan, Bangladesh, China, etc. Thieman began the workshop with a description of the IDN and its status. Other participants followed with descriptions of their countries' data holdings and their information system capabilities. All were requested to provide information to the IDN and were invited to an IDN meeting to be held at the spring Catalog Interoperability/NASA Science Internet (CI/NSI) meeting in San Diego, April 27-29, 1993.

Standing from left to right are Jim Thieman (NSSDC); Lorraine Wolf (WDC-A Coordinator, Office Director, NAS); Stan Ruttenberg (Chair of ICSU WDC Panel); Meixing Gao (Director, WDC-D for Geophysics); Pat Ruttenberg; and Herb Meyer (NOAA National Geophysical Data Center).

In Moscow Thieman discussed the future plans for the IDN node to be hosted by the World Data Center B for Geophysics. Dr. Nechitailenko has been actively promoting the IDN among organizations in the Moscow area; Thieman's presentation on the IDN's status was attended by several representatives outside the geophysics area, such as the Hydrological Institute. A network connection probably will be established to the Center for Geophysics in the near future, and the directory node there could then be reached by a variety of organizations in the Moscow area through intercity network connections. Future connections outside Moscow would likely follow.

Thieman delivered an invited lecture on the IDN and interoperability at the Fifth School Seminar on Nuclear Physics and Astrophysics near Sochi, Russia. (Despite the unrest in the area from the conflict ongoing at the Russia-Georgia border nearby, the meeting took place without incident.) The IDN does not contain descriptions of nuclear physics data, but there is much information available in the areas of astrophysics and space physics. Nonetheless, the nuclear physicists as well as the space physicists and astrophysicists in attendance expressed interest in the progress of the IDN. Contacts were made with several groups that have useful space science data and wish to share information through the IDN in the future.

Beijing hosted the 13th biennial International CODATA Meeting, which brought together data information system developers from around the world to discuss the latest in available data and information system developments. A special session related to global change data information was organized by the CODATA program committee for the meeting. Thieman was joined by NSSDC staff members Joy Beier and Connie Li. Three presentations described the nature and status of the IDN, the technology used for information sharing and dissemination in the network, and the underlying data description standard—the Directory Interchange Format.

The CODATA conference was followed by a general World Data Center meeting (also in Beijing) and ended with a bilateral meeting between the World Data Centers D (WDC-D) of China and the World Data Centers A (WDC-A) of the U.S. Thieman represented World Data Center A for Rockets and Satellites, which is operated by NSSDC. Selected WDC-A delegations visited each of the World Data Center D sites in the Beijing vicinity. Thieman visited the WDC-Ds for Geophysics, Astronomy, and Space Physics, as well as the computing center of the Chinese Academy of Sciences. Versions of the PC-based MD are now available in each of these centers, and cooperation is planned in obtaining data descriptions from all of the WDC-Ds for the IDN. Hopefully, network connections will be established through this computing center to the WDC-Ds, and a node of the IDN may also be established in China for the benefit of the community there.

In summary, the Eurasian community is quite interested in sharing data with the rest of the world. They realize that some of the data are in need of work to make them useful to the community, but the possibilities of sharing in a worldwide research effort, which are made feasible through tools such as the IDN, information systems, networks, CD-ROMs, etc., provide the impetus for making it happen.

Jim Thieman

NEWSBRIEFS NEWSBRIEFS

Williams Named in Major Unix Industry Award

At its recent Winter Technical Conference in San Diego, the Usenix Association awarded its first "Lifetime Achievement Award." The award was given to the Computer Systems Research Group (CSRG) of the University of California at Berkeley, in recognition of the tremendous influence the group has had on the course of the Unix operating system development. In addition to the seven past and present members of the CSRG, the award also named the organizations and individuals that have contributed to Berkeley Unix.

James Williams, a Hughes STX employee and a Principal Systems Programmer in the Systems Support Group at NSSDC, was among the 162 individuals named in the award. Williams, a long-time Berkeley Unix advocate, contributed to the CSRG's efforts to produce a version of Berkeley Unix that is as free as possible of proprietary AT&T code. The purpose of this effort was to make a high- quality standard operating system, complete with source code, available to the Academic community as an instructional tool and test bed for Operating Systems research. With the release of Berkeley Software Distribution 4.4, expected later this year, this goal will have been accomplished.

Rick Payne

ADF Node Now Active on Astrophysics Data System

The Astrophysics Data Facility (Code 631) node of the Astrophysics Data System (ADS) became operational in mid-November with the version 3.1 release of the ADS client software. During the preliminary shake-out period, a single catalog from the archives of NSSDC's Astronomical Data Center, the SAO/J2000/Hd/DM/GC Cross Index, was installed as an ADS data base. The ADS is a distributed data base system, which currently runs on Sun Microsystems, DEC RISC Ultrix, and Hewlett-Packard HP/UX workstations. It uses a proprietary client-server architecture to access data bases mounted at IPAC, SAO, IUE RDAF, STScI, Penn State, and the University of Colorado. The ADF node is operated on a DECstation 5000/125 and uses a Silicon Graphics 4D/340VGX as its data base engine. For more information about how to receive copies of the OCF/Motif and character-based client code, contact ADS User Support via E-mail at ads@cuads.colorado.edu.

Lee Brotzman

International Halley Watch CD-ROMs Are Available

Data gathered as a result of the International Halley Watch (IHW) effort are available exclusively on CD-ROM. The 24-volumeset includes the entire remote sensing (ground-based, airborne, and Earth-orbiting) component of the effort. All of the various IHW disciplines are represented on these discs. (Later this year Volumes 25 and 26 will be published.)

In summary, Volumes 1–18 hold wide-field images that were archived by the Large-Scale Phenomena discipline. Volumes 19–23 contain data from Astronomy, Infrared Studies, Large-Scale Phenomena (subsample images), Meteor Studies, Near-Nucleus Studies, Photometry and Polarimetry, Radio Studies, Spectroscopy and Spectrophotometry, and Amateur Observation. Volume 24 holds data from "Trail Run" targets P.Crommelin and P/Gaicobini-Zinner.

For general purposes, Volume 20 is a useful sample disc. However, for K-12 educators, Volume 18 is ideal.

Carol Kanga

NSSDC's Earth Science Data Transition Begins

NSSDC has been informed by the Langley EOS Version Zero Distributed Active Archive Center (V0 DAAC) that it is now ready to start responding to requests from the research community and other communities for copies of the Earth Radiation Budget Experiment (ERBE) data from the ERBS spacecraft and some NOAA spacecraft. NSSDC will complete the processing of two working requests for ERBE data and will refer future requests to the Langley DAAC.

NSSDC's Valerie Thomas headed the effort to create the Earth Science Data Transition Plan document.

This is the first step in the implementation of an "Earth Science Data Transition Plan," whereby Earth science data and associated responsibilities are migrated from NSSDC to the EOS DAACs. The Plan was created about a year ago by a team of GSFC people representing NSSDC, the GSFC DAAC, and the Earth Science Data Information Systems (ESDIS) Project Office. NSSDC's Valerie Thomas led the team. The Plan reflects a HQ/SE intent that NSSDC's Earth science data/responsibility be transitioned to the DAACs by the end of 1994.

Joseph King

RSIRS Comes of Age ('72–'93)

The System for Information Retrieval and Storage (SIRS) was a generalized information management system developed at NSSDC to support the collection, maintenance, dissemination and analysis of space research data. Created in July 1972 on an IBM 7094 computer, it was moved to the MODCOMP in 1976. It originally consisted of the following six partitions:

Automated Internal Management (AIM)
Technical Reference File (TRF)
NonSatellite Data File (NSDF)
Rocket (ROCK) file
Request Activity and Name Directory (RAND)
Data Set Inventory File (DSIF)

In 1987, RAND and the tape inventory portion of DSIF were migrated from the MODCOMP to the IDM under Smartstar and became IRAND (Interactive RAND) and IDA (Interactive Digital Archive). The remaining SIRS partitions (AIM, TRF, NSD, ROCK, SITE, and a MAP inventory) were migrated in June 1991 to the IDM under RSIRS (Relational SIRS), which is a new set of software tools developed for these partitions. The following list summarizes the information that each partition now contains:

AIM: 4740 spacecraft, 5089 instruments from some of those spacecraft, and 4890 data sets from those instruments;

NSD: 1495 supplemental data sets, including ground-based data, models, and programs;

TRF: 33,717 space science related articles and documents;

ROCK: 15,478 sounding rocket launchings;

SITE: 906 launch sites;

MAP: 1274 lunar and planetary maps at NSSDC;

IRAND: 42,500 people and organizations who have requested data/information from NSSDC or who are on one or more distribution lists, and 33,715 requests since 1982;

IDA: approximately 125,000 digital media stored either in NSSDC's archive or the Federal Records Center.

Pat Ross

NSSDC news

NSSDC News is published quarterly by NASA's National Space Science Data Center. Please send your comments to the director (NSSDC Head, Dr. Joseph King) or the editor at the address below, or send an E-mail message to KANGA@nssdca.gsfc.nasa.gov. To subscribe or change your address, or to request data, contact the Coordinated Request and User Support Office by E-mail at REQUEST@nssdca.gsfc.nasa.gov or call (301) 286-6695.

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