

**2004 ANNUAL STATISTICS AND HIGHLIGHTS REPORT FOR  
THE  
NATIONAL SPACE SCIENCE DATA CENTER**

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## PREFACE

The [National Space Science Data Center](#), as noted in its [charter](#), serves as the permanent archive for NASA's Office of Space Science (OSS). A major component of its mission is to ensure future data accessibility and usability. NSSDC also provides current data access, complementary to the efforts of other NASA/OSS "active archives," in support of the NASA and international astrophysics and space physics research enterprises. Finally, NSSDC is a conduit for the general public and education community to acquire NASA space science data that may interest them.

For the year 2004 we again report on only the activities of the NSSDC, since NSSDC and the Sun-Earth Connection Active Archive (SECAA) of the Space Physics Data Facility (SPDF), whose activities were jointly reported in 2002 and earlier, more recently have been funded from separate offices within NASA. SPDF and NSSDC remain organizational peers within the GSFC Space Sciences Data Operations Office (SSDOO) and continue to be co-located with a number of shared resources. In late 2004 the Goddard Space Flight Center initiated a transformation which will redefine SSDOO and separate its components, so NSSDC's parent organization is in flux as this reporting period ends, but internally NSSDC is undisturbed.

NSSDC is pleased to issue this 2004 Annual Report describing (1) the 2004 growth and evolution of NSSDC's data archives, access pathways, and other tools and services, and (2) the 2004 access to those data and services by NSSDC's customer communities. This report has been made WWW-accessible in the hope that readers will avail themselves of the opportunity to link to the services reported herein.

I welcome suggestions from users for improvements to this Annual Report and to NSSDC services.

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## 1. INTRODUCTION

This report characterizes NSSDC's data holdings, metadata holdings, access pathways, and value-added data products, tools, and services at the end of 2004, with a focus on the 2004 activities leading to that end-of-year state. In addition, this report characterizes the nature and amount of 2004 access to NSSDC's data and services by its many users from various communities. It is assumed the reader will have a general familiarity with NSSDC and its mission. The top NSSDC web page is at <http://nssdc.gsfc.nasa.gov/> .

As the designated permanent archive for the Office of Space Science, with over 30 years experience in managing and preserving digital information now comprising thousands of data sets, NSSDC is acutely aware of the need to acquire and preserve adequate documentation to ensure the associated data are independently understandable and usable to current and future researchers. This remains our primary mission. But in this era of virtual observatory concepts for more seamless access to data, NSSDC must also play a larger role, especially for data which is not available from the Active Archives. It is NSSDC's intent to expend considerable effort becoming part of the Virtual Observatories, starting with work to reach an OSS wide consensus on minimum standards for associated documentation in order to raise the overall quality of OSS's archived information.

## 2. SOME SELECTED STATISTICS

Shown below are key statistics for 2004 or totals as of 12/31/04 (statistics following in parentheses are similar numbers for 2003):

Volume of data at NSSDC: 32.9 TB (29.1 TB)  
Distinct data sets: 4454 (4443)  
Distinct digital media volumes: 54,375 (56,105)  
Media Volumes arriving in 2004: 1530 (2041)  
Data volume reaching NSSDC during 2004: 2.9 TB (4.2)  
Data sets with 2004-arriving data: 187 (69)  
Files downloaded from NSSDC via ftp: 2,559,250 (2,755,149)  
    From Photo\_Gallery specifically: 1,277,133 (1,633,333)  
Executions of geophysical models Ephemerides: 166,428  
Number of offline requests satisfied: 230 (342)  
Number of refereed papers published citing NSSDC: > 100

## 3. HIGHLIGHTS

Our goal with this report is to streamline the discussions and showcase the 14 Tables which summarize the activities of 2004. In most cases these numbers speak for themselves, though it is irresistible to address a few highlights.

The most important result of NSSDC's 2004 activities is the continuing preservation of growing space science data volumes, ensuring their continuing and future accessibility to the space science, education, and general public communities. The statistics to follow reveal that NSSDC's archive has now grown to 29.6 TB of space science data and an additional 3.3 TB of Earth science data. During 2004, 3.7 TB of data were added to the NSSDC.

NSSDC's data dissemination leads to the publication of significant new science. In 2004 more than 100 papers in scientific journals acknowledged NSSDC data or services as contributing to their analyses and that is just the papers that have come to the attention of our staff. Most science journals in which NSSDC data or services may have been used are not routinely reviewed by our staff, and several authors do not cite use of NSSDC data/services, so the list represents a lower limit on papers enabled or benefited by NSSDC. Nonetheless, we have appended the list of the 100 publications we know cite NSSDC at the end of this report.

In 2001 NSSDC began using its reengineered data management approach, which stores data as Archive Information Packages (AIPs; bundles of data files and companion attribute files as prescribed by the ISO/CCSDS Archive Reference model) written to DLTs. Its first application was for migration of NSSDC Data Archive and Dissemination System (NDADS) data files, which was essentially completed in 2003. About half the AIPs constituent data and attribute files also were written to a unix-based RAID magnetic disk environment for external user access. The IMAGE spacecraft project continued to use NSSDC-provided software to prepare AIPs for submission to NSSDC and ingestion to the permanent archive on DLTs. This facilitates an automated NSSDC data ingest and management pipeline. The approach will hopefully be replicated with other missions and individuals preparing data for NSSDC submission to support the rapidly growing data ingest volumes. During 2004 we continued planning for the creation of AIPs from the offline digital archive and their ingestion to the nearline DLT jukebox.

The NSSDC continues to lead within the Consultative Committee for Space Data Systems for the widespread adoption of the Reference Model for an Open Archival Information System (OAIS). This standard provides a conceptual model of a digital archive, including a functional view and an information view. The model establishes initial criteria for recognition of a true archival function and should lead to improved archival implementations, provide a basis for further standardization, and provide more cost-effective vendor support. Its use has been considered by an ever growing variety of organizations including data centers, libraries, national archives, and commercial organizations around the world.

In 2004, the NASA Sun-Earth Connection Education Forum (SECEF) team, with major NSSDC participation, prepared for and orchestrated Sun-Earth Day held in June, 2004. The event theme was "Venus Transit" and used that relatively rare event (the last was 1882) to highlight the planet Venus, as well as the mechanics that explain transits. Many thousands packets of information were sent to teachers, scientists, etc. for Sun Earth Day programs, reaching hundreds of thousands of people which was webcast live. SECEF also sponsored a number of workshops and teacher professional development events reaching thousands of teachers, girl scouts, amateur astronomers, and the general public in partnership with SEC missions, museums, science centers, and planetariums as well as science and educational professional societies. The SECEF web site is available at <http://sunearth.gsfc.nasa.gov/> .

#### 4. DATA MANAGED AT NSSDC, AND 2004 INFLOW AND OUTFLOW

There are several ways to characterize the multi-disciplinary NSSDC archive. Byte counts are a common metric for modern archives, and will be reported herein. Numbers of distinct data sets and numbers and diversity of media volumes managed are also very important. (In NSSDC's terminology, a data set is typically all the data from a given source at a given processing level in a given format.) The diversity of data sets and of media types relate to the intellectual heterogeneity and technical heterogeneity of the archive, respectively, and we shall report on these also.

For the remainder of this section we will present this variety of statistics in tables, similar to prior years' reports, and brief discussions highlighting occasional specifics from individual tables.

Table 1. Counts of NSSDC Datasets December 31, 2004

<b>Discipline</b> -----	<b>Digital</b> -----	<b>Non-Digital</b> -----	<b>Totals</b> -----
Astronomy	248	75	323
Space/Solar Phys	1285	660	1945
Planetary	645	749	1394
Earth	130	124	254
Other (incl Ephem)	100	438	538
<b>TOTAL</b>	<b>2408</b>	<b>2046</b>	<b>4454</b>

At the end of 2004, NSSDC was managing 4,454 distinct data sets and accompanying documentation packages. Table 1 indicates the disciplines from which these data sets come and whether the data sets are digital or non-digital. By data set count, space physics is the dominant discipline, accounting for nearly half of NSSDC's data sets. This reflects that in its early years, NASA launched a preponderance of space physics missions and also that space physics spacecraft typically carry more independent experiments than do astrophysics missions.

NSSDC manages almost as many non-digital (film, microfilm and microfiche) data sets as digital data sets, though in recent years new data has been essentially all digital. NSSDC also has generated digital versions for some of its film archive, often in response to requests.

Table 2. State of the NSSDC Archive December 31, 2004

	<b>All Digital Data (TB)</b>
<b>Astro</b>	6.1
<b>Space Physics</b>	17.8
<b>Planetary</b>	5.5
<b>Earth</b>	3.3
<b>Other</b>	0.2
<b>Total</b>	<b>32.9</b>

Table 2 is a different characterization of the NSSDC archive, showing byte counts for the entire archive and for the portion stored as media-independent, platform-independent AIPs. The byte counts are estimates, involving assumptions about the mean numbers of bytes on various media types for some data sets.

Table 3. Data Ingested to Nearline Permanent Archive.

	2001		2002		2003		2004	
	<i>AIPs</i>	<i>GB</i>	<i>AIPs</i>	<i>GB</i>	<i>AIPs</i>	<i>GB</i>	<i>AIPs</i>	<i>GB</i>
<b>IMP8</b>	900	1.6	10	0.02	12,690	7.40	8,158	0.53
<b>ISIS</b>	594,200	328.4	243,430	122.40	136,190	75.08	26,853	11.33
<b>DE</b>	71,600	193.3	4,520	2.93	220	1.98	-	-
<b>IMAGE</b>	5,500	77.5	4,620	57.38	3,510	49.27	3,336	45.85
<b>IRAS</b>	12,600	14.0	144,960	80.56	-	-	-	-
<b>ISEE</b>	4,200	1.6	1,030	0.09	1,070	1.60	4,998	6.74
<b>SAMPEX</b>	6,800	44.2	950	5.83	790	5.09	528	3.43
<b>OSO-8</b>			3,650	4.06	-	-	-	-
<b>PIONEER</b>			280	0.52	-	-	-	-
<b>SANMARCO</b>			10	0.01	-	-	-	-
<b>ULYSSES</b>			13,220	0.83	30,360	6.17	8,405	17.49
<b>VOYAGER</b>			8,650	20.65	-	-	-	-
<b>WIND</b>			1,940	1.09	1,090	0.88	337	0.27
<b>MARINER</b>					290	0.02	-	-
<b>RHESSI</b>					10,890	856.39	8,833	677.88
<b>SNOE</b>							63,345	0.89
<b>LEGACY DATA</b>							6	0.03
<b>Totals</b>	<b>695,800</b>	<b>660.6</b>	<b>427,270</b>	<b>296.37</b>	<b>197,100</b>	<b>1003.9</b>	<b>124,799</b>	<b>764.45</b>

Data are also being moved from NSSDC's traditional offline archive to a nearline archive based on a DLT jukebox attached to a unix server. Data are newly archived in Archive Information Packages AIPs, which hold data files and companion attribute files as per the AIP concept of the ISO/CCSDS Open Archival Information System reference model. Table 3 shows the volumes of data ingested to this new portion of the archive for 2001-4 for a total of 2.75 TB in AIPs, which are media-independent and platform-independent.

Table 4. Space Physics Data Electronically Accessible from NSSDC  
December 31, 2004

Spacecraft	ftp://nssdcftp/spacecraft_data GB
ACE	7.45
CRRES	33.96
DE	186.32
HELIOS	1.07
IMAGE	195.60
IMP	18.39
ISEE	14.51
ISIS	47.72
MAGSAT	1.87
PIONEER	2.00
SAMPEX	57.39
SWAS	5.31
ULYSSES	31.10
VOYAGER	25.59
WIND	11.28
Others*	3.76
<b>TOTAL</b>	<b>643.32</b>

\* total for spacecraft with <1Gb data each, including AE-C,-D,-E, AEROS, Alouette, ARCAD, Explorers 22 & 31, Galileo, Hinotori, Mariner 10, OGO, OMNI, Prognoz 6,7, & 9, San Marco, SNOE, and additional Soviet spacecraft.

About half of the data stored in AIPs are made network-accessible from NSSDC for the convenience of some portions of the user community. Table 4 lists by project NSSDC's network-accessible astrophysics and space physics data as of 31 December 2004.

Table 5. Counts of Volumes\* at NSSDC Archive on Dec 31, 2004

	Astro Physics	Space Physics	Planetary Science	Earth Science	Total
4-mm Tape	145	93	3	97	338
8-mm Tape	190	503	74	0	767
9-Track Tape	532	2599	3752	17297	24180
3480 Cartridges	761	1762	973	2912	6408
DLT	70	124	0	0	194
CD-ROM	46	407	1087	34	1574
CD-WO	467	15990	3497	42	19996
DVD	0	0	3	0	3
DVD Write Once	168	367	104	0	639
12" Worm	0	4	0	0	4
M-O Disk	272	0	0	0	272
Floppy Disk	0	0	0	0	0

<b>Totals</b>	2651	21849	9493	20382	54375
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\* Backup volumes and those not attributable to these 4 disciplines not included.

Table 5 characterizes the digital media types managed at NSSDC, not including back up copies. It should be noted that most volumes are replicable and have one backup volume. However, for "CD-ROM," commercially pressed CDs, NSSDC typically holds extra copies. If more are needed, a CD duplicator is available.

Table 6. Photographic Data Products at NSSDC by Discipline

<b>Discipline</b>	<b>Micro film</b>	<b>Micro fiche</b>	<b>Film (feet)</b>	<b>Film (Frames)</b>	<b>Reels</b>	<b>Slides</b>
<b>Astrophysics</b>	6,020	18,524	100	63,459		121
<b>Earth Science</b>	1,430		4,200	236,066		
<b>Planetary Science</b>	3,294	6,345	143,214	392,122	259	25
<b>Space Physics</b>	20,195	14,669	4,640	4,379		41,509
<b>Communications</b>	183					
<b>Other</b>	162					
<b>Totals</b>	31,284	39,538	152,154	696,026	259	41,555

Table 6 lists NSSDC's non-digital archive holdings by disciplines and by form factor. This has been unchanged for the last few years. NSSDC has begun digitizing some of its Apollo film products to systematically generate computer-readable versions of some of them, though it is so far a level of effort task spurred by occasional student help.

#### 4.1 Data Inflow

Tables 7 and 8 characterize the inflow of digital data to NSSDC during 2004.

Table 7. Media Arriving at NSSDC During 2004\*

	<b>Astro Physics</b>	<b>Space Physics</b>	<b>Planetary Science</b>	<b>Total</b>
<b>4-mm Tape</b>	121	14	0	135
<b>DLT</b>	0	20	0	20
<b>CD-ROM (Titles)</b>	0	0	0	0
<b>CD-WO</b>	23	865	115	1003
<b>DVD-WO</b>	168	183	9	360
<b>M-O Disk</b>	0	12	0	12
<b>Totals</b>	312	1094	124	1530

\* Ephemeris and Other data not included.

Table 7 characterizes the in-flowing media types by discipline. As in recent years, CD-WO media clearly dominate input media type overall.

Table 8. Data Arriving at NSSDC During 2004

<b>Astrophysics</b>	<b>GB</b>	<b>Planetary</b>	<b>GB</b>	<b>Space Physics</b>	<b>GB</b>
2MASS All Sky Cat's	41.48	Magellan	0.02	ACE	21.25
COBE	6.00	Mars Global Survy	101.37	AE-C	0.02
FUSE	461.23	Phobos 2	0.09	AE -D	0.02
GALEX	123	Pioneer Venus Orbiter	0.02	AE -E	0.02
IUE	0.18	Voyager	1.26	FAST	472.32
OAD 3	2.03			Dynamics Explorer 1	121.34
SMM	0.02			Dynamics Explorer 2	0.02
TD 1A	0.06			Helios A	0.45
				Helios B	0.35
				IMAGE	176.44
				IMP-8	0.53
				ISEE	6.74
				ISIS	211.98
				ISTP	
				Geotail	127.86
				Polar LO	363.07
				Wind	14.32
				Cluster	330.35
				OV3-3	0.18
				RHESSI	1072.80
				Sampex	10.63
				San Marco	0.05
				Skylab	0.14
				SNOE	1.80
				STS 9 Spacelab 1	0.02
				Ulysses	44.27
				Legacy Data	0.03
<b>TOTALS</b>	<b>634.00</b>		<b>102.76</b>		<b>2977.00</b>
		<b>Grand Total</b>	<b>3713.76</b>		

Table 8 shows that NSSDC received approximately 3.7 TB of new data in 2004, via a combination of electronic deliveries and hard media. Table 8 shows data volumes by project. Dominating the counts are Level-0 data from the IMAGE missions plus data from the ISIS and RHESSI missions. During 2004, NSSDC received approximately 0.8 TB of data electronically, in addition to the data arriving on the media reported above in Table 7.

#### 4.2 Data Outflow

Much of the data outflow discussed in previous years' NSSDC Annual Reports is actually activity within SPDF, which maintains the Active Archive for NASA Space Physics missions. Recognizing this distinction, the activities of CDAWeb, etc, previously discussed in this section are covered in SPDF reports elsewhere.

NSSDC provides user access to its data holdings with network-accessible data for chosen datasets and, in addition, through a user support infrastructure for the mailing of offline digital and non-digital data volumes. Most electronic interfaces are accessible through NSSDC's WWW home page and include (1) special WWW-based interfaces to specific data sets or groups thereof and (2) ftp pathways to a range of data files maintained permanently on NSSDC magnetic disk. The CDF-formatted data underlying CDAWeb are at <ftp://cdaweb.gsfc.nasa.gov/> while all other data are at <ftp://nssdcftp.gsfc.nasa.gov/>. Because NSSDC and SPDF have been co-located since the latter's inception, nssdcftp is and remains a shared resource.

Table 9. 2004 Access Statistics to Geophysical Models & Services

<b>Geophysical Models</b>	<b>Accesses*</b>
<b>Corrected Geomagnetic Coordinates, and Related Parameters</b>	20,140
<b>International Reference Ionosphere Model (IRI)</b>	48,646
<b>MSIS Atmospheric Model</b>	24,958
<b>International Geomagnetic Reference Field Model (IGRF)</b>	66,724
<b>User-Oriented Service Based on External (T_89,T_96)and Internal (IGRF) Geomagnetic Field Models</b>	2,884
<b>Trapped Particles Model</b>	3,076
<b>Total, Geophysical Models and Ephemerides</b>	<b>166,428</b>

\* These counts are software executions, yielding results for user-specified criteria. They do not include ftp-downloads of corresponding software.

Table 9 reports statistics on the usage of NSSDC's executable geophysical models services and its services for magnetospheric and heliospheric orbits. The models service lets users specify a model, a spatial point of interest, and any other parameters on which the model depends, and have the model parameters computed at the point or along a profile through the point of interest. Table 9 shows that there were about 166,000 such computations done by NSSDC customers in 2004, with geomagnetic, ionospheric and atmospheric models dominating.

Table 10. Number of Files Downloaded via FTP

	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
<b>Photo Gallery</b>	1,918,000	2,888,000	1,516,658	1,633,333	1,277,133
<b>Spacecraft Data</b>	76,000	155,000	746,008	572,791	468,580
<b>Geophysical Models</b>	N/A	95,000	95,957	110,191	92,063
<b>All others on nssdcftp</b>	290,000	195,000	179,277	438,834	721,474
<b>Total</b>	<b>2,284,000</b>	<b>3,333,000</b>	<b>2,537,900</b>	<b>2,755,149</b>	<b>2,559,250</b>

A great many NSSDC data sets and other information services are held permanently on magnetic disk for ftp access. The reader is invited to review all these services from the ftp link on the NSSDC home page. Table 10 gives the annual counts of files downloaded, both overall and for selected directories with high activity. Note that the Photo Gallery, of high public interest,

dominates the individual category statistics with nearly half of the total downloads from nssdcftp. However the researcher-downloading via ftp of data files from the spacecraft\_data subdirectory is about 20% and shows the high interest in and great value of these services. Ftp access to models' software (over 140,000 file downloads in 2004) is also included here.

WWW access statistics are frequently misleading, insofar as they usually individually count the many files (buttons, etc.) that make up a page. Nevertheless, growth in WWW accesses is indicative of continuing and growing use of the WWW-provided services. In 2004, there was an average of 13.9 million hits monthly to NSSDC's web pages, the highest access rate so far.

Table 11. NSSDC User Community (Offline Requests Only) for CY 2004

<b>Affiliation Category</b> -----	<b>Total Requests</b> -----	<b>Percent of Total</b> -----
<b>No Affiliation [General Public]</b>	74	32.2
<b>Non-US</b>	57	24.8
<b>US Academic Institutions</b>	38	16.5
<b>US Private Industry</b>	27	11.7
<b>NASA/GSFC</b>	17	7.4
<b>NASA Centers, Excluding GSFC</b>	7	3.0
<b>Other Government Agencies</b>	9	3.9
<b>Miscellaneous</b>	1	0.4
<b>Total</b>	230	100

The dominant mode of dissemination of data to the research communities is via the internet, so that offline data dissemination has decreased, but is still significant. For 2004 Table 11 shows that NSSDC responded to 230 (compared to 342 in 2003) distinct requests for "traditional" products. Table 11 also characterizes the user community of NSSDC's offline services. To a very large extent it is the U.S. and international general public, the education enterprise, publishers, etc. and their desire for NASA imagery on CD-ROM and as film products that account for most of NSSDC's offline request activity.

Table 12. Number of Requests for Offline Satellite Data from NSSDC by Discipline \*

<b>Discipline</b> -----	<b>Data Set Requests</b> <b>1968 - 2004</b> -----	<b>Data Set Requests</b> <b>2004</b> -----
<b>Astrophysics</b>	11382	9
<b>Earth Science</b>	7139	2
<b>Planetary Science</b>	47115	312
<b>Space Physics</b>	9077	60
<b>Ephemeris</b>	89	1

<b>Other</b>	33	10
<b>Total</b>	74835	394

\* One request for all or parts of two distinct data sets adds two to these Table 14 statistics, but only one to the Table 13 statistics.

Table 12 gives the counts of requests for offline data sets from various disciplines in 2004, and as integrated over NSSDC's history. Note particularly the dominance of planetary data over both time scales. This is largely associated with lunar and planetary image data that are widely requested by the general public. The high level of previous astrophysical offline activity reflects requests by the amateur and professional astronomical communities for ADC catalogs on CD-ROM. Most offline space physics request activity was for copies of the IMAGE-based "Solar Storms" video tape.

Table 13. NSSDC Offline Data Dissemination Statistics 2000-2004

<b>Offline</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
-----	-----	-----	-----	-----	-----
<b>DVDs</b>				46	10
<b>CDs</b>	4387	2241	1741	1813	793
<b>Films</b>	6573	2494	1114	215	221
<b>Videotapes</b>	231	280	211	112	105
<b>Magnetic tapes</b>			5	0	0
<b>TOTAL Units Sent</b>	11191	5015	3071	2186	1129

Table 13 shows the most recent 5-year history of NSSDC's offline satellite data request activity by media type. Several points are noteworthy. The dominant mode of offline digital data dissemination continues to be by CD-ROM. The downward trend in CD numbers continues, as more members of the general public are able to access NSSDC's data electronically. Presumably growth of public internet access is a major contributor to the decline in other categories also.

## 5. ADDITIONAL NSSDC SERVICES

In addition to its archive of scientific data and the variety of data interfaces characterized in the preceding sections, NSSDC offers a number of additional services, which are described below.

### 5.1 NSSDC Information Management System

The NSSDC Information Management System (NIMS) encompasses most of the separate databases that NSSDC has used to track data and information through the years. The NSSDC is in the process of incorporating its off-line data inventory system into NIMS, a task which began in earnest in 2002 and is expected to be completed in 2005.

Table 14. NIMS/JEDS Database Statistics for CY 2004

<b>Subpartition</b>	<b>Number of Records as of 12/31/04</b>	<b>Number Added in 2004</b>
<b>Spacecraft</b>	6,069	71
<b>Experiment</b>	5,189	43
<b>Data Set</b>	5,063	39
<b>Totals</b>	16,321	153

Number of spacecraft with experiment records - 1,040  
 Number of experiments with data sets at NSSDC - 1,537  
 Additional datasets associated only with spacecraft, not experiments - 334  
 Additional datasets that are not associated with spacecraft/experiment - 75

Table 15. NIMS Bibliographic Partition Statistics as of Dec 31, 2004

<b>Total Number of Records</b>	45,542
<b>Number of Records Inserted in 2004</b>	923

NIMS identifies virtually all launched spacecraft, the experiments carried by many of these spacecraft, and data sets from these spacecraft primarily as archived at NSSDC. This portion of the database is the source of information for many of NSSDC's WWW information pages. The NSSDC Master Catalog (NMC) dynamically generates WWW pages so that the latest information is presented to the user. A number of discipline and project pages are based on information derived from NIMS or utilize the NMC to generate such information.

## 5.2 NASA/Science Office of Standards and Technology (NOST) at NSSDC

NOST's mission is to facilitate the recognition and use of standards to reduce cost/benefit ratios in the exchange and management of scientific data among NASA entities and the scientific communities they serve. NOST's Web Home Page is at <http://ssdoo.gsfc.nasa.gov/nost/>. The NOST strategy is to play a coordinating role in helping the science disciplines identify new standards requirements. NOST participates in partnerships with them, other agencies, and industry on facilitating the adoption of leading-edge technologies with national or international visibility that can be tailored to meet NASA science information management and exchange requirements, and it assists in the process of moving these technologies toward standards with commercial support.

NOST operates NASA's highest level Control Authority office in accordance with the applicable [Consultative Committee for Space Data Systems \(CCSDS\)](#) and ISO standards to formally archive data descriptions for interchange and long term preservation. NOST also participated in the development of draft CCSDS/ISO standards applicable to multi-discipline and sub-discipline

information interchange. The WWW is the ideal forum for the worldwide standards work. The reader is referred to <http://www.ccsds.org/> for specifics.

# Glossary

ACE	Advanced Composition Explorer
ADC	Astronomical Data Center
AE	Atmospheric Explorer
AEROS	AEROnomy Satellite
AIP	Archive Information Package
ARCAD	Arc Aurorale et Densite
CANOPUS	Canadian Auroral Network for the OPEN Program Unified Study
CCSDS	Consultative Committee for Space Data Systems
CD-ROM	Compact Disk-Read Only Memory
CD-WO	Compact Disk-Write Once
CDAW	Coordinated Data Analysis Workshop
CDF	Common Data Format
COBE	Cosmic Background Explorer
CRRES	Chemical Release and Radiation Effects Satellite
DARN	Dual Auroral Radar Network
DE	Dynamics Explorer
DLT	Digital Linear Tape
DTD	Data Type Description
DVD	Digital Versatile Disk (originally, V = video)
DVD-WO	Digital Versatile Disk-Write Once
FAST	Fast Auroral SnapshoT
FTP	File Transfer Protocol
GB	Gigabyte
GOES	Geostationary Observational Environmental Satellite
GSFC	Goddard Space Flight Center
IDA	Interactive Data Archive
IMAGE	Imager for Magnetopause-to-Aurora Global Exploration
IMP	Interplanetary Monitoring Platform
ISEE	International Sun-Earth Explorer
ISIS	International Satellite for Ionosphere Studies
ISO	International Organization for Standardization
ISTP	International Solar-Terrestrial Physics
JEDS	Java Experiments, Data sets, Spacecraft
JRAND	Java Request and Name Directory
KP	Key Parameters
LANL	Los Alamos National Laboratory
MAGSAT	MAGnetic field SATellite
M-O	Magneto-optic
MSIS	Mass Spectrometer and Incoherent Scatter
NASA	National Aeronautics and Space Administration
NDADS	NSSDC Data Archive and Distribution System
NEAR	Near Earth Asteroid Rendezvous
NIMS	NSSDC Information Management System
NMC	NSSDC Master Catalog
NOST	NASA/Science Office of Standards and Technology
NSSDC	National Space Science Data Center

NVO	National Virtual Observatory
OAIS	Open Archival Information System
OMNI	Interplanetary Medium Data (not an acronym)
OSO	Orbiting Solar Observatory
OSS	Office of Space Science
RAID	Redundant Array of Independent Disks (originally, “I” was “Inexpensive”)
SAMPEX	Solar Anomalous and Magnetospheric Particle Explorer
SEC	Sun Earth Connection
SECAA	Sun Earth Connection Active Archive
SECEF	Sun Earth Connection Education Forum
SNOE	Student Nitrogen Oxide Explorer
SOHO	Solar and Heliospheric Observatory
SSC	Satellite Situation Center
SWAS	Submillimeter Wave Astronomy Satellite
TB	Terabyte
TRF	Technical Reference File
WORM	Write-Once, Read-Many
WWW	World Wide Web
XDF	eXtensible Data Format
XML	eXtensible Markup Language

NSSDC Acknowledged 2004 Publications

B54611-000A

Abraham, S., Le Vine, D. M.,  
Use of IRI to model the effect of ionosphere emission on earth remote sensing  
at L-band,  
Adv. Space Res., 34, No. 9, 2059-2066, Nov. 2004.

B53990-000A

Andersson, L., Peterson, W. K., McBryde, K. M.,  
Dynamic coordinates for auroral ion outflow,  
J. Geophys. Res., 109, A08201, doi:10.1029/2004JA010424, 2004.

B54463-000A

Belenkaya, E. S., Alexeev, I. I., Clauer, C. R., Jr.,  
Field-aligned current distribution in the transition current system,  
J. Geophys. Res., 109, A11207, doi:10.1029/2004JA010484, 2004.

B53912-000A

Bilitza, D.,  
A correction for the IRI topside electron density model based on  
Alouette/ISIS topside sounder data,  
Adv. Space Res., 33, No. 6, doi:10.1016/j.asr.2003.07.009, 2004.

B54607-000A

Bilitza, D., Obrou, O. K., Adeniyi, J. O., Oladipo, O.,  
Variability of foF2 in the equatorial ionosphere,  
Adv. Space Res., 34, No. 9, 1901-1906, Nov. 2004.

B54583-000A

Bogdanova, Y. V., Fazakerley, A. N., Owen, C. J., Klecker, B., Cornilleau-  
Wehrin, N.,  
Correlation between suprathermal electron bursts, broadband extremely low  
frequency waves, and local ion heating in the midaltitude cleft/low-latitude  
boundary layer observed by Cluster,  
J. Geophys. Res., 109, A12226, doi:10.1029/2004JA010554, 2004.

B54562-000A

Caballero-Lopez, R. A., Moraal, H., McCracken, K. G., McDonald, F. B.,  
The heliospheric magnetic field from 850 to 2000 AD inferred from 10Be  
records,  
J. Geophys. Res., 109, A12102, doi:10.1029/2004JA010633, 2004.

B54580-000A

Chang, S.-W., Gallagher, D. L., Spann, J. F., Mende, S. B., Greenwald, R. A.,  
Cusp and LLBL as sources of the isolated dayside auroral feature during  
northward IMF,  
J. Geophys. Res., 109, A12222, doi:10.1029/2004JA010619, 2004.

B54460-000A

Chapman, J. F., Cairns, I. H.,  
Modeling of Earth's bow shock: Applications,  
J. Geophys. Res., 109, A11202, doi:10.1029/2004JA010540, 2004.

B53541-000A

Chen, S.-H., Moore, T. E.,  
Dayside flow bursts in the Earth's outer magnetosphere,

J. Geophys. Res., 109, A03215, doi:10.1029/2003JA010007, 2004.

B54569-000A

Coumans, V., Gerard, J.-C., Hubert, B., Mende, S. B., Cowley, S. W. H.,  
Morphology and seasonal variations of global auroral proton precipitation  
observed by IMAGE-FUV,  
J. Geophys. Res., 109, A12205, doi:10.1029/2003JA010348, 2004.

B54122-000A

Denton, R. E., Menietti, J. D., Goldstein, J., Young, S. L., Anderson, R. R.,  
Electron density in the magnetosphere,  
J. Geophys. Res., 109, A09215, doi:10.1029/2003JA010245, 2004.

B53692-000A

Dmitriev, A. V., Suvorova, A. V., Chao, J. K., Yang, Y.-H.,  
Dawn-dusk asymmetry of geosynchronous magnetopause crossings,  
J. Geophys. Res., 109, A05203, doi:10.1029/2003JA010171, May 2004.

B54571-000A

Ebihara, Y., Fok, M.-C.,  
Postmidnight storm-time enhancement of tens-of-keV proton flux,  
J. Geophys. Res., 109, A12209, doi:10.1029/2004JA010523, 2004.

B53639-000A

Echer, E., Gonzalez, W. D.,  
Geoeffectiveness of interplanetary shocks, magnetic clouds, sector boundary  
crossings and their combined occurrence,  
Geophys. Res. Lett., 31, L09808, doi:10.1029/2003GL019199, May 2004.

B53647-000A

Echer, E., Svalgaard, L.,  
Asymmetry in the Rosenberg-Coleman effect around solar minimum revealed by  
wavelet analysis of the interplanetary magnetic field polarity data (1927-  
2002),  
Geophys. Res. Lett., 31, L12808, doi:10.1029/2004GL020228, June 2004.

B53362-000A

El-Alaoui, M., Richard, R. L., Ashour-Abdalla, M., Chen, M. W.,  
Low Mach number bow shock locations during a magnetic cloud event:  
Observations and magnetohydrodynamic simulations,  
Geophys. Res. Lett., 31, L03813, doi:10.1029/2003GL018788, 2004.

B53635-000A

Felix Pereira, B., Girish, T. E.,  
Sunspot cycle-dependent changes in the distribution of GSE latitudinal angles  
of IMF observed near 1 AU,  
Geophys. Res. Lett., 31, L09801, doi:10.1029/2003GL018924, May 2004.

B53845-000A

Frey, H. U., Ostgaard, N., Immel, T. J., Korth, H., Mende, S. B.,  
Seasonal dependence of localized, high-latitude dayside aurora  
(HiLDA),  
J. Geophys. Res., 109, A04303, doi:10.1029/2003JA010293, Apr. 2004.

B53956-000A

Fujiwara, H., Maeda, S., Suzuki, M., Nozawa, S., Fukunishi, H.,

Estimates of electromagnetic and turbulent energy dissipation rates under the existence of strong wind shears in the polar lower thermosphere from the European Incoherent Scatter (EISCAT) Svalbard radar observations, *J. Geophys. Res.*, 109, A07306, doi:10.1029/2003JA010046, 2004.

B54584-000A

Fuselier, S. A., Gary, S. P., Thomsen, M. F., Claflin, E. S., Hubert, B., Generation of transient dayside subauroral proton precipitation, *J. Geophys. Res.*, 109, A12227, doi:10.1029/2004JA010393, 2004.

B53517-000A

Garner, T. W., Wolf, R. A., Spiro, R. W., Burke, W. J., Fejer, B. G., Magnetospheric electric fields and plasma sheet injection to low L-shells during the 4-5 June 1991 magnetic storm: Comparison between the Rice Convection Model and observations, *J. Geophys. Res.*, 109, A02214, doi:10.1029/2003JA010208, 2004.

B53535-000A

Gerard, J.-C., Hubert, B., Grard, A., Meurant, M., Mende, S. B., Solar wind control of auroral substorm onset locations observed with the IMAGE-FUV imagers, *J. Geophys. Res.*, 109, A03208, doi:10.1029/2003JA010129, 2004.

B54071-000A

Golovchanskaya, I. V., Maltsev, Y. P., On the direction of the Poynting flux related to the mesoscale electromagnetic turbulence at high latitudes, *J. Geophys. Res.*, 109, A10203, doi:10.1029/2004JA010432, 2004.

B53539-000A

Green, J. C., Kivelson, M. G., Relativistic electrons in the outer radiation belt: Differentiating between acceleration mechanisms, *J. Geophys. Res.*, 109, A03213, doi:10.1029/2003JA010153, 2004.

B54573-000A

Green, J. C., Onsager, T. G., O'Brien, T. P., Baker, D. N., Testing loss mechanisms capable of rapidly depleting relativistic electron flux in the Earth's outer radiation belt, *J. Geophys. Res.*, 109, A12211, doi:10.1029/2004JA010579, 2004.

B53532-000A

Green, J. L., Boardsen, S., Fung, S. F., Matsumoto, H., Hashimoto, K., Association of kilometric continuum radiation with plasmaspheric structures, *J. Geophys. Res.*, 109, A03203, doi:10.1029/2003JA010093, 2004.

B53708-000A

Green, J. L., Boardsen, S., Garcia, L., Fung, S. F., Reinisch, B. W., Seasonal and solar cycle dynamics of the auroral kilometric radiation source region, *J. Geophys. Res.*, 109, A05223, doi:10.1029/2003JA010311, May 2004.

B54609-000A

Gulyaeva, T. L., Incorporation of topside half peak density anchor point in IRI, *Adv. Space Res.*, 34, No. 9, 1993-1997, Nov. 2004.

B53902-000A

Gulyaeva, T. L., Jayachandran, B., Krishnankutty, T. N.,  
Latitudinal variation of ionospheric slab thickness,  
Adv. Space Res., doi:10.1016/j.asr.2003.08.009, 2004.

B53424-000A

Hasegawa, H., Fujimoto, M., Saito, Y., Mukai, T.,  
Dense and stagnant ions in the low-latitude boundary region under northward  
interplanetary magnetic field,  
Geophys. Res. Lett., 31, L06802, doi:10.1029/2003GL019120, 2004.

B54456-000A

Hausman, B. A., Michel, F. C., Espley, J. R., Cloutier, P. A.,  
On determining the nature and orientation of magnetic directional  
discontinuities: Problems with the minimum variance method,  
J. Geophys. Res., 109, A11102, doi:10.1029/2004JA010670, 2004.

B53704-000A

Huang, C.-S., Foster, J. C., Goncharenko, L. P., Reeves, G. D., Chau, J. L.,  
Variations of low-latitude geomagnetic fields and Dst index caused by  
magnetospheric substorms,  
J. Geophys. Res., 109, A05219, doi:10.1029/2003JA010334, May 2004.

B53855-000A

Hubert, B., Gerard, J. C., Fuselier, S. A., Mende, S. B., Burch, J. L.,  
Proton precipitation during transpolar auroral events: Observations with the  
IMAGE-FUV imagers,  
J. Geophys. Res., 109, A06204, doi:10.1029/2003JA010136, June 2004.

B53488-000A

Hubert, D., Samsonov, A.,  
Steady state slow shock inside the Earth's magnetosheath: To be or not to be?  
1. The original observations revisited,  
J. Geophys. Res., 109, A01217, doi:10.1029/2003JA010008, 2004.

B54419-000A

Hwang, J., Min, K. W., Lee, E., Lee, C., Lee, D. Y.,  
A case study to determine the relationship of relativistic electron events to  
substorm injections and ULF power,  
Geophys. Res. Lett., 31, L23801, doi:10.1029/2004GL021544, 2004.

B53507-000A

Ifedili, S. O.,  
The two-step Forbush decrease: An empirical model,  
J. Geophys. Res., 109, A02117, doi:10.1029/2002JA009814, 2004.

B54152-000A

Jones, G. H., Brandt, J. C.,  
The interaction of comet 153P/Ikeya-Zhang with interplanetary coronal mass  
ejections: Identification of fast ICME signatures,  
Geophys. Res. Lett., 31, L20805, doi:10.1029/2004GL021166, 2004.

B53844-000A

Kellogg, P. J., Bale, S. D.,  
Nearly monochromatic waves in the distant tail of the Earth,  
J. Geophys. Res., 109, A04223, doi:10.1029/2003JA010131, Apr. 2004.

B53832-000A

Kepko, L., Kivelson, M. G., McPherron, R. L., Spence, H. E.,  
Relative timing of substorm onset phenomena,  
J. Geophys. Res., 109, A4203, doi:10.1029/2003JA010285, Apr. 2004.

B53833-000A

Khotyaintsev, Y., Buchert, S., Stasiewicz, K., Vaivads, A., Savin, S.,  
Transient reconnection in the cusp during strongly negative IMF By,  
J. Geophys. Res., 109, A4204, doi:10.1029/2003JA009908, Apr. 2004.

B53406-000A

Kress, B. T., Hudson, M. K., Perry, K. L., Slocum, P. L.,  
Dynamic modeling of geomagnetic cutoff for the 23-24 November 2001 solar  
energetic particle event,  
Geophys. Res. Lett., 31, L04808, doi:10.1029/2003GL018599, 2004.

B54577-000A

Kullen, A., Karlsson, T.,  
On the relation between solar wind, pseudobreakups, and substorms,  
J. Geophys. Res., 109, A12218, doi:10.1029/2004JA010488, 2004.

B53511-000A

Lam, M. M., Rodger, A. S.,  
A test of the magnetospheric source of traveling convection vortices,  
J. Geophys. Res., 109, A02204, doi:10.1029/2003JA010214, 2004.

B53848-000A

Laurenza, M., Storini, M., Moreno, G., Fujii, Z.,  
Reliability of the interplanetary magnetic field polarities inferred from  
north-south cosmic ray anisotropy and geomagnetic data,  
J. Geophys. Res., 109, A06103, doi:10.1029/2003JA010323, June 2004.

B53947-000A

Le Sager, P., Svalgaard, L.,  
No increase of the interplanetary electric field since 1926,  
J. Geophys. Res., 109, A07106, doi:10.1029/2004JA010411, 2004.

B53688-000A

Leamon, R. J., Canfield, R. C., Jones, S. L., Lambkin, K., Lundberg, B. J.,  
Helicity of magnetic clouds and their associated active regions,  
J. Geophys. Res., 109, A05106, doi:10.1029/2003JA010324, May 2004.

B53831-000A

Lee, D.-Y., Lyons, L. R., Yumoto, K.,  
Sawtooth oscillations directly driven by solar wind dynamic pressure  
enhancements,  
J. Geophys. Res., 109, A4202, doi:10.1029/2003JA010246, 2004.

B53830-000A

Lee, D.-Y., Lyons, L. R.,  
Geosynchronous magnetic field response to solar wind dynamic pressure pulse,  
J. Geophys. Res., 109, A4201, doi:10.1029/2003JA010076, 2004.

B53943-000A

Lei, J., Liu, L., Wan, W., Zhang, S.-R., Holt, J. M.,  
A statistical study of ionospheric profile parameters derived from Millstone  
Hill incoherent scatter radar measurements,

Geophys. Res. Lett., 31, L14804, doi:10.1029/2004GL020578, 2004.

B54574-000A

Lennartsson, O. W., Collin, H. L., Peterson, W. K.,  
Solar wind control of Earth's H<sup>+</sup> and O<sup>+</sup> outflow rates in the 15-eV to 33-keV  
energy range,  
J. Geophys. Res., 109, A12212, doi:10.1029/2004JA010690, 2004.

B53731-000A

Li, Y., Luhmann, J.,  
Solar cycle control of the magnetic cloud polarity and the geoeffectiveness,  
J. Atmos. Solar-Terres. Phys., 66, 323-331, 2004.

B53862-000A

Liang, J., Sofko, G. J., Donovan, E. F.,  
On the spatial and temporal relationship between auroral intensification and  
flow enhancement in a pseudosubstorm event,  
J. Geophys. Res., 109, A06213, doi:10.1029/2003JA010200, June 2004.

B53536-000A

Liemohn, M. W., Ridley, A. J., Gallagher, D. L., Ober, D. M., Kozyra, J. U.,  
Dependence of plasmaspheric morphology on the electric field description  
during the recovery phase of the 17 April 2002 magnetic storm,  
J. Geophys. Res., 109, A03209, doi:10.1029/2003JA010304, 2004.

B53858-000A

Lu, G., Onsager, T. G., Le, G., Russell, C. T.,  
Ion injections and magnetic field oscillations near the high-latitude  
magnetopause associated with solar wind dynamic pressure enhancement,  
J. Geophys. Res., 109, A06208, doi:10.1029/2003JA010297, June 2004.

B54610-000A

Marinov, P., Kutiev, I., Watanabe, S.,  
Empirical model of O<sup>+</sup>-H<sup>+</sup> transition height based on topside sounder data,  
Adv. Space Res., 34, No. 9, 2021-2025, Nov. 2004.

B54070-000A

Matsui, H., Jordanova, V. K., Quinn, J. M., Torbert, R. B., Paschmann, G.,  
Derivation of electric potential patterns in the inner magnetosphere from  
Cluster EDI data: Initial results,  
J. Geophys. Res., 109, A10202, doi:10.1029/2003JA010319, 2004.

B53859-000A

Meredith, N. P., Horne, R. B., Thorne, R. M., Summers, D., Anderson, R. R.,  
Substorm dependence of plasmaspheric hiss,  
J. Geophys. Res., 109, A06209, doi:10.1029/2004JA010387, June 2004.

B53842-000A

Milan, S. E., Cowley, S. W. H., Lester, M., Wright, D. M., Slavin, J. A.,  
Response of the magnetotail to changes in the open flux content of the  
magnetosphere,  
J. Geophys. Res., 109, A04220, doi:10.1029/2003JA010350, Apr. 2004.

B53908-000A

Minow, J. I.,  
Development and implementation of an empirical ionosphere variability model,  
Adv. Space Res., 33, No. 6, doi:10.1016/j.asr.2003.08.011, 2004.

B53661-000A

Moen, J., Oksavik, K., Carlson, H. C.,  
On the relationship between ion upflow events and cusp auroral transients,  
Geophys. Res. Lett., 31, L11808, doi:10.1029/2004GL020129, June 2004.

B54078-000A

Moon, G.-H., Ahn, B.-H., Kamide, Y., Reeves, G. D.,  
Correlation between particle injections observed at geosynchronous orbit and  
the Dst index during geomagnetic storms,  
J. Geophys. Res., 109, A10213, doi:10.1029/2004JA010390, 2004.

B53856-000A

Morioka, A., Yuasa, T., Miyoshi, Y. S., Tsuchiya, F., Misawa, H.,  
Source characteristics and radiation mechanism of Jovian anomalous continuum,  
J. Geophys. Res., 109, A06206, doi:10.1029/2004JA010409, June 2004.

B54613-000A

Moses, R. W., Jacobson, A. R.,  
Ionospheric profiling through radio-frequency signals recorded by the FORTE  
satellite, with comparison to the International Reference Ionosphere,  
Adv. Space Res., 34, No. 9, 2096-2103, Nov. 2004.

B53693-000A

Nakamura, R., Baumjohann, W., Nagai, T., Fujimoto, M., Mukai, T.,  
Flow shear near the boundary of the plasma sheet observed by Cluster and  
Geotail,  
J. Geophys. Res., 109, A05204, doi:10.1029/2003JA010174, May 2004.

B53506-000A

Odstrcil, D., Riley, P., Zhao, X. P.,  
Numerical simulation of the 12 May 1997 interplanetary CME event,  
J. Geophys. Res., 109, A02116, doi:10.1029/2003JA010135, 2004.

B54469-000A

Orsini, S., Milillo, A., Mura, A.,  
Modeling the time-evolving plasma in the inner magnetosphere: An empirical  
approach,  
J. Geophys. Res., 109, A11216, doi:10.1029/2004JA010532, 2004.

B53472-000A

Pagel, A. C., Crooker, N. U., Zurbuchen, T. H., Gosling, J. T.,  
Correlation of solar wind entropy and oxygen ion charge state ratio,  
J. Geophys. Res., 109, A01113, doi:10.1029/2003JA010010, 2004.

B54113-000A

Perez, J. D., Zhang, X.-X., Brandt, P. C., Mitchell, D. G., Jahn, J.-M.,  
Trapped and precipitating protons in the inner magnetosphere as seen by  
IMAGE,  
J. Geophys. Res., 109, A09202, doi:10.1029/2004JA010421, 2004.

B54063-000A

Richardson, I. G., Cane, H. V.,  
The fraction of interplanetary coronal mass ejections that are magnetic  
clouds: Evidence for a solar cycle variation,  
Geophys. Res. Lett., 31, L18804, doi:10.1029/2004GL020958, 2004.

B54112-000A

Richardson, I. G., Cane, H. V.,  
Identification of interplanetary coronal mass ejections at 1 AU using  
multiple solar wind plasma composition anomalies,  
J. Geophys. Res., 109, A09104, doi:10.1029/2004JA010598, 2004.

B53489-000A

Samsonov, A. A., Hubert, D.,  
Steady state slow shock inside the Earth's magnetosheath: To be or not to be?  
2. Numerical three-dimensional MHD modeling,  
J. Geophys. Res., 109, A01218, doi:10.1029/2003JA010006, 2004.

B54069-000A

Sato, N., Wright, D. M., Carlson, C. W., Ebihara, Y., Sato, M.,  
Generation region of pulsating aurora obtained simultaneously by the FAST  
satellite and a Syowa-Iceland conjugate pair of observatories,  
J. Geophys. Res., 109, A10201, doi:10.1029/2004JA010419, 2004.

B53417-000A

Sergeev, V., Runov, A., Baumjohann, W., Nakamura, R., Zhang, T. L.,  
Orientation and propagation of current sheet oscillations,  
Geophys. Res. Lett., 31, L05807, doi:10.1029/2003GL019346, 2004.

B53910-000A

Sidorova, L. N.,  
He<sup>+</sup> density topside modeling based on ISS-b satellite data,  
Adv. Space Res., 33, No. 6, doi:10.1016/j.asr.2003.06.007, 2004.

B54467-000A

Sonwalkar, V. S., Carpenter, D. L., Bell, T. F., Spasojevic, M., Inan, U. S.,  
Diagnostics of magnetospheric electron density and irregularities at  
altitudes <5000 km using whistler and Z mode echoes from radio sounding on  
the IMAGE satellite,  
J. Geophys. Res., 109, A11212, doi:10.1029/2004JA010471, 2004.

B53402-000A

Spasojevic, M., Frey, H. U., Thomsen, M. F., Fuselier, S. A., Gary, S. P.,  
The link between a detached subauroral proton arc and a plasmaspheric plume,  
Geophys. Res. Lett., 31, L04803, doi:10.1029/2003GL018389, 2004.

B54118-000A

Stubbs, T. J., Cargill, P. J., Lockwood, M., Grande, M., Kellett, B. J.,  
Extended cusp-like regions and their dependence on the Polar orbit, seasonal  
variations, and interplanetary conditions,  
J. Geophys. Res., 109, A09210, doi:10.1029/2003JA010163, 2004.

B53836-000A

Taguchi, S., Collier, M. R., Moore, T. E., Fok, M.-C., Singer, H. J.,  
Response of neutral atom emissions in the low-latitude and high-latitude  
magnetosheath direction to the magnetopause motion under extreme solar wind,  
J. Geophys. Res., 109, A4208, doi:10.1029/2003JA010147, Apr. 2004.

B53942-000A

Tan, L. C., Fung, S. F., Shao, X.,  
Observation of magnetospheric relativistic electrons accelerated by Pc-5 ULF  
waves,  
Geophys. Res. Lett., 31, L14802, doi:10.1029/2004GL019459, 2004.

B53545-000A

Trattner, K. J., Fuselier, S. A., Petrinec, S. M.,  
Location of the reconnection line for northward interplanetary magnetic  
field,  
J. Geophys. Res., 109, A03219, doi:10.1029/2003JA009975, 2004.

B53911-000A

Truhlik, V., Triskova, L., Smilauer, J.,  
New advances in empirical modelling of ion composition in the outer  
ionosphere,  
Adv. Space Res., 33, No. 6, doi: 10.1016/j.asr.2003.06.006, 2004.

B53544-000A

Tsyganenko, N. A., Fairfield, D. H.,  
Global shape of the magnetotail current sheet as derived from Geotail and  
Polar data,  
J. Geophys. Res., 109, A03218, doi:10.1029/2003JA010062, 2004.

B53951-000A

Tu, J.-N., Horwitz, J. L., Nsumei, P. A., Song, P., Huang, X.-Q.,  
Simulation of polar cap field-aligned electron density profiles measured with  
the IMAGE radio plasma imager,  
J. Geophys. Res., 109, A07206, doi:10.1029/2003JA010310, 2004.

B53637-000A

Ukhorskiy, A. Y., Sitnov, M. I., Sharma, A. S., Anderson, B. J., Ohtani, S.,  
Data-derived forecasting model for relativistic electron intensity at  
geosynchronous orbit,  
Geophys. Res. Lett., 31, L09806, doi:10.1029/2004GL019616, May 2004.

B53992-000A

Uozumi, T., Yumoto, K., Kawano, H., Yoshikawa, A., Ohtani, S.,  
Propagation characteristics of Pi 2 magnetic pulsations observed at ground  
high latitudes,  
J. Geophys. Res., 109, A08203, doi:10.1029/2003JA009898, 2004.

B53733-000A

Villante, U., Di Giuseppe, P.,  
Some aspects of the geomagnetic response to solar wind pressure variations: A  
case study at low and middle latitudes,  
Ann. Geophys., 22, 2053-2066, 2004.

B54464-000A

Volwerk, M., Glassmeier, K.-H., Runov, A., Nakamura, R., Baumjohann, W.,  
Flow burst--induced large-scale plasma sheet oscillation,  
J. Geophys. Res., 109, A11208, doi:10.1029/2004JA010533, 2004.

B53849-000A

Wang, C., Richardson, J. D.,  
Interplanetary coronal mass ejection observed by Voyager 2 between 1 & 30 AU,  
J. Geophys. Res., 109, A06104, doi:10.1029/2004JA010379, June 2004.

B54566-000A

Wang, C.-P., Lyons, L. R., Chen, M. W., Toffoletto, F. R.,  
Modeling the transition of the inner plasma sheet from weak to enhanced  
convection,

J. Geophys. Res., 109, A12202, doi:10.1029/2004JA010591, 2004.

B53486-000A

Watanabe, M., Sofko, G. J., Andre, D. A., Tanaka, T., Hairston, M. R.,  
Polar cap bifurcation during steady-state northward interplanetary magnetic  
field with  $BY \sim BZ$ ,  
J. Geophys. Res., 109, A01215, doi:10.1029/2003JA009944, 2004.

B53530-000A

Xie, H., Ofman, L., Lawrence, G.,  
Cone model for halo CMEs: Application to space weather forecasting,  
J. Geophys. Res., 109, A03109, doi:10.1029/2003JA010226, 2004.

B53533-000A

Yamaguchi, R., Kawano, H., Ohtani, S., Kokubun, S., Yumoto, K.,  
Total pressure variations in the magnetotail as a function of the position  
and the substorm magnitude,  
J. Geophys. Res., 109, A03206, doi:10.1029/2003JA010196, 2004.

B53546-000A

Zeng, W., Horwitz, J. L., Craven, P. D., Rich, F. J., Moore, T. E.,  
The O<sup>+</sup> density trough at 5000 km altitude in the polar cap,  
J. Geophys. Res., 109, A03220, doi:10.1029/2003JA010210, 2004.

B53473-000A

Zesta, E., Sibeck, D. G.,  
A detailed description of the solar wind triggers of two dayside transients:  
Events of 25 July 1997,  
J. Geophys. Res., 109, A01201, doi:10.1029/2003JA009864, 2004.

B54109-000A

Zhang, J., Liemohn, M. W., Kozyra, J. U., Lynch, B. J., Zurbuchen, T. H.,  
A statistical study of the geoeffectiveness of magnetic clouds during high  
solar activity years,  
J. Geophys. Res., 109, A09101, doi:10.1029/2004JA010410, 2004.

B53905-000A

Zhang, S.-R., Holt, J. M.,  
Ionospheric plasma temperatures during 1976-2001 over Millstone Hill,  
Adv. Space Res., doi:10.1016/j.asr.2003.07.012, 2004.

B54478-000A

Zhang, S.-R., Holt, J. M., Zalucha, A. M., Amory-Mazaudier, C.,  
Midlatitude ionospheric plasma temperature climatology and empirical model  
based on Saint Santin incoherent scatter radar data from 1966 to 1987,  
J. Geophys. Res., 109, A11311, doi:10.1029/2004JA010709, 2004.

B53651-000A

Zhang, Y., Paxton, L. J., Meng, C.-I., Morrison, D., Wolven, B.,  
Double dayside detached auroras: TIMED/GUVI observations,  
Geophys. Res. Lett., 31, L10801, doi:10.1029/2003GL018949, May 2004.

B53641-000A

Zong, Q.-G., Fritz, T. A., Zhang, H., Korth, A., Daly, P. W.,  
Triple cusps observed by Cluster--Temporal or spatial effect?,  
Geophys. Res. Lett., 31, L09810, doi:10.1029/2003GL019128, May 2004.