

The logo consists of the letters "IGS" in a white, serif font, centered within a black, horizontally-oriented oval. A thin black vertical line extends downwards from the bottom center of the oval.

D A T A C E N T E R R E P O R T S





IGS

GLOBAL CENTERS

CDDIS 1998 Global Data Center Report

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Introduction

The Crustal Dynamics Data Information System (CDDIS) has supported the International GPS Service (IGS) as a global data center since 1992. The CDDIS activities within the IGS during 1998 are summarized below; this report also includes any changes or enhancements made to the CDDIS during the past year. General CDDIS background and system information can be found in the CDDIS data center summary included in the *IGS 1994 Annual Report* (Noll, 1995) as well as the subsequent updates (Noll, 1996, Noll, 1997, and Noll, 1998).

System Description

The CDDIS archive of IGS data and products are now accessible worldwide through anonymous ftp. New users can contact the CDDIS staff to obtain general instructions on the host computer, directory structure, and data availability. The CDDIS is located at NASA's Goddard Space Flight Center (GSFC) and is accessible to users 24 hours per day, seven days per week. The system is available to users globally through the Internet and the World Wide Web (WWW).

Computer Architecture

During early 1998, CDDIS operations continued on the dedicated Digital Equipment Corporation (DEC) VAX 4000 Model 200 running the VMS operating system; in May, however, these operations, both data processing and data access, were transitioned to a new UNIX-based DEC AlphaServer 4000. The GPS data processing software was tested on this new computer during early 1998 with the help of the various IGS data and analysis centers that supply (and retrieve) data to the CDDIS. The directory structures supporting GPS data and products were consolidated under a single filesystem, thus simplifying the access to these data sets for the user community. All data and product files are now stored in UNIX compressed format, using lowercase filenames (with the exception of the *.Z* indicating a compressed file). At present, nearly 130 Gbytes of on-line magnetic disk space is devoted to the storage of the daily GPS tracking data and products.

The CDDIS staff began populating a 600-platter CD-ROM jukebox with CDs containing older GPS data not currently on-line. Thus far, most of the GPS data from 1997 have been archived to CD, one week per CD. These data are migrated from magneto-optical

disks (in VAX/VMS format) to the UNIX system where a CD-ROM image is created. The CDs are written using a local CD recordable system consisting of a Macintosh computer and a CD-ROM tower with the capability of recording up to five copies of a CD. After mounting the resulting CDs in the jukebox, users can access the data contained on these CDs in a transparent fashion, i.e., the jukebox software creates a filesystem similar to on-line magnetic disk filesystems. A dual-drive, rewriteable optical disk system connected to the VAX computer continues to be utilized for the off-line storage of older GPS data not yet recorded on CD.

Archive Content

As a global data center for the IGS, the CDDIS is responsible for archiving and providing access to both GPS data from the global IGS network as well as the products derived from the analyses of these data.

GPS Tracking Data

The GPS user community has access to the on-line and near-line archive of GPS data available through the global archives of the IGS. Operational and regional data centers provide the interface to the network of GPS receivers for the IGS global data centers. For the CDDIS, the following operational or regional data centers make data available to the CDDIS from selected receivers on a daily basis:

- Australian Survey and Land Information Group (AUSLIG) in Belconnen, Australia
- Alfred Wegener Institute (AWI) for Polar and Marine Research in Bremerhaven, Germany
- European Space Agency (ESA) in Darmstadt, Germany
- Geoforschungszentrum (GFZ) in Potsdam, Germany
- Geographical Survey Institute (GSI) in Tsukuba, Japan
- NOAA's Geosciences Laboratory (GL/NOAA) Operational Data Center (GODC) in Rockville, Maryland
- Korean Astronomy Observatory (KAO) in Taejeon, Korea
- Jet Propulsion Laboratory (JPL) in Pasadena, California
- National Geography Institute (NGI) in Suwon-shi, Korea
- National Imagery and Mapping Agency (NIMA) in St. Louis, Missouri
- Natural Resources of Canada (NRCan) in Ottawa, Canada
- Regional GPS Data Acquisition and Analysis Center on Northern Eurasia (RDAAC) in Moscow, Russia
- University NAVSTAR Consortium (UNAVCO) in Boulder, Colorado
- United States Geological Survey (USGS) in Reston, Virginia

In addition, the CDDIS accesses the other two IGS global data centers, Scripps Institution of Oceanography (SIO) in La Jolla California and the Institut Géographique

National (IGN) in Paris France, to retrieve (or receive) data holdings not routinely transmitted to the CDDIS by a regional data center. Table 1 lists the data sources and their respective sites that were transferred daily to the CDDIS in 1998. Nearly 54K station days from 185 distinct GPS receivers were archived at the CDDIS during 1998. A complete list of all archived sites can be found on the CDDIS web site (ftp://cddisa.gsfc.nasa.gov/pub/reports/gpsdata/cddis_summary.1998).

Daily GPS Data Files

Once the daily RINEX data files arrive at the CDDIS, these data are quality-checked, summarized, and archived to public disk areas in daily subdirectories; the summary and inventory information are also loaded into an on-line data base. Typically, the archiving routines on the CDDIS are executed several times a day for each source in order to coincide with their automated delivery processes and to ensure timely arrival in the CDDIS public disk areas. In general, the procedures for archiving the GPS tracking data are fully automated, requiring occasional monitoring only, for replacement data sets or re-execution because of system or network problems.

The CDDIS daily GPS tracking archive consists of observation, navigation, and meteorological data, all in compressed (UNIX compression) RINEX format. Furthermore, summaries of the observation files are generated by the UNAVCO quality-checking program TEQC (Estey 1999) and are used for data inventory and quality reporting purposes. During 1998, the CDDIS archived data on a daily basis from an average of 150 stations; toward the end of the year, this number increased to over 160 stations. Each site produces approximately 0.8 Mbytes of data per day (compressed RINEX, compressed compact RINEX, navigation, meteorological, and summary); thus, one day's worth of GPS tracking data totals nearly 130 Mbytes. For 1998, the CDDIS GPS data archive totaled over forty Gbytes in volume; this figure represents data from nearly 54K observation days. Of the 160 or more sites archived each day at the CDDIS, not all are of "global" interest; some, such as those in Southern California, are regionally oriented. The CDDIS receives data from these sites as part of its NASA archiving responsibilities.

During 1998, the "compact RINEX" data format became the operational format for exchange of GPS data between the IGS data and analysis centers. This software, developed by Hatanaka Yuki (GSI) and Werner Gurtner (AIUB), when used with UNIX compression, reduces the size of the RINEX data by approximately a factor of eight (as compared to approximately 2.5 with using UNIX compression alone). The CDDIS continues, however, to archive and make data available in the compressed RINEX format for the greater user community.

The majority of the data delivered to and archived in the CDDIS during 1998 was available to the user community within six hours after the observation day. As shown in Figure 1, over 35 percent of the data from all sites delivered to the CDDIS were available within three hours of the end of the observation day; over ten percent were available

within one hour. These statistics were derived from the results of the daily archive report utilities developed by the IGS Central Bureau and executed several times each day on the CDDIS.

Hourly GPS Data Files

In mid-1998, selected operational data centers (JPL and ESA) began transmission of hourly data files to the global data centers. Each file of observation (in compact RINEX format only), navigation, and meteorological data contains a single hour's worth of data. The individual hourly files are labeled by incrementing the sequence number digit in the RINEX file naming convention; e.g., the file *mmmmddd.yy.Z* contains the observation data for the first hour of day *ddd* in year *yy* for site *mmmm*. Within minutes of receipt, the files are archived to separate subdirectories (*/gps/nrtdata*) by day on the CDDIS. These data are retained on-line for three days. After three days, the hourly data files are deleted; the daily file, transmitted through normal channels with a typical delay of one to two hours, will have been received and archived already and thus the hourly data are of little use. Furthermore, to ensure the most rapid delivery of these data to the user community, no validation or checks on data quality are performed. On average, these hourly data files were available to the user community within thirty minutes of the end of the hour. GPS sites supplying hourly data to the CDDIS in 1998 are denoted by an * in Table 1.

Meteorological Data

The CDDIS currently receives meteorological data from nearly thirty sites, as noted in Table 1 below. The meteorological data provided are dry temperature, relative humidity, and barometric pressure at thirty minute sampling intervals. These data are stored on CDDIS with the daily GPS observation and navigation data files in parallel subdirectories.

IGS Products

The seven IGS data analysis centers (ACs) retrieve the GPS tracking data on a daily basis from the global data centers to produce daily orbit products and weekly Earth rotation parameters (ERPs) and station position solutions; the eight IGS associate analysis centers (AACs) also retrieve IGS data and products to produce station position solutions. The CDDIS archives the products generated by both types of IGS analysis centers. These files are delivered to the CDDIS by the IGS analysis centers to individual user accounts, copied to the central disk archive, and made available in compressed format on the CDDIS by automated routines that execute several times per day. The Analysis Coordinator for the IGS then accesses the CDDIS (or one of the other global analysis centers) on a regular basis to retrieve these products and derive the combined IGS orbits, clock corrections, and Earth rotation parameters as well as to generate reports on data quality and statistics on product comparisons. Users interested in obtaining precision orbits for use in general surveys and regional experiments can also download the IGS products. The CDDIS currently provides on-line access to all IGS products generated since the start of the IGS

Test Campaign in June 1992. Access to the on-line archive of CDDIS products can also be performed through ftp or the WWW.

Regional Network Associate Analysis Centers (RNAACs) routinely generate station position solutions for regional networks in Software INdependent EXchange (SINEX) format. The three Global Network AACs (GNAACs) perform a comparison of these files and submit the resulting SINEX files to the CDDIS. The GNAACs also access the SINEX files from the IGS ACs and RNAACs and produced comparison and combined, polyhedron station position solutions.

The derived products from the IGS ACs are typically delivered to the CDDIS within seven days of the end of the observation week; delivery times for AAC products vary, but average thirty days for regional solutions. Figure 2 presents the median delay during 1998, in days and by source, of AC and AAC products delivered to the CDDIS. The statistics were computed based upon the arrival date of the solution summary file for the week. The time delay of the IGS products and the combined SINEX solutions are dependent upon the timeliness of the individual IGS analysis centers; on average, the combined orbit is generated within one to two days of receipt of data from all analysis centers and is typically available to the user community within ten days.

The rapid orbit and ERP products generated by the IGS Analysis Coordinator, designated IGR, were also made available to the IGS global data centers starting in June 1996. These products are produced daily, by 17:00 hours UTC; automated procedures at the CDDIS download these files from the Analysis Coordinator in a timely fashion.

Starting in early 1998, the IGS Analysis Center Coordinator began generating predicted orbit, clock, and Earth rotation parameter combinations based upon the individual ACs' predicted solutions. These solutions, designated IGP, are available by 23:30 UTC. The IGS global data centers, including the CDDIS, have made these products available in a timely fashion to ensure their usefulness to the user community.

Also early in 1998, the IGS Analysis Center Coordinator began generating accumulated IGR and IGS ERP files on a daily and weekly basis; these data are used with either the final or the rapid orbits. These files will be produced at the same time as the IGS rapid and final products are generated and downloaded by the IGS global data centers. The files are designated igs95p02.erp (to be used with the IGS final orbits) and igs96p02.erp (to be used with IGS rapid orbits).

The CDDIS began generating "short-SINEX" files, designated with an .ssc extension, from all AC and AAC SINEX files in early 1998. These files contain the site information from the SINEX file but no matrices. The files are stored in the weekly IGS product subdirectories.

Since January 1997, the IGS has conducted a pilot experiment on the combination of troposphere estimates. Using a sampling rate of two hours, the zenith path delay (ZPD) estimates generated by the IGS analysis centers were combined by GFZ to form weekly

ZPD files for approximately 100 IGS sites. As of early 1998, these troposphere products are available through the IGS global data centers; at the CDDIS the files are in a subdirectory of each weekly GPS products directories (i.e., /gps/products/WWW/trop).

As of June 1, 1998, several IGS Analysis Centers began supplying daily, global ionosphere maps of total electron content (TEC) in the form of IONEX (an official format for the exchange of ionosphere maps) files. These products are also available from the IGS global data centers. At the CDDIS, the IONEX files are located in daily subdirectories of the main product area (e.g., /gps/products/ionex), rather than under the weekly subdirectory structure, since the files are produced daily.

Supporting Information

Daily status files of GPS data holdings, reflecting timeliness of the data delivered as well as statistics on number of data points, cycle slips, and multipath continue to be generated by the CDDIS. By accessing these files, the user community can receive a quick look at a day's data availability and quality by downloading a single file. Furthermore, monthly summaries of the data quality for the IGS sites are also generated. Both the daily and monthly status files are available through the WWW at URL <ftp://cddisa.gsfc.nasa.gov/pub/reports/gpsstatus/>. The daily status files are also archived in the daily GPS data directories. An example of this daily status file, for day 98200, is shown in Figure 3.

Ancillary information to aid in the use of GPS data and products are also accessible through the CDDIS. Weekly and yearly summaries of IGS tracking data archived at the CDDIS are generated on a routine basis and distributed to the IGS user community through IGS Report mailings. These summaries are now accessible through the WWW at URL <ftp://cddisa.gsfc.nasa.gov/pub/reports/gpsdata>. The CDDIS also maintains an archive of and indices to IGS Mail, Report, and Network messages.

System Usage

Figures 4 through 6 summarize the monthly usage of the CDDIS for the deposit and retrieval of GPS data during 1998. These figures were produced daily by automated routines that peruse the log files created by each network access of the CDDIS. Data for January through May reflect access to the CDDIS VAX system; data for the remainder of 1998 are for accesses to the AlphaServer computer. Figure 4 illustrates the amount of data retrieved by the user community during 1998. Nearly two million files were transferred in 1998, totaling approximately 380 Gbytes in volume. Averaging these figures, users transferred 150K files per month, totaling nearly 30 Gbytes in size. The chart in Figure 5 details the total number of host accesses per month with the number of distinct (i.e., unique) hosts per month shown as an overlay. Here, a host access is defined as an initiation of an ftp session; this session may transfer a single file, or many files. Figure 6 illustrates the profile of users accessing the UNIX system during 1998; these figures represent the number of distinct hosts in a particular country, geographic area, or

organization. This year, less than one half of the users of GPS data available from the CDDIS come from U.S. government agencies, universities, or corporations.

The figures referenced above present statistics for routine access of the on-line CDDIS GPS data archives. However, a significant amount of staff time is expended on fielding inquiries about the IGS and the CDDIS data archives as well as identifying and making data available from the off-line archives. Table 2 summarizes the type and amount of special requests directed to the CDDIS staff during 1998. To satisfy requests for off-line data, the CDDIS staff must copy data from the optical disk archive to an on-line magnetic disk area, or for larger requests, mount the optical disks in a scheduled fashion, coordinating with the user as data are downloaded. It is hoped that as CD-ROMs of older data become available through the on-line jukebox this figure can be greatly reduced in the coming years.

Other Activities

The CDDIS (and NASA) as well as the IGS were sponsors and co-conveners of the IGS Network Systems Workshop, held in Annapolis Maryland in November 1998. This was the first workshop of its type, focusing on the network and infrastructure issues and how future plans for the IGS affect the components of the service. Over eighty people attended this workshop which provided a venue for the various network components of the IGS to meet and discuss current configurations, problems and their resolutions, incorporation of the many future requirements into the existing infrastructure of the IGS, and the identification of emerging technologies. The proceedings from this very successful workshop, including recommendations generated during the event, will be published in mid-1999.

In early 1998, a Call for Participation in the International GLONASS EXperiment (IGEX-98) was issued. IGEX-98, sponsored by several organizations, including the IGS, and requested participation by stations, data centers, and analysis centers. The CDDIS responded to this call and was selected to serve as a global data center for GLONASS data and products. The staff took advantage of the data archiving and processing procedures developed for the IGS in the support of IGEX. The campaign started in October of 1998 and continues into 1999. The CDDIS archived GLONASS data from 66 sites totaling nearly 3500 station days of data. GLONASS products from six analysis centers were also made available to the public. IGEX data and products are accessible via anonymous ftp to host [cddisa.gsfc.nasa.gov](ftp://cddisa.gsfc.nasa.gov), in the filesystem /igex.

Publications

The CDDIS staff attended several conferences during 1998 and presented papers on or conducted demos of their activities within the IGS, including:

- “1997 IGS Data Center Reports” (Carey Noll) for 1997 IGS Annual Report
- “Data Center Issues” (Loic Daniel, Jeffrey Dean, Myron McCallum, Carey Noll) was presented at the IGS Network Systems Workshop in November 1998

- “Recent Enhancements to the CDDIS” (Carey Noll) was presented at the IGS Network Systems Workshop in November 1998
- “The Space Geodesy Data Archive and Distribution Facility of the CDDIS (Carey Noll and Maurice Dube) was presented at the American Geophysical Union in December 1998

Hypertext versions of this and other publications can be accessed through the CDDIS on-line documentation page on the WWW at URL <http://cddisa.gsfc.nasa.gov/documents.html>.

Future Plans

Computer System Enhancements

The AlphaServer 4000 computer supporting the CDDIS has been operational for nearly one year. Additional disk space may be procured in the near future, as well as a dedicated tape backup system. CDDIS staff will continue the migration of older off-line GPS data from VAX/VMS formatted magneto-optical disks to CD-ROM.

Changes in the Data Archive

The IGS sponsored a workshop in March 1999 focusing on data and analysis requirements of low Earth orbiting (LEO) missions. The GPS products required by these missions will need one second GPS data, probably on an hourly basis. The CDDIS, as well as other IGS data centers, will begin the archive and distribution of one second data files, probably utilizing a new, more efficient binary exchange format, during the later part of 1999. It is also possible that the data centers will become involved in the archive of space-borne GPS receiver data. A pilot program for the use of this flight data may begin in 1999.

One area under investigation within the IGS is a common directory structure for data and products among all data centers. This system would aid IGS analysis centers and users in navigation of multiple data centers. An extension of this plan is the participation of IGS data centers in the GPS Seamless Archive Center (GSAC) activity (McCallum et. al., 1998), sponsored by UNAVCO, and designed to allow easy navigation of multiple GPS archives for data of interest. Both activities will be investigated further to ascertain how best to implement the concepts within the CDDIS.

Changes in the Product Archive

Many of the seven IGS ACs will soon supply GPS and ground station clock values on a weekly basis. A new format has been developed for these data. The daily files will be made available through the IGS global data centers; the CDDIS will store the files in the weekly products directories (subdirectories of /gps/products).

The IGS Reference Frame Coordinator, currently located at NRCAN, has begun generating the official IGS combined weekly SINEX solutions and Earth rotation parameters. These files will also be made available to the user community through the global data centers.

The 1999 LEO Workshop also recommended that the IGS Analysis Centers should develop a new ultra-rapid analysis product (orbit, clock, EOP, and predictions) with a latency of less than three hours. These new products will most likely be developed and generated through a pilot program in late 1999.

Contact Information

To obtain more information about the CDDIS IGS archive of data and products, contact:

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Greenbelt, MD 20771	http://cddisa.gsfc.nasa.gov/cddis_welcome.html

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Table 1: Sources of GPS Data Transferred to the CDDIS in 1998

Source	Sites								No. Sites
AUSLIG	ALIC	CAS1	COCO	DAV1	DARW	HOB2	JAB1	KARR	12
	MAC1	MAW1	ORRO	TOW2					
AWI	Goug	VESL							2
NOAA/GL	ACMT/2	AOML ^m	BARB	BARH	BRMU	EPRT	FORT	HNPT	15
	KELY	RCM6	SOL1 ^m	USNA	USNO ^m	WES2 ^m	WUHN		
NRCan	ALBH ^m	ALGO ^m	CHUR	DRAO	DUBO	FLIN	HOLB	NANO	17
	NRC1 ^m	PRDS ^m	SCH2	STJO ^m	UCLU	WHIT	WILL	WSLR	
								YELL ^m	
ESA	KIRU*	KOUR*	MALI	MAS1	PERT*	VILL*			6
GFZ	KIT3 ^m	KSTU	LPGS	OBER ^m	POTS ^m	URUM	ZWEN ⁿ		7
GSI	TSKB								1
IGN	ANKR	BOR1	BRUS ^m	EBRE	GLSV	GRAS	GRAZ ^m	HARK	33
	HERS ^m	HOFN	IRKT	JOZE	KERG	(KIRU)	(KIT3)	KOSG	(40)
	(KSTU)	LHAS ^m	(LPGS)	(MAS1)	MATE	MDVO	METS ^m	NICO	
	NOUM	NTUS	NYA1	NYAL	OHIG	ONSA	(POTS)	REYK ^m	
	TAHI/THTI	TRO1	TROM	WSRT	WTZR ^m	ZECK	ZIMM ^m	(ZWEN ⁿ)	
JPL	AOA1*	AREQ	ASC1	AUCK sm	AZU1	BOGT*	BRAZ	CARR	62
	CASA	CAT1	CHAT ^m	CICE*	CIT1	CRO1*	CSN1	DGAR	
	EISL*	FAIR sm	GALA	GODE sm	GOL2*	GOLD	GUAM*	HARV	
	HRAO*	IAVH	IISC	JPLF	JPLM*	KOKB sm	KRAK	KUNM	
	KWJ1*	LBCH	MAD2	MADR*	MCM4*	MDO1 sm	MKEA	MOIN	
	NLIB*	NSSP*	OAT2*	PIE1*	POL2	QUIN*	SANT*	SELE	
	SHAO	SNI1	SPK1	SUTH*	THU1	TID2*	TIDB	UCLP*	
		USC1*	USUD*	WHC1	WLSN	XIAN	YAR1		
KAO	TAEJ								1
NGI	SUWN								1
NIMA	BAHR ^m								1
RDAAC	MAG0	PETR/1/P	TIXI	YAKA	YAKZ				5
SIO	BAKO	INEG	(MAG0)	MONP	(PETR/P)	PIN1	PVEP	RAMO	8
	SIO3	VNDP	(YAKA)	(YAKZ)					(12)
UNAVCO	CEDU	CHUM	KAYT	KUMT	(NSSP*)	(POL2)	RIOP	SHAS	8
	SUMK	TVST							(10)
USGS	AMUN	PALM							2
Totals:	181 sites from 16 data centers during 1998								

Notes: Sites in () indicate backup delivery route

Sites in italics indicate sites new to the CDDIS in 1998

* Indicates site also providing hourly data to the CDDIS in 1998

^m Indicates site providing meteorological data to the CDDIS in 1998 (NRCan has ceased to provide met data as of late 1998)

Table 2: Summary of Special Requests for GPS Data and Information in 1998

Type of Request	Totals
General IGS/CDDIS information	~350 requests (phone, fax, e-mail)
Off-line GPS data	~75 requests (phone, fax, e-mail)
Amount of off-line data requested	~10,000 station days [†]
Volume of off-line data requested	~9 Gbytes

Notes: [†]In this context, a station day is defined as one day's worth of GPS data (observation and navigation file in RINEX format)

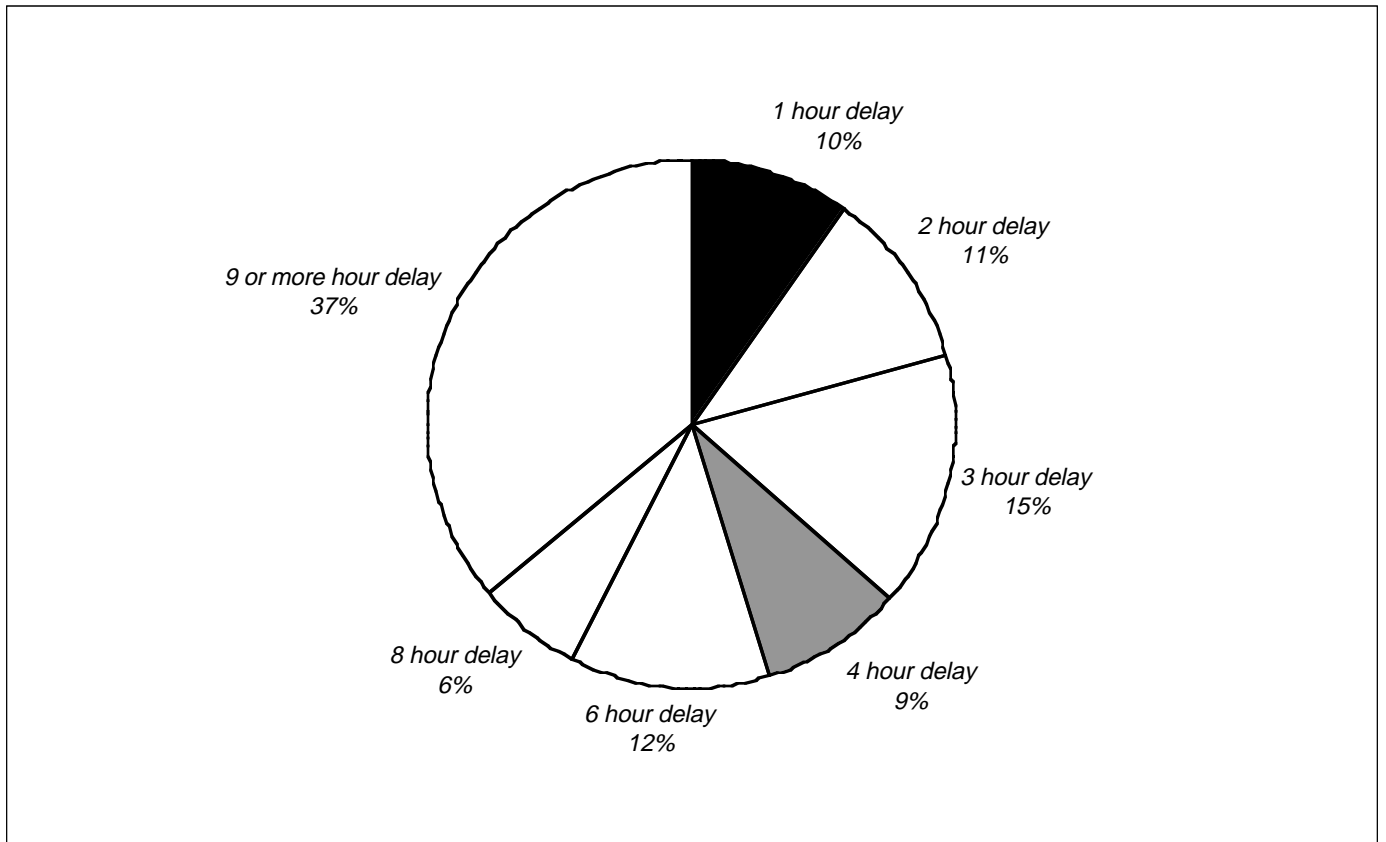


Figure 1: Average delay in GPS data delivery (all sites) to the CDDIS in 1998

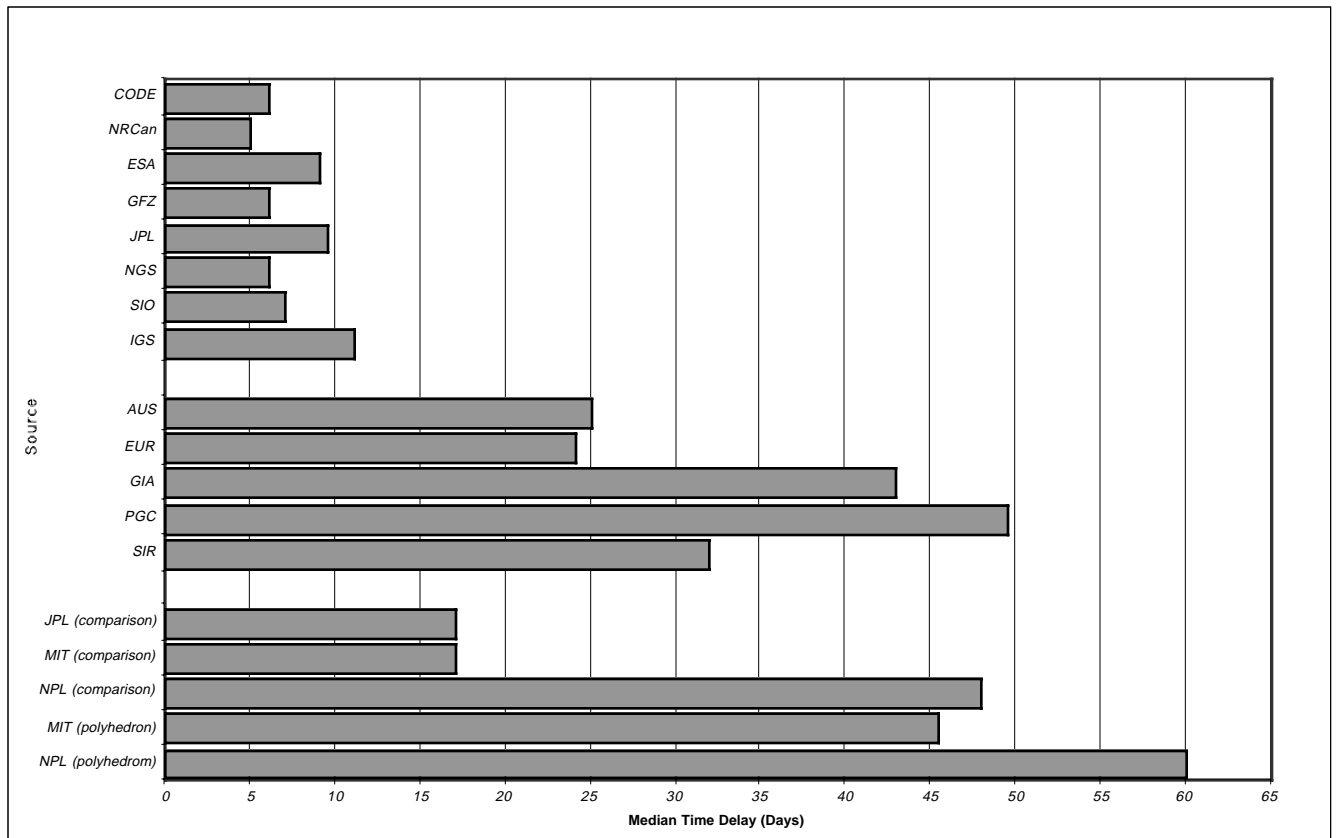


Figure 2: Median delay in GPS product delivery to the CDDIS (by source) in 1998

IGS Tracking Network Status for 19-Jul-98 980719 98200															GPS Week 0967 Day 1		As of date: Aug 19 1998 09:40:35	
Site	Dly (H)	No. Exp.	No. Obs.	Pts. Del.	%	Avg. MP1	Avg. MP2	Pos. Diff	No. Slps	V	Receiver Type	Antenna Type	Ant. Height	Marker Name	Marker Number			
albh	4	21927	21244	0	96	0.37	0.66	0.03	30	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.10	albh WCDA-ACP	927 40129M003			
algo	4	21853	20332	12	93	0.41	1.13	0.04	17	1	ROGUE SNR-8000	DORNE MARGOLIN T	.10	algo CACS-ACP	8831 40104M002			
alic	28	21988	20495	0	93	0.43	1.33	0.03	453	1	ROGUE SNR-8100	DORNE MARGOLIN T	0.00	ALIC	AU012-501			
amct	12	22127	20504	1080	92	0.33	0.98	0.41	129	1	ROGUE SNR-12	DORNE MARGOLIN T	.00	AMCT	40472S003			
amun	714	26214	25924	13	98	0.60	0.45	0.00	4	1	ASHTECH Z-XII3	DORNE MARGOLIN ASH	0.07	AMUN				
ankr	24	21545	18008	1939	83	0.22	0.86	0.08	132	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.06	ANKARA	20805M002			
aoal	1	21862	19745	468	90	0.44	0.81	0.00	40	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.00	AOA1	40483S001			
aoml	1	22524	19944	501	88	0.36	0.80	0.04	48	1	ROGUE SNR-8000	DORNE MARGOLIN T	.00	ATLANTIC OCEANOGRAPH	49914S001			
areq	6	23089	19913	545	86	0.26	0.88	0.00	47	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.06	AREQ	42202M005			
ascl	1	22549	19283	1123	75	0.47	0.79	0.00	109	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.06	ASCL	30602M001			
auck	37	22211	20076	72	90	0.23	0.65	0.00	21	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.00	AUCK	50209M001			
azul																		
bahr	18	21990	21807	16	99	0.17	0.19	0.07	3	1	ASHTECH Z-12	DORNE MARGOLIN ASH	3.12	BAHR	249010M02			
bako	18	24741	21411	312	86	0.55	0.67	0.04	105	1	TRIMBLE 4000SSE	4000ST L1/L2 GEOD	1.67	BAKO	TTG.01			
barb																		
bogt	2	25262	18405	1547	72	0.41	0.88	0.00	81	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.06	BOGT	41901M001			
bor1	10	2254	1737	0	77	0.23	1.98	0.03	12	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.06	BOR1	12205M002			
braz																		
:																		
yar1	1	21874	20388	55	93	0.24	0.59	0.00	38	1	ROGUE SNR-8100	DORNE MARGOLIN T	0.08	YAR1	50107M004			
yell	4	24480	23588	3	96	0.51	0.75	0.04	10	1	ROGUE SNR-12 RM	DORNE MARGOLIN T	.10	yell CACS-ACP	8892 40127M003			
zeck	23	21592	19903	96	92	0.36	0.65	0.03	28	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.04	ZECK	12351M001			
zimm	2	21756	21316	86	97	0.28	0.71	0.05	22	1	TRIMBLE 4000SSE	4000ST L1/L2 GEOD	0.00	ZIMM	14001M004			
zwen	22	22726	20412	0	89	0.49	0.93	0.05	56	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.04	ZWEN	12330M001			
Program: QC V3 by UNAVCO run with elevation angle cutoff of 10 degrees																		
Field Size Type Explanation																		
Site	4	char	Site name															
Dly (H)	3	number	Delivery delay in hours															
No. Exp.	5	number	Total number of observations expected															
No. Obs.	5	number	Total number of observations in file															
Pts. Del.	5	number	Total number of points deleted															
%	3	number	Data collection percentage															
Avg. MP1	4	number	Average L1 multipath (rounded to two decimal places)															
Avg. MP2	4	number	Average L2 multipath (rounded to two decimal places)															
Pos. Diff	4	number	RINEX vs QC point position difference (km)															
No. Slps	4	number	Number of detected slips															
V	1	number	Version of the data file (set to 1 for initial delivery)															
Receiver Type	20	char	Type of GPS receiver from RINEX header															
Antenna Type	20	char	Type of GPS antenna from RINEX header															
Ant. Height	6	number	Height of antenna from RINEX header															
Marker Name	20	char	Marker name from RINEX header															
Marker Number	10	char	Marker DOME number from RINEX header															

Figure 3. Daily Status File Produced by CDDIS

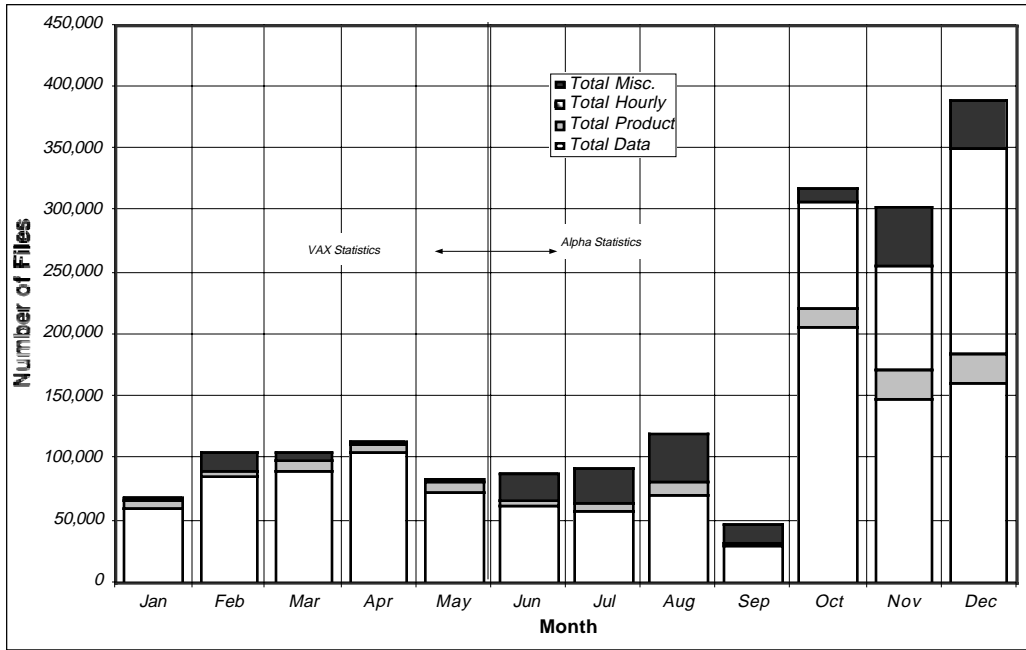


Figure 4: Number of GPS related files transferred from the CDDIS in 1998

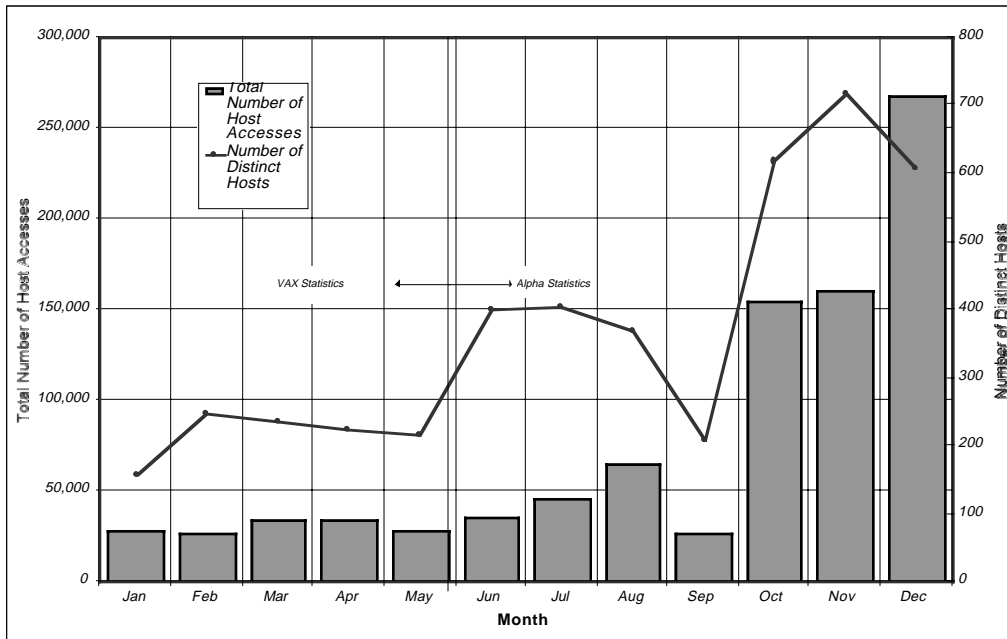


Figure 5: Number of hosts accessing GPS data and products on the CDDIS in 1998

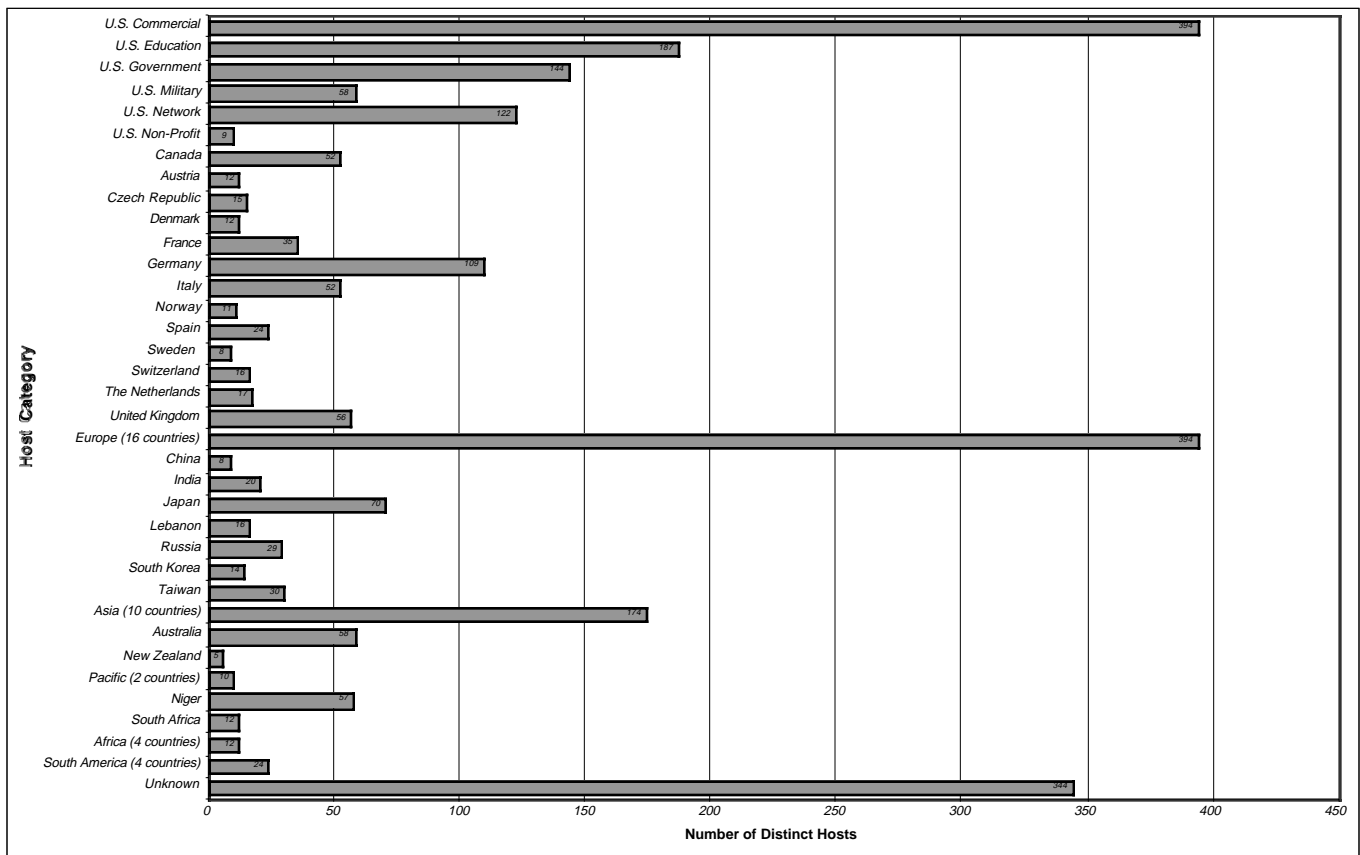


Figure 6: Distribution of IGS users of the CDDIS in 1998