

# THE CDDIS DATA CENTER – NASA'S SPACE GEODESY DATA ARCHIVE

Carey Noll and Maurice Dube  
NASA GSFC



## CDDIS OVERVIEW

The Crustal Dynamics Data Information System (CDDIS) is a dedicated data center supporting the international space geodesy community, providing easy and ready access to a variety of data sets, products, and information about these data. The data center was established in 1982 as a dedicated data bank to archive and distribute all Crustal Dynamics Project-acquired data and information about these data. Today, the CDDIS continues to serve as the NASA archive and distribution center for space geodesy data, particularly Global Positioning System (GPS), Global Navigation Satellite System (GLONASS), laser ranging, Very Long Baseline Interferometry (VLBI), and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) data. The specialized nature of the CDDIS lends itself well to enhancement to accommodate diverse data sets and user requirements.

The CDDIS serves as one of the primary data centers for the following International Association of Geodesy (IAG) services:

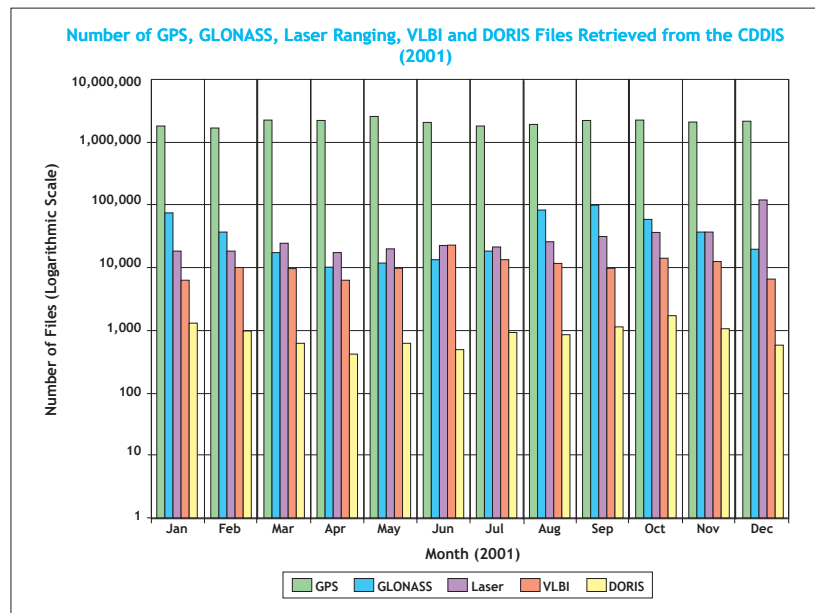
- International GPS Service (IGS)
- International Laser Ranging Service (ILRS)
- International VLBI Service for Geodesy and Astrometry (IVS)
- International Earth Rotation Service (IERS)
- International DORIS Service (IDS)

Operational data centers deposit data to individual user accounts on the CDDIS host computer. All data are processed to ensure data integrity and to extract pertinent metadata. These metadata are loaded into a relational database for data tracking and query purposes. Data are then copied to public directories and made available to the user community through anonymous ftp and the web.

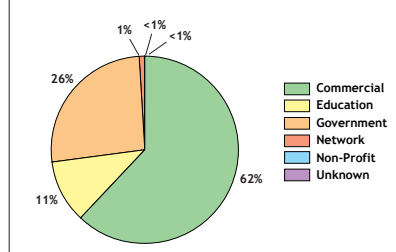
The CDDIS is operational on a UNIX server with over 550 Gbytes of on-line disk storage. A majority of the archive is devoted to the archive of GPS data and products.

In 2001, over 2.2 million files totaling over 150 Gbytes in size were downloaded each month from the CDDIS on-line archive. More than 6,700 distinct hosts in 95 countries accessed and downloaded data from the CDDIS last year. Over 120 institutions in over sixty countries supply data to the CDDIS on a daily basis for

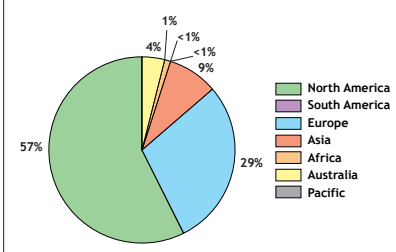
## CDDIS ARCHIVE STATISTICS



Number of GPS, GLONASS, Laser, VLBI, and DORIS Files Retrieved in 2001 (By Host Type)



Number of GPS, GLONASS, Laser, VLBI, and DORIS Files Retrieved in 2001 (By Geographic Area)

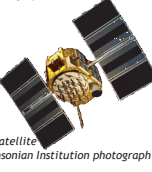


## IGS DATA AND PRODUCTS

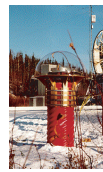
The main mission of the International GPS Service (IGS) is to provide a service to support geodetic and geophysical research activities through GPS data and products. This service has been operational since 1994. The current network consists of nearly 300 permanently occupied, globally distributed sites that provide GPS data to IGS data centers on a daily, hourly, and near-real-time basis. These GPS data are used by the IGS analysis centers to generate products such as precise satellite ephemerides and clock information.



GODE GPS antenna at Greenbelt, MD CDDIS photograph



GPS satellite Smithsonian Institution photograph



FAIR GPS antenna at Fairbanks, AK IGS photograph

### GPS (and GLONASS) Data:

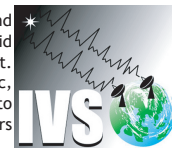
- Daily files containing 30-second sampled GPS data in RINEX format
- ~200+ GPS (and ~50 GLONASS) stations/day
- ~0.35 Mbytes/site/day in size (compressed)
- Data since January 1997 on-line
- Hourly files of 30-second sampled GPS data in RINEX format
- ~15+ GPS (and 16 GPS/GLONASS) stations/day
- ~0.02 Mbytes/site/hour in size (compressed)
- Data retained for three days
- Fifteen-minute files of one-second sampled GPS data in RINEX format
- ~40+ GPS stations/day
- ~0.45 Mbytes/site/hour in size (compressed)
- Data since May 2001 on-line
- Daily files of ten-second sampled satellite-borne GPS receive data in RINEX format
- Two satellites (SAC-C, CHAMP); JASON, GRACE to be archived
- ~2.5 Mbytes/satellite/day in size (compressed)
- Data since January 2002 on-line

### IGS Products:

- Precise GPS satellite ephemerides (<5 cm accuracy)
- Earth rotation parameters
- IGS tracking station coordinates and velocities
- GPS satellite and IGS tracking station clock information
- Global ionosphere maps of total electron content (TEC)

## IVS DATA AND PRODUCTS

Products generated by International VLBI Service for Geodesy and Astrometry (IVS) contribute to research in many areas, including solid Earth, tides, studies of the vertical, and VLBI technique improvement. The objectives of IVS are to provide a service to support geodetic, geophysical, and astrometric research and operational activities, to promote research and development for VLBI, and to interact with users of VLBI products



VLBI antenna at Fairbanks, AK IVS web site photograph



DORIS antenna located in Hartebeesthoek, South Africa IGS web site photograph

### VLBI Data:

- VLBI data bases in DBH and NGS card formats
- Auxiliary files (e.g., log, met data, schedule, cable info, correlator notes, etc.)
- Currently, over 40 antennas participate in the IVS
- ~2-3 Mbyte/data base file (compressed)
- CDDIS VLBI data archive: 1979 through present; most data holdings available on-line

### IVS Products:

- Intensive and session Earth orientation parameter series (EOP-I and EOP-S)

## ILRS DATA AND PRODUCTS

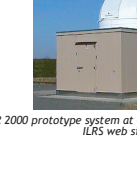
The International Laser Ranging Service (ILRS), operational since 1998, provides global satellite and lunar laser ranging data and their related products to support geodetic and geophysical research



Retroreflector array on Jason, GPO-1, ICEsat, and ADEOS-II ILRS web site photograph



LAGEOS satellite ILRS web site photograph



SLR 2000 prototype system at Greenbelt, MD ILRS web site photograph

### Laser Data:

- Daily and monthly files containing on-site normal points, sorted by satellite, in ILRS normal point format
- Hourly files containing on-site normal points from all satellites, in ILRS normal point format retained for five days
- Daily and monthly full-rate data files from a subset of the global network, sorted by satellite, in ILRS full-rate format
- Currently, 26 satellites and four sites on the moon are tracked on a routine basis by 40 SLR and LLR stations
- Approximately 1 Mbyte/day on-site normal point data (uncompressed); 2 Mbytes/day full-rate data (compressed)
- CDDIS laser data archive: 1976 through present; approximately 90% of data holdings available on-line

### ILRS Products (future):

- Precise satellite ephemerides

## IDS DATA AND PRODUCTS

The DORIS system, developed in France, is based on the measurement of Doppler shifts in radio signals, transmitted by ground beacons to a DORIS receiver on-board the satellite. Like GPS and SLR, precise satellite orbits, positions of and distances between observing stations, and Earth rotation, orientation, and polar motion values can be derived from DORIS measurements. The primary objective of the International DORIS Service (IDS) is to foster the DORIS technique to support international geodetic, geophysical, and other research and operational activities.



DORIS on-board receiver IDS web site photograph

### DORIS Data:

- Files containing one "cycle" (~ten days) of data (computed range measurements), sorted by satellite, in DORIS-specific format
- Seven satellites have on-board DORIS receivers that receive transmitted signals from a network of nearly 50 beacons
- ~5 Mbyte/satellite/cycle (compressed)
- CDDIS DORIS data archive: 1992 through present; all data available on-line

### IDS Products (future):

- Precise satellite ephemerides
- Site coordinates and velocities; position time series
- Earth rotation parameters
- Special products
- Ionosphere information
- Time varying geocenter coordinates

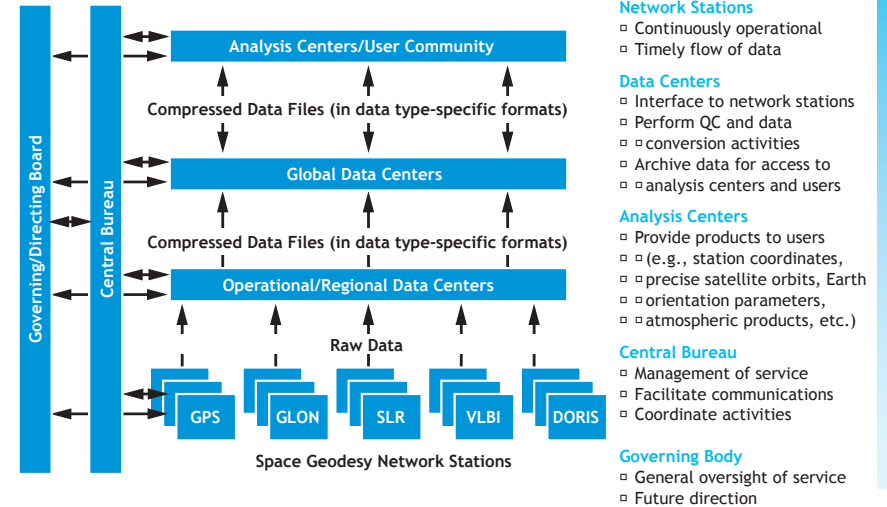


DORIS antenna located in Hartebeesthoek, South Africa IGS web site photograph



DORIS satellite antenna AVISO web site photograph

## DATA FLOW FOR INTERNATIONAL SERVICES



## GLOBAL GPS, GLONASS, LASER, VLBI, AND DORIS NETWORKS



## FOR FURTHER INFORMATION

Carey Noll  
Manager, CDDIS  
NASA GSFC  
Greenbelt, MD 20771  
USA  
Carey.Noll@gssc.nasa.gov

Maurice Dube  
Raytheon ITSS  
Lanham, MD 20706  
USA  
mdube@pop900.gsfc.nasa.gov

CDDIS Web Site: <http://cddis.nasa.gov> or  
<http://cddis.gsfc.nasa.gov>

