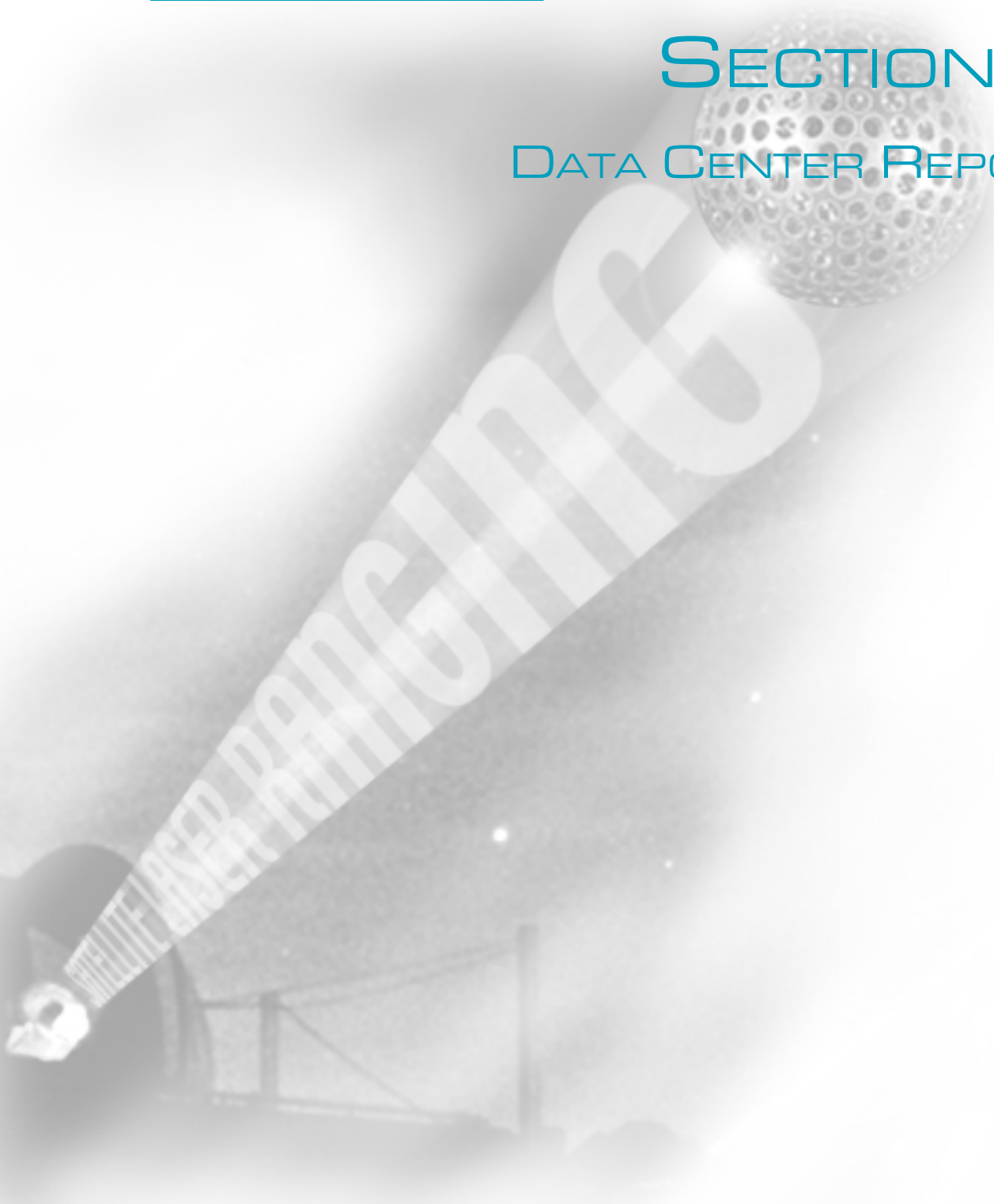# SECTION 6

DATA CENTER REPORT

SECTION 6 – DATA CENTER REPORTS

6.1 INTRODUCTION

Carey Noll, *NASA Goddard Space Flight Center*

BACKGROUND

In late 1998, the International Laser Ranging Service began operations. Two Global Data Centers and one Regional Data Center currently support the service. Global Data Centers archive data from the entire ILRS network and provide access to these holdings to the general user community. Furthermore, global Data Centers archive products derived from the ILRS data as well as any ancillary information, such as site logs, coordinates and eccentricities, relevant electronic communications, and summaries of data holdings. Regional Data Centers archive data from a subset of the ILRS network; currently, the single ILRS Data Center at Shanghai is responsible for archiving data for the Asian region. A list of Data and Operations Centers and contacts can be found in the ILRS 1999 Annual Report.

The ILRS utilizes previously developed data flow paths to provide laser ranging data (both to orbiting satellites and the moon) to the user community. Table 6.1-1 lists the laser stations by network and Operations/Data Center; this table illustrates which of the operations or Data Centers, Honeywell Technology Solutions Inc. (HTSI) or the EUROLAS Data Center (EDC), these stations transmit their data to. At a minimum, laser stations forward their data to Operations/Data Centers on a daily basis where they are merged into files by day and satellite for transmission to and archive at the Global Data Centers. Currently, the two ILRS Global Data Centers make their data holdings available in different directory and file structures as will be discussed in their individual reports. These centers exchange their recently delivered data at least once per day to ensure that their holdings are equalized and that users can continue to reliably access data should one center be unavailable.

NASA Stations		
Greenbelt, MD, USA	*Monument Peak, CA, USA*	*Arequipa, Peru*
Haleakala, HI, USA	*McDonald Obs., TX, USA*	*Tahiti, French Polynesia*
Hartebeesthoek, South Africa	*Yaragadee, Australia***	
WPLTN Stations		
Kashima, Japan	Beijing, China	Komsomolsk, Russia
Koganei, Japan	*Changchun, China*	Mendeleevo, Russia
Miura, Japan	Kunming, China	Sarapul, Russia[†]
Tateyama, Japan	*Shanghai, China*	Maidenak, Uzbekistan
Simosato, Japan	Wuhan, China	Mt. Stromlo, Australia
Tokyo, Japan*[†]	Riyadh, Saudi Arabia	TROS, China
Yaragadee, Australia**		
EUROLAS Stations		
Potsdam, Germany	Herstmonceux, UK	Borowiec, Poland
Wettzell, Germany	San Fernando, Spain	Riga, Latvia
Grasse SLR, France	Matera, Italy	Katzively, Ukraine
Grasse LLR, France	Cagliari, Italy	Kiev, Ukraine
Graz, Austria	Metsahovi, Finland	Simeiz, Ukraine
Zimmerwald, Switzerland	Helwan, Egypt	Santiago de Cuba*

Notes: * indicates cooperating SLR station providing data but not part of ILRS
      [†] indicates SLR station not providing data during 2000
      ** included in both NASA and WPLTN Networks
      SLR stations in *italics* flow data to HTSI; others flow data to EDC

Table 6.1-1. ILRS Stations by Network and Operations/Data Center.

HIGHLIGHTS FOR 2000 AND PLANS FOR 2001

In 2000, over 71,000 passes were recorded by a network of 42 laser systems. All laser ranging data were made available through the ILRS Global Data Centers, the principle source of data for the user community. A summary of all data received and archived at the ILRS data centers during 2000 can be found in Section 8 of this annual report.

With the launch of CHAMP in 2000, laser stations were asked to provide SLR data deliveries more frequently than once per day in order to update the satellite's precise orbit information several times per day. To answer this requirement, the ILRS instituted a data flow and file naming convention to permit the rapid availability of SLR data to the orbit analysts and user community in general. Data delivered more frequently than once per day to the HTSI operations and EDC data centers are routed to both ILRS global data centers within ten minutes past the hour. All data continue to be made available in files transmitted on a daily basis. Individual hourly data files are retained at the data center for five days after which time they are purged from the on-line archives.

Procedures were also implemented in 2000 to deliver data to EDC (either through ftp or e-mail) when the operations center at HTSI is unavailable to receive data. Werner Gurtner (AIUB) established a procedure to allow stations to send their data via e-mail to Zimmerwald should the EDC be unavailable to receive data. The data are then collected and sent to the HTSI operations center for distribution to the ILRS. For those stations using ftp to EDC, the data can be delivered directly to HTSI. If the CDDIS is unavailable, HTSI can deliver data and predictions directly to EDC, thus providing the user community continued access to SLR data. This data flow backup procedure is shown in Figure 6.1-1.
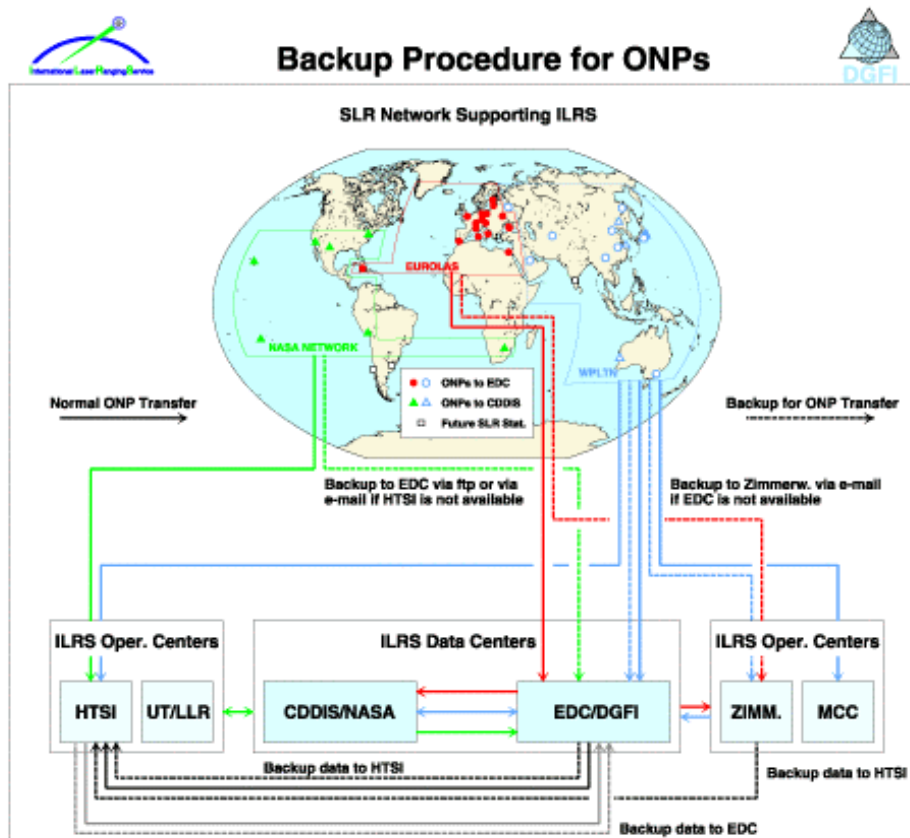

Figure 6.1-1: Backup procedure for prediction distribution.

The CDDIS, EDC, and HTSI also worked on backup procedures for the flow prediction information. The main ILRS prediction e-mail distribution lists are maintained and executed through the CDDIS; however, when the CDDIS computer facility is unavailable, prediction messages (now daily and sub-daily) are automatically distributed by the EDC (as shown in Figure 6.1-2).

Plans are underway to install procedures in 2001 at the EDC and CDDIS to regularly compare data holdings to ensure the same data sets are available at both ILRS data centers. Currently, CDDIS staff periodically downloads EDC archives and manually compare the two data sets. Recent comparisons have found differences of less than one percent of total passes.
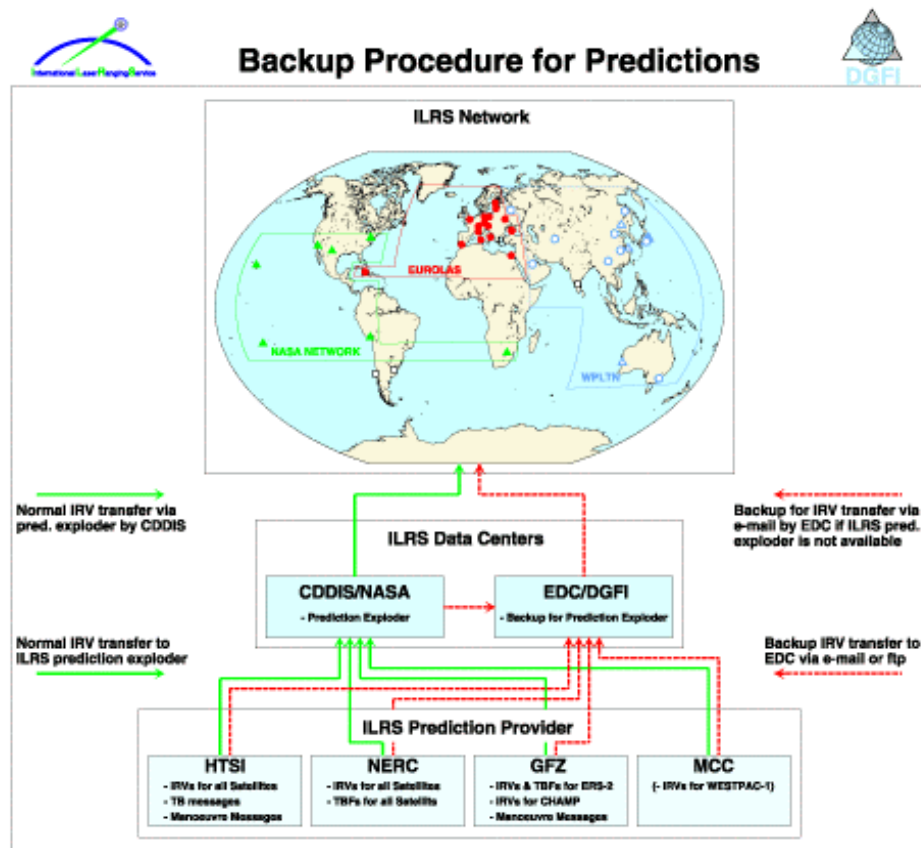

Figure 6.1-2: Backup procedure for on-site normal point (onp) data distribution.

6.2 GLOBAL DATA CENTERS

6.2.1 CDDIS REPORT

Carey Noll, *NASA Goddard Space Flight Cente*m

INTRODUCTION

The Crustal Dynamics Data Information System (CDDIS) has supported the archive and distribution of laser ranging data (both lunar and satellite) since its inception in 1982. This report summarizes the activities for the year 2000 and future plans of the CDDIS with respect to the International Laser Ranging Service (ILRS). General CDDIS background and system information can be found in the CDDIS data center summary included in the ILRS 1999 Annual Report.

The CDDIS is located at NASA Goddard Space Flight Center and is operational on a dedicated Compaq AlphaServer 4000 running the UNIX operating system. The CDDIS archive of laser ranging data and products are accessible to the public via anonymous ftp and the WWW at address:

ftp://cddisa.gsfc.nasa.gov/pub/slr and ftp://cddisa.gsfc.nasa.gov/pub /reports.

DEVELOPMENTS IN 2000

SLR Data and Products Archive

The CDDIS staff has recently enhanced the automated routines that peruse the accounts of the two sources (HTSI and EDC) of laser data. These programs now create and augment merged, time-sorted, monthly satellite files as well as copy new files to the public disk areas. The monthly files contain data for the specific month and satellite; therefore users can easily retrieve data for a particular time span.

The CDDIS began the archive of hourly SLR data files in 2000 to aid in the generation of satellite predictions for several recent missions. These files contain all laser ranging data received at HTSI (both from individual stations and through the EDC) during the previous hour and are archived at the CDDIS within ten minutes following the start of the hour. These files can be found in the yearly "allsat" directories on CDDIS: ftp://cddisa.gsfc.nasa.gov/pub/slr/slrql/allsat/**yyyy**/ new_ql**yymmddt**.allsat where **yyyy** is the four-digit year, **yy** is the two-digit year, **mm** is the two-digit month, **dd** is the two-digit day, and **h** is the hour (a through x). All data available in these hourly files will be delivered the following day in the daily allsat file as well as the individual satellite files. The hourly files are retained on-line on the CDDIS for five days after which time they are deleted.

The staff also created automated routines to archive prediction files posted to the CDDIS on a daily and sub-daily basis. The daily files were then merged into yearly prediction files to reduce the number of individual files archived.

During 2000, the CDDIS archived SLR product files for new ILRS Analysis Working Group (AWG) pilot projects to compare individual analysis center solutions of station positions and Earth orientation parameters. These solutions were deposited in the CDDIS by the ILRS Analysis and Associate Analysis Centers and copied to public disk areas within the SLR data directories. The CDDIS staff also assisted the AWG by generating specialized LAGEOS data sets to be utilized by the analysts in their pilot projects.

Support of the ILRS Central Bureau

The CDDIS staff instituted several e-mail distribution lists (or exploders) to aid communication within the ILRS infrastructure; messages sent to these exploders are also archived. A list of these exploders and their members can be viewed at URL http://ilrs.gsfc.nasa.gov/ilrs_exploders.html and is shown in Table 6.2.1-1. Furthermore, the staff created automated procedures to maintain these exploders, particularly when updates are made to the ILRS personnel data base.

Distribution List	Address
ILRS General Distribution	ilrs@ilrs.gsfc.nasa.gov
Central Bureau	cb@ilrs.gsfc.nasa.gov
Governing Board	ilrsgb@ilrs.gsfc.nasa.gov
Analysis Centers	ilrsac@ilrs.gsfc.nasa.gov
Associate Analysis Centers	ilrsaac@ilrs.gsfc.nasa.gov
Data Centers	ilrsdc@ilrs.gsfc.nasa.gov
Operation Centers	ilrsoc@ilrs.gsfc.nasa.gov
Stations	ilrssta@ilrs.gsfc.nasa.gov
Predictions	ilrspred@ilrs.gsfc.nasa.gov
Urgent messages (e.g., satellite maneuvers)	urgent@ilrs.gsfc.nasa.gov
Webmasters	ilrsweb@ilrs.gsfc.nasa.govv
Technique Coordinators	techcoor@ilrs.gsfc.nasa.gov
Missions Working Group	ilrsmwg@ilrs.gsfc.nasa.govv
Analysis Working Group	ilrsawg@ilrs.gsfc.nasa.gov
Data Formats and Procedures Working Group	ilrsdfpwg@ilrs.gsfc.nasa.gov
Networks and Engineering Working Group	ilrsnewg@ilrs.gsfc.nasa.gov
Signal Processing Working Group	ilrssp@ilrs.gsfc.nasa.gov

Table 6.2.1-1. ILRS E-Mail Distributions Lists Maintained at the CDDIS.

A new report was developed to allow the ILRS community to view the operational status of ILRS stations, past, current, and future. This report is maintained at the CDDIS and can be viewed at

  http://ilrs.gsfc.nasa.gov/station_status.txt (last 15 weeks) and

  http://ilrs.gsfc.nasa.gov/station_status_full.txt (entire year).

  ILRS stations are tasked to send a weekly e-mail message to the ILRS stating their current status (operational, engineering, temporarily non-operational, or long-term non-operational); CDDIS staff peruse these messages and update the status files daily.

The CDDIS staff also assisted the ILRS Central Bureau in preparation and publication of the 1999 ILRS annual reports.

The CDDIS computer facility hosts the web site for the ILRS (http://ilrs.gsfc.nasa.gov). The staff has created several forms within this web site to allow users to query the SLR data holdings of the CDDIS. There are also forms for viewing ILRS associate information and providing updates to this information. These query forms are listed in Table 6.2.1-2.

Form	URL
View SLR data by station for a specified satellite	http://ilrs.gsfc.nasa.gov/slrsat_query.html
View SLR data by station for a specified satellite and time span	http://ilrs.gsfc.nasa.gov/slrsatdate_query.html
View SLR data by satellite for a specified station	http://ilrs.gsfc.nasa.gov/slrsta_query.html
View SLR data by satellite for a specified station and time span	http://ilrs.gsfc.nasa.gov/slrstadate_query.html
View ILRS personnel information by ILRS affiliation	http://ilrs.gsfc.nasa.gov/ilrs_personnel.html
View personnel information by name	http://ilrs.gsfc.nasa.gov/ilrs_personnel.html

Table 6.2.1-2. ILRS Query Forms.

CONTACT INFORMATION

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

Ms. Carey E. Noll   Phone: (301) 614-6542
Manager, CDDIS   Fax: (301) 614-5970
Code 920.1   E-mail: noll@cddis.gsfc.nasa.gov
NASA GSFC   WWW: http://cddisa.gsfc.nasa.gov/cddis_welcome.html
Greenbelt, MD 20771
USA

6.2.2 EDC REPORT

Wolfgang Seemüller, *Deutsches Geodätisches Forschungsinstitut*

INTRODUCTION

Since the inception of EUROLAS Data Center (EDC) in August 1991 by an agreement between the Consortium of European Satellite Laser Ranging Stations and DGFI, the EDC acts as a data and information center for the European SLR Network. In November 1998, the International Laser Ranging Service (ILRS) was established with all its permanent components. Since then, the EDC operates as one of the ILRS Global Data Centers. Background information, functions provided, and the facilities of the EDC were reported in the <u>ILRS 1999 Annual Report</u>. All SLR data and information are available to the public via the EDC ftp server and the web pages at the address:

> http://www. dgfi.badw-muenchen.de/edc/edc.html.

 A mirror of the ILRS web site is also available through the EDC at the address

> http://www.dgfi.badw-muenchen.de/edc/ilrs/ ilrs.gsfc.nasa.gov/ilrs_home.html.

The EDC is operational on a Pentium Pro 200 with 128 Mbytes if memory and running the LINUX operation system. All data and information is mirrored on a second similarly configured machine.

DEVELOPMENTS IN 2000

For comparison reasons of the content at both Global Data Centers you find the summary of received data in the year 2000 at EDC in Section 8. The summaries per month for all satellites and all SLR stations are available at the EDC ftp server under pub/laser/messages/slreport.

The EDC is maintaining and running the following distribution lists (exploders) for communication within the ILRS:

- SLRmail
- SLReport
- SLRtbf (backup)
- Backup for predictions
- SLR station change and configuration log files

As already reported in the <u>ILRS 1999 Annual Report</u>, the Low Earth Orbiting (LEO) satellites (e.g., CHAMP) require a faster data exchange procedure as well as daily or sub-daily prediction distribution. Since April 2000, many of the SLR stations of the ILRS network submit their data to either the EDC or the Operations Center at HTSI immediately after the observation. The exchange of the normal point data between the two ILRS data centers is performed on an hourly basis.

A special service is provided by EDC for new SLR stations (on request) for validating the proper delivery of their normal point data the EDC. SLR stations can check that all data sent was received at the EDC by viewing a summary file at the ftp server at EDC

> ftp://www.dgfi.badw-muenchen.de/pub/laser/station-name.

 The summaries of all data received at the EDC and CDDIS/HTSI can be viewed at the address

> ftp://www.dgfi.badw-muenchen.de/pub/laser/summaries.

FUTURE PLANS

It was recommended at the ILRS General Meeting in Florence in September 1999 to have the same structure at both ILRS Global Data Centers CDDIS and EDC; this task is still open. EDC has promised to make arrangements to have the same tree structure at both sites, at least from a specified directory onward.

Procedures also have to be generated for controlling the data contents at both ILRS Global Data Centers so that the same content at both sites is guaranteed.

REFERENCES

Seemüller, W., EDC Report, In: Pearlman, M., Taggert, L. (eds.), International Laser Ranging Service 1999 Annual Report, pp. 148-150, NASA/TP-2000-209969, 2000.

See reports at former CSTG SLR/LLR Subcommission and ILRS General Meeting reports at the ILRS Web pages

CONTACT INFORMATION

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		slreport@dgfi.badw-muenchen.de (SLReport)
		slrtbf@dgfi.badw-muenchen.de (SLRTBF)