SECTION 8 - ILRS INFORMATION

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8.1 ILRS TERMS OF REFERENCE

INTRODUCTION

Charter and Affiliations

The International Laser Ranging Service (ILRS) is an established Service within Section II, Advanced Space Technology, of the International Association of Geodesy (IAG). The primary objective of the ILRS is to provide a service to support, through Satellite and Lunar Laser Ranging data and related products, geodetic and geophysical research activities as well as International Earth Rotation Service (IERS) products important to the maintenance of an accurate International Terrestrial Reference Frame (ITRF). The service also develops the necessary standards/specifications and encourages international adherence to its conventions.

Services

The ILRS collects, merges, archives and distributes Satellite Laser Ranging (SLR) and Lunar Laser Ranging (LLR) observation datasets of sufficient accuracy to satisfy the objectives of a wide range of scientific, engineering, and operational applications and experimentation. These data sets are used by the ILRS to generate a number of scientific and operational data products including but not limited to:

- Earth orientation parameters (polar motion and length of day)
- Three-dimensional coordinates and velocities of the ILRS tracking stations
- Time-varying geocenter coordinates
- Static and time-varying coefficients of the Earth's gravity field
- Centimeter accuracy satellite ephimerides
- Fundamental physical constants
- Lunar ephemerides and librations
- Lunar orientation parameters

The accuracy of SLR/LLR data products is sufficient to support a variety of scientific and operational applications including:

- Realization of global accessibility to and the improvement of the International Terrestrial Reference Frame (ITRF)

- Monitoring three-dimensional deformations of the solid Earth
- Monitoring Earth rotation and polar motion
- Support the monitoring of variations in the topography and volume of the liquid Earth (ocean circulation, mean sea level, ice sheet thickness, wave heights, etc.)
- Tidally generated variations in atmospheric mass distribution
- Calibration of microwave tracking techniques
- Picosecond global time transfer experiments
- Astrometric observations including determination of the dynamic equinox, obliquity of the ecliptic, and the precession constant
- Gravitational and general relativistic studies including Einstein's Equivalence
- Principle, the Robertson-Walker b parameter, and time rate of change of the gravitational constant, G
- Lunar physics including the dissipation of rotational energy, shape of the core-mantle boundary (Love Number k2), and free librations and stimulating mechanisms
- Solar System ties to the International Celestial Reference Frame (ICRF)

Amendments to the ILRS Terms of Reference

A proposal to amend the ILRS Terms of Reference can be made in writing to the Chairperson of the Governing Board (see "*GOVERNING BOARD*") by any ILRS Associate Member (see "*ILRS Associate Members*"). Proposed amendments will be forwarded by e-mail to all ILRS Associate Members of record for comment and amended as necessary by the Chairperson prior to a Governing Board vote. Associate Members will be given two weeks to comment. Final approval of any such amendment requires a 2/3 affirmative vote of the Governing Board. Proposed amendments to the Terms and subsequent Board actions will be summarized and presented to the Associate Members by the Chairperson at the next General Assembly.

PERMANENT COMPONENTS OF THE ILRS

The ILRS accomplishes its mission through the following permanent components:

- Tracking Stations and Subnetworks
- Operations Centers
- Global and Regional Data Centers
- Analysis, Lunar Analysis, and Associate Analysis Centers
- Central Bureau

The characteristics and responsibilities of these entities is described in the following subsections.

Tracking Stations and Subnetworks

ILRS Tracking Stations range to a constellation of approved satellites (including the Moon), contained in a list of satellites compiled and approved by the ILRS Governing Board, through the use of state of the art laser tracking equipment and data transmission facilities which allow for a rapid (at least daily) data transmission to one or more Operations and/or Data Centers (see below).

The stations must meet data accuracy, quantity, and timeliness requirements which are specified in separate documents. The tracking data produced by the ILRS stations are regularly and continuously analyzed by at least one ILRS Analysis Center or one mission-specific Associate Analysis Center.

Tracking Stations may be organized into regional or institutional subnetworks.

Operations Centers

The Operational Centers are in direct contact with tracking sites organized in a subnetwork. Their tasks include the collection and merging of data from the subnetwork, initial data quality checks, data reformatting into a uniform format, compression of data files if requested, maintenance of a local archive of the tracking data, and the electronic transmission of data to a designated ILRS Data Center. Operational Centers also provide the tracking sites with sustaining engineering, communications links, and other technical support. In addition, Operational Centers can perform limited services for the entire network.

Individual tracking stations can also perform part or all of the tasks of an Operational Center themselves.

Data Centers

Regional Data Centers

The Regional Data Centers reduce traffic on electronic networks. They collect reformatted tracking data from Operational Data Centers and/or individual tracking stations, maintain a local archive of the data received and, in some cases, transmit these data to the Global Data Centers. Regional Data Centers may also meet the requirements for Operational Centers and Global Data Centers (as defined in the previous and following paragraphs) of strictly regional network operations and duplicate activities of Global Data Centers to facilitate easy access to the information and products.

Global Data Centers

The Global Data Centers are the primary interfaces to the Analysis Centers and the outside user community. Their primary tasks include the following:

- Receive/retrieve, archive and provide on-line access to tracking data received from the Operational/Regional Data Centers
- Provide on-line access to ancillary information such as site information, occupation histories, meteorological data, site specific engineering data, etc.

- Receive/retrieve, archive and provide on-line access to ILRS scientific data products received from the Analysis Centers
- Backup and secure ILRS data and products

Analysis Centers

The analysis centers fall into three categories: Analysis Centers, Lunar Analysis Centers, and Associate Analysis Centers.

Analysis Centers

The Analysis Centers receive and process tracking data from one or more data centers for the purpose of producing ILRS products. The Analysis Centers are committed to produce the products, without interruption, at an interval and with a time lag specified by the Governing Board to meet ILRS requirements. The products are delivered to the Global Data Centers, to the IERS (as per bilateral agreements), and to other bodies, using designated standards. At a minimum, the Analysis Centers must process the global LAGEOS-1 and LAGEOS-2 data sets and are encouraged to include other geodetic satellites in their solutions.

The Analysis Centers provide, as a minimum, Earth orientation parameters on a weekly or sub-weekly basis, as well as other products, such as station coordinates, on a monthly or quarterly basis or as otherwise required by the IERS. The Analysis Centers also provide a second level of quality assurance on the global data set by monitoring individual station range and time biases via the fitted orbits (primarily the LAGEOS 1 and 2 satellites) used in generating the quick-look science results.

Associate Analysis Centers

Associate Analysis Centers are organizations that produce special products, such as satellite predictions, time bias information, precise orbits for special-purpose satellites, station coordinates and velocities within a certain geographic region, or scientific data products of a mission-specific nature. Associate Analysis Centers are encouraged to perform additional quality control functions through the direct comparison on individual Analysis Center products and/or the creation of "combined" solutions, perhaps in combination with data from other space geodetic techniques (e.g. VLBI, GPS, GLONASS, DORIS, PRARE, etc.), in support of the IERS International Terrestrial Reference Frame (ITRF) or precise orbit determination. Organizations with the desire of eventually becoming Analysis Centers may also be designated as Associate Analysis Centers by the Governing Board until they are ready for full scale operation.

Lunar Analysis Centers

Lunar Analysis Centers process normal point data from the Lunar Laser Ranging (LLR) stations and generate a variety of scientific products including precise lunar ephimerides, librations, and orientation parameters which provide insights into the composition and internal makeup of the Moon, its interaction with the Earth, tests of General Relativity, and Solar System ties to the International Celestial Reference Frame.

Central Bureau

The Central Bureau (CB) is responsible for the daily coordination and management of the ILRS in a manner consistent with the directives and policies established by the Governing Board. The primary functions of the CB are to facilitate communications and information transfer within the ILRS and between the ILRS and the external scientific community, coordinate ILRS activities, maintain a list of satellites approved for tracking support and their priorities, promote compliance to ILRS network standards, monitor network operations and quality assurance of data, maintain ILRS documentation and databases, produce reports as required, and organize meetings and workshops.

Although the Chairperson of the Governing Board is the official representative of the ILRS to external organizations, the CB, consonant with the directives established by the Governing Board, is responsible for the day-to-day liaison with such organizations.

The CB coordinates and publishes all documents required for the satisfactory planning and operation of the Service, including standards/specifications regarding the performance, functionality and configuration requirements of all elements of the Service including user interface functions.

The CB operates the communication center for the ILRS. It produces and/or maintains a hierarchy of documents and reports, in both hard copy and electronic form, including network information, standards, newsletters, electronic bulletin board, directories, summaries of ILRS performance and products, and an Annual Report.

The Central Bureau may propose to the Governing Board names of individuals to be elected as members at large to help ensure the proper representation of important contributing organizations.

The responsibilities and activities of the Central Bureau may be distributed between different groups and organizations according to written agreements and charters.

In summary, the Central Bureau performs a long term coordination and communication role to ensure that ILRS participants contribute to the Service in a consistent and continuous manner and that they adhere to ILRS standards.

The Central Bureau is headed by a Central Bureau Director, who is an ex-officio member of the ILRS Governing Board. The Secretary of the GB is also provided by the Central Bureau.

GOVERNING BOARD

Roles and Responsibilities

The Governing Board is responsible for the general directions in which the ILRS is providing its services. It defines the official ILRS products, decides upon the satellites to be included in the ILRS tracking list, accepts standards and procedures prepared and proposed by the individual bodies of the ILRS and ensures, through its chairperson, the contact to other services and organizations.

The GB exercises general control over the activities of the Service including modifications to the organization that would be appropriate to maintain efficiency and reliability, while taking full advantage of the advances in technology and theory.

Most GB decisions are to be made by consensus or by a simple majority vote of the members present, provided that there is a quorum consisting of at least ten members of the GB. In case of lack of a quorum

the voting is by mail or e-mail. Changes in Terms of References and the Chairperson of the GB can be made by a 2/3 majority of the members of the GB, i.e., by twelve or more votes.

Membership

The Governing Board consists of both appointed and elected members. The appointed members include:

- Director of the Central Bureau 1
- Secretary of the Central Bureau 1
- President of IAG Sect. II or Com. VIII (CSTG) 1

Members elected by their peers within the ILRS Associates include:

- NASA SLR Network representatives 2
- EUROLAS Network representatives 2
- WPLTN Network representatives 2
- Analysis and Associate Analysis Centers' representatives 2
- Data centers' representative 1
- LLR Representative 1
- At-Large Members 2
- IERS Representative 1

Total **16**

The appointed members are considered ex-officio and are not subject to institutional restrictions. The elected board positions are nominated by the ILRS components they represent for a two-year term. The At-Large members are intended to compensate for under-representation among the various components of the ILRS or to provide additional skills or knowledge of use to the Board in carrying out its duties. The total GB membership should be properly balanced in all respects with regard to supporting organizations, skill mix, geography, etc.

Nomination and Election of Members

ILRS Associate Members (see "*ILRS Associate Members*"), together with the GB, may nominate and vote for the elected members of the GB. The Call for Nominations and GB Elections will be conducted by the Central Bureau via official e-mail lists and will be held approximately every two years prior to the International Workshop on Laser Ranging. Newly elected GB members will be installed at the next semiannual meeting. With the exception of At-Large members, GB nominees must be associated with the relevant ILRS component (e.g. Analysis, Data Centers, Lunar, etc.), and only ILRS Associate Members officially associated with that component as determined by the official e-mail lists maintained by the CB can participate in the election of their representative. The full ILRS membership can vote for At-Large members. The GB will be final arbiter on an individual's qualifications for a particular elected post on the Board. Election is by a simple majority of votes received. In the unlikely event of a tie vote, the GB will make the final selection in Executive Session.

Election and Role of Chairperson

The GB Chairperson is elected by the Board from among its members for a term of two years, renewable for three terms. Nomination and selection of the Chairperson is carried out in GB Executive Session during the biannual Workshop Meeting. The Chairperson does not vote, except in case of a tie. He/she is the official representative of the ILRS to external organizations.

Frequency of Meetings

The Board shall endeavor to meet semiannually and at such other times as shall be considered appropriate or opportune by the Chairperson or at the request of at least eight members.

Rights and Privileges of GB Members

Members of the GB shall become IAG Fellows with the appropriate rights and privileges following two years of recognized service.

Analysis and Lunar Coordinators

The laser ranging technique is a broad based one. As an observational technique, the division between lunar laser ranging and artificial satellite laser ranging has become largely a historical one. However, present differences in many areas related to observations (e.g., predictions and data formats) are still being reconciled. It must also be recognized that the major data analysis packages that are presently used for artificial satellite analysis are not yet equipped to deal with lunar laser ranging observations and most of the LLR analysis packages are equally not yet compatible with SLR observations. Thus, it is prudent to maintain separate LLR and SLR coordinators for an, as yet, undefined time into the future. The SLR and LLR coordinators must work within their own disciplines to maintain observational and data integrities. However, they must also work together in an effort to unify both techniques, bringing together the best of both, and, when possible, learning from the other.

The Analysis Coordinator is a voting member of the ILRS Governing Board and is elected by the Governing Board as the ILRS representative to the IERS Directing Board. Under a reciprocal arrangement, the IERS designates a representative to serve as a voting member on the ILRS Governing Board. The Lunar Coordinator may represent the ILRS as a deputy voting member on the IERS Directing Board in the Analysis Coordinator's absence and may otherwise attend IERS Board meetings at their discretion in a non-voting advisory capacity.

The Analysis Coordinator chairs the Analysis Working Group which includes, at a minimum, the Lunar Coordinator, one representative from each of the Global Analysis Centers and may contain representatives of Associate Analysis Centers as well.

The responsibility of the Analysis Coordinator is to monitor the Analysis Centers' activities to ensure that the ILRS objectives are carried out. Specific expectations include global data quality control, station performance evaluation and reporting, and continued development of appropriate analysis standards and formats for the final science products. The Analysis Coordinator is also responsible for the appropriate combination of designated Analysis Centers products into a single and coherent set of products.

The Analysis Coordinator ensures that the ILRS products produced by the ILRS Analysis and Associate Analysis Centers conform with IERS requirements and standards.

Working Groups

The Governing Board, at its discretion, can create or disband Working Groups. A Working Group (WG) may be either permanent (Standing) or temporary (Ad-Hoc) in nature. Standing Working Groups are created by the GB to carry out continuously evolving business of the ILRS. Occasionally, Ad-Hoc Working Groups are appointed to carry out special investigations or tasks of a temporary or interdisciplinary nature.

The Coordinator of each Standing WG is selected by the GB from amongst its members to ensure close coupling of the WG with the GB and its goals. The WG Coordinator can independently appoint additional members to the WG from among the other GB members, ILRS Associate Members or ILRS Correspondents (see below). The WG Coordinator may also designate a Deputy to act on his/her behalf in his/her absence. All GB members, with the exception of the ex-officio members, Chairperson, and IERS representative to the ILRS are required to serve on at least one of the Standing Working Groups.

The Coordinator for Ad-Hoc Working Groups may be chosen, at the discretion of the Board, from outside its membership in order to best fulfill the goals of that WG.

Currently, the Standing Working Groups are:

- Missions
- Data Formats and Procedures
- Networks and Engineering
- Analysis

DEFINITIONS

ILRS Associate Members

Persons affiliated with recognized ILRS institutions and who routinely participate in any of the ILRS activities (management, missions, tracking, engineering, operations, data analysis, archiving, etc.) are eligible to be ILRS Associate Members. To gain official membership in the ILRS, the ILRS institution must submit the person's name, e-mail, and primary ILRS function in the organization. ILRS Associate Members do not have to be employed by their institution sponsor; they merely need to provide a recognized ILRS-related service to the sponsoring institution under a contractual or cooperative arrangement. The Associate's stated function will determine eligibility to nominate and/or vote for specific GB representatives as described in "*Nomination and Election of Members*."

Associate Members may attend open (non-executive) ILRS meetings which are announced to the general community by the CB, place nominations for elected GB posts, vote in ILRS elections, and serve on the Governing Board if appointed or elected. A directory, electronic and/or hard copy, of ILRS Associate Members, and their approved association with a particular component of the ILRS, is maintained by the CB.

ILRS Associate Members are considered IAG Affiliates with the corresponding rights and privileges.

ILRS Correspondents

ILRS Correspondents are persons on a mailing list maintained by the Central Bureau, who do not actively participate in the ILRS but who either express interest in receiving ILRS publications, wish to participate in workshops or scientific meetings organized by the ILRS, or generally are interested in ILRS activities. Ex-officio ILRS Correspondents are the following persons:

- IAG General Secretary
- President of IAG Section V

8.2 ILRS WEBSITE REFERENCE CARD

ILRS Quick Reference Card

http://ilrs.gsfc.nasa.gov

The ILRS is based on a global network of approximately forty permanently operating geodetic quality satellite and lunar laser ranging systems in support of more than twenty geodetic, oceanographic, and special purpose satellite missions. The station normal point data are archived daily at the two Global Data Centers.

Three Analysis Centers process LAGEOS data and regularly provide earth orientation parameters, site coordinates, and station quality assessment. Eighteen Associate Analysis Centers produce mission specific products such as satellite predictions, precise orbit, and earth's gravity field coefficients. Four Lunar Analysis Centers process lunar data and generate precise lunar ephemerides, librations, and orientation parameters.

The Central Bureau is responsible for the maintenance of the ILRS web site and the daily management and coordination of this service consistent with the policies established by the internationally elected Governing Board.

International Laser Ranging Service

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ILRS Data, Algorithms, and Formats

Daily Normal Point (NP) Data

Normal point algorithm:
http://ilrs.gsfc.nasa.gov/np_algo.html

ILRS NP format overview:
http://ilrs.gsfc.nasa.gov/np_format_intro.html

ILRS NP format (SLR & LLR):
http://ilrs.gsfc.nasa.gov/np_format.html

NP data access (root directory):
ftp://cddisa.gsfc.nasa.gov/pub/slr/slrql/
ftp://ftp.dgfi.badw-muenchen.de/pub/laser/qldata/

LLR NP data access (root directory):
ftp://cddisa.gsfc.nasa.gov/pub/slr/llrnpt/
ftp://ftp.dgfi.badw-muenchen.de/pub/laser/qldata/

Data centers NP file naming conventions:
CDDIS - daily (new_qlyymmdd.*satabbr*)
CDDIS - monthly (new_qlyymm.*satabbr*)
EDC - daily (*satname*_yymm.*dd*)
EDC - monthly (*satname*_yymm)

Daily SLR Full-Rate (FR) Data

ILRS FR format:
http://ilrs.gsfc.nasa.gov /fr_format_v3.html

FR data access:
ftp://cddisa.gsfc.nasa.gov/pub/slr/slrfr/
ftp://ftp.dgfi.badw-muenchen.de/pub/laser/frdata/

ILRS Analysis Information

International Terrestrial Reference Frame (ITRF):
http://hpiers.obspm.fr/webiers/general/syframes/itrsf/ITRF.html

SINEX format:
ftp://cddisa.gsfc.nasa.gov/pub/formats/sinex1.format

ILRS Reports

ILRS Meeting Minutes:
http://ilrs.gsfc.nasa.gov/ilrs_reports.html

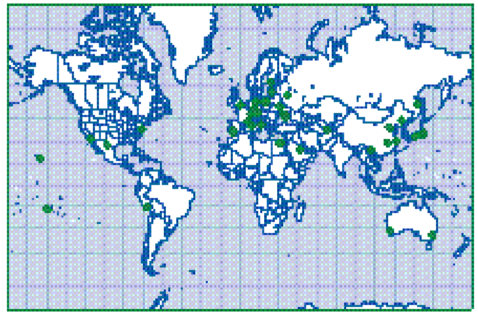
System Performance

Weekly/Daily Reports:
http://ilrs.gsfc.nasa.gov/mission_analysis.html

Quarterly Report Card:
http://ilrs.gsfc.nasa.gov/performance.html

ILRS Station Information

ILRS Network



Stations:
http://ilrs.gsfc.nasa.gov/stations.html

Site Identifiers

DOMES procedure:
http://ilrs.gsfc.nasa.gov/domes_and_domex.html

Site Occupation Designator (SOD) procedure:
http://ilrs.gsfc.nasa.gov/sod.html

SOD and DOMES numbers of current sites:
http://ilrs.gsfc.nasa.gov/sod_domes.html

SLR System SODs:
ftp://cddisa.gsfc.nasa.gov/pub/slrocc/slrocc.txt

SLR Site Coordinates:
ftp://cddisa.gsfc.nasa.gov/pub/slrocc/slrcoor.txt

SLR Site Eccentricities:
ftp://cddisa.gsfc.nasa.gov/pub/slrocc/slrecc.txt

Site Configuration reporting procedure:
http://ilrs.gsfc.nasa.gov/sys_cong_proc.html

Configuration file(s) access:
ftp://cddisa.gsfc.nasa.gov/pub/reports/slrscf/
ftp://ftp.dgfi.badw-muenchen.de/pub/laser/station/

Bias Information:
http://ilrs.gsfc.nasa.gov/slr_problems_index.html

ILRS Central Bureau
NASA GSFC
Code 920.1
Greenbelt, MD 20771 USA

WWW: http://ilrs.gsfc.nasa.gov
E-mail: cb@ilrs.gsfc.nasa.gov
Webmaster: ilrsweb@ilrs.gsfc.nasa.gov
Phone: +1 301-614-5969
Fax: +1 301-614-5970

ILRS General Information

ILRS Science:
http://ilrs.gsfc.nasa.gov/science.html

ILRS Bibliography:
http://ilrs.gsfc.nasa.gov/biblio.html

ILRS Meeting Schedule:
http://ilrs.gsfc.nasa.gov/meetings.html

ILRS Acronyms:
http://ilrs.gsfc.nasa.gov/acronyms.html

Terms of Reference:
http://ilrs.gsfc.nasa.gov/termsref.html

SLR Overview:
http://ilrs.gsfc.nasa.gov/slrover.pdf

Governing Board:
http://ilrs.gsfc.nasa.gov/gb.html

Satellite Missions:
http://ilrs.gsfc.nasa.gov/missions.html

Stations:
http://ilrs.gsfc.nasa.gov/stations.html

Analysis Centers:
http://ilrs.gsfc.nasa.gov/analysis_centers.html

Working Groups:
http://ilrs.gsfc.nasa.gov/working.html

Central Bureau:
http://ilrs.gsfc.nasa.gov/central.html

Global Data Centers

WWW:
http://cddisa.gsfc.nasa.gov/cddis_nfhome.html
http://www.dgfi.badw-muenchen.de/edc/edc.html

Anonymous ftp access (root directory):
ftp://cddisa.gsfc.nasa.gov/pub/slr
ftp://ftp.dgfi.badw-muenchen.de/pub/laser

ILRS Working Groups (WG)

WG Activities

Data Formats and Procedures (DF&P):
http://ilrs.gsfc.nasa.gov/data_activities.html

Rapid LEO Predictions:
http://ilrs.gsfc.nasa.gov/lion.html

Analysis:
http://ilrs.gsfc.nasa.gov/analysis_activities.html

Missions:
http://ilrs.gsfc.nasa.gov/missions_activities.html

Networks and Engineering (N&E):
http://ilrs.gsfc.nasa.gov/networks_activities.html

Center of Mass and Signal Processing (SP):
http://ilrs.gsfc.nasa.gov/tiger_activities.html

ILRS Directory and E-Mail

ILRS personnel directory:
http://ilrs.gsfc.nasa.gov/ilrs_directory.html

ILRS Email Exploders

Governing Board:
ilrsgb@ilrs.gsfc.nasa.gov

Central Bureau:
cb@ilrs.gsfc.nasa.gov

Stations:
ilrssta@ilrs.gsfc.nasa.gov

Analysis and Associate Analysis Centers:
ilrsac@ilrs.gsfc.nasa.gov
ilrsaac@ilrs.gsfc.nasa.gov

Data Centers:
ilrsdc@ilrs.gsfc.nasa.gov

ILRS Associates and Correspondents (SLRMail):
slrmail@dgfi.badw-muenchen.de

SLRMail Procedure:
http://ilrs.gsfc.nasa.gov/slrmail.html

Archive of SLRMail messages:
ftp://cddisa.gsfc.nasa.gov/pub/reports/slrmail/
ftp://ftp.dgfi.badwmuenchen.de/pub/laser/messages/slrmail

Working Groups:
DF&P - ilrsdfpwg@ilrs.gsfc.nasa.gov
Analysis - ilrsawg@ilrs.gsfc.nasa.gov
Missions - ilrsmwg@ilrs.gsfc.nasa.gov
N&E - ilrsnewg@ilrs.gsfc.nasa.gov
SP - ilrssp@ilrs.gsfc.nasa.gov

WWW Links

Mirror Sites:
http://galileo.crl.go.jp/ilrs/ilrs_home.html
http://www.dgfi.badw-muenchen.de/edc/ilrs/ilrs_home.html

Agencies:
http://ilrs.gsfc.nasa.gov/agencylinks.html

Analysis Centers:
http://ilrs.gsfc.nasa.gov/analysislinks.html

Satellite Missions:
http://ilrs.gsfc.nasa.gov/satellitelinks.html

Stations:
http://ilrs.gsfc.nasa.gov/stationlinks.html

ILRS Mission Information

Satellite Missions:
http://ilrs.gsfc.nasa.gov/missions.html

Satellite Tracking Priorities:
http://ilrs.gsfc.nasa.gov/priorities.html

Satellite IDs, Bin Sizes, Orbit Info:
http://ilrs.gsfc.nasa.gov/satellite_list.html

Mission Support Request Form:
http://ilrs.gsfc.nasa.gov/ilrssup.html

Satellite Support History:
http://ilrs.gsfc.nasa.gov/slr_satellite_support.html

Satellite Predictions (including Lunar) Tuned IRV (TIRV) format:
ftp://cddisa.gsfc.nasa.gov/pub/formats/tirv.format

TIRV force model:
http://ilrs.gsfc.nasa.gov/tirv.html

TIRV access:
ftp://cddisa.gsfc.nasa.gov/pub/predicts/
ftp://ftp.csr.utexas.edu/pub/slr/ephemeris/
ftp://ftp.dgfi.badw-muenchen.de/pub/laser/predictions/
ftp://mtfiles.nerc-monkswood.ac.uk/nercslr/current/

Lunar Ephemeris:
http://ssd.jpl.nasa.gov/plan-eph-data/ephdata.html

NORAD 2-line element format:
http://liftoff.msfc.nasa.gov/academy/rocket_sci/orbmech/state/2line.html

NORAD 2-line element access:
http://celestrak.com/NORAD/elements/index.html
http://oigsysop.atsc.allied.com/scripts/foxweb.dll/app01

Maneuver format:
http://ilrs.gsfc.nasa.gov/manoeuver.html

Maneuver histories:
http://ilrs.gsfc.nasa.gov/maneuvers.html

Drag function format:
http://ilrs.gsfc.nasa.gov/drag_function.html

Drag function algorithms:
http://ilrs.gsfc.nasa.gov/drag_function_subroutines.html

Time bias function (TBF) format:
http://ilrs.gsfc.nasa.gov/tb_function_format.html

TBF description:
http://ilrs.gsfc.nasa.gov/tb_format_intro.html

TBF access:
ftp://cddisa.gsfc.nasa.gov/pub/reports/slrtbf/
ftp://ftp.dgfi.badw-muenchen.de/pub/laser/timebias/
ftp://mtfiles.nerc-monkswood.ac.uk/nercslr/current/

Prediction centers:
http://ilrs.gsfc.nasa.gov/prediction_centers.html

8.3 ILRS WEBSITE MAP

The ILRS Home Page at NASA in the USA

http://ilrs.gsfc.nasa.gov/

is mirrored at EDC in Germany

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

and CRL in Japan

http://galileo.crl.go.jp/ilrs/ilrs_home.html

FAQs	Contact the ILRS	What's New
•	• Directory of Associates • Associate Locator	• Campaign/Missions News • Meetings News • Station News
Engineering/Technology	**Data Products/Formats**	**Science/Analysis**
• Collocation Results • Performance Evaluation • SLR Applications • SLR Animation	• Normal Points (NP) • Predictions • Fullrate (FR) • Data Flow	• IERS Conventions • Analysis Centers • Analysis Data Products • Mission Analysis Reports • ITRF Yearly Solutions • SLR and Earth Science • Science meetings
Satellite Missions	**About the ILRS**	**Stations**
• Campaign/Mission News • Campaign Reports • List of Missions • Mission Analysis Reports • Mission Parameters • Mission Support History • Priorities • Request Tracking Support	• Acronyms • Call for Participation • Central Bureau • Governing Board • History • Join the ILRS • Meetings • Network Map • Organization Chart • Standards • Terms of reference	• Configurations • Contacts • Coordinates • Data Anomalies • DOMES Procedure • Eccentricity Database • Network Map • News • Site Pressure Profiles • SOD and DOMES Numbers • SOD Procedure • Status Reporting • System Performance

Links	Reports	Working Groups (WG)
• Agencies	• Analysis Reports	• Analysis WG Charter
• Altimetry	• Bulletins	• Analysis WG Members
• Analysis Centers	• Campaign Reports	• Analysis WG Activities
• Data Centers	• Data Center Reports	• DFandP WG Charter
• Earthquake/Tectonics	• ILRS Meetings Reports	• DFandP WG Members
• Earth Rotation	• Laser Workshop Reports	• DFandP WG Activities
• El Niño and La Niña	• Network Reports	• LEO Rapid Predictions
• Gravity	• Performance Report Card	• Missions WG Charter
• Laser Safety	• Press Releases	• Missions WG Members
• Other Geodesy	• SLR/LLR CSTG Reports	• Misisons WG Activities
• Satellite Missions	• SLRMail and SLReport	• NandE WG Charter
• Stations	• Special Reports	• NandE WG Members
• Useful	• Station Data Anomalies	• NandE WG Activities
• Y2K	• Station Status Reports	• SP (Tiger) WG Charter
	• Techincal Papers	• SP (Tiger) WG Members
	• Trip Reports	• SP (Tiger) WG Activities

8.4 NETWORK PERFORMANCE REPORT CARD FOR 1999

In addition to the report card, the following graphs are available from the ILRS Web Site:

- Total Data Volume (January 1999 - December 1999) by passes or by normal points
- LEO Satellite Data Volume (January 1999 - December 1999) by passes or by normal points
- LAGEOS Data Volume (January 1999 - December 1999) by passes or by normal points
- High Satellite Data Volume (January 1999 - December 1999) by passes or by normal points
- LAGEOS Single Shot RMS (4th Quarter 1999)
- LAGEOS Normal Point RMS (4th Quarter 1999)
- Short Term Bias Stability (4th Quarter 1999)
- Long Term Bias Stability (January 1999 - December 1999)
- Percentage of Good LAGEOS NP (4th Quarter 1999)

Special Note: This is the first report card that actually reflects the "true" pass totals. In previous report cards, the pass totals were actually the pass segments totals.

Below are the detailed descriptions of each column in the performance report card:

Column 1 is the station location name.

Column 2 is the monument marker number.

Column 3 is the LEO pass total during the past 12 months.

Column 4 is the LAGEOS pass total during the past 12 months.

Column 5 is the high satellite pass total during the past 12 months.

Column 6 is the pass total (i.e., all satellites) during the past 12 months.

Column 7 is the LEO NP total during the past 12 months.

Column 8 is the LAGEOS NP total during the past 12 months.

Column 9 is the high satellite NP total during the past 12 months.

Column 10 is the NP total (i.e., all satellites) during the past 12 months.

Column 11 is the average single-shot LAGEOS RMS, in millimeters, during the last quarter.

Column 12 is the average LAGEOS normal point RMS, in millimeters, during the last quarter, based on CSR Weekly LAGEOS analysis.

Column 13 is the measure of short term bias stability, in millimeters, during the last quarter. The short term stability is computed as the standard deviation about the mean of the pass-by-pass range biases from the CSR Weekly LAGEOS analysis.

Column 14 is the measure of long term bias stability, in millimeter, during the past year. A station must have tracked LAGEOS-1 in at least 8 of the last 12 months for a valid measurement. The long term stability is the standard deviation about the mean of the 15 day LAGEOS-1 range biases from CSR LAGEOS-1 long arc analysis.

Column 15 is the percentage of LAGEOS normal points that were accepted in CSR weekly LAGEOS analysis.

Column 16 is the average data latency time, in days, to the data centers, during the last quarter.

Column 17 is the ILRS normal point format revision number used within the last quarter.

Column 18 is a yes/no answer to the question of whether or not configuration files have been provided to the data centers.

Column 19 is a yes/no answer to the question of whether a station normal points comply with the ILRS Bin Size recommendations on all satellites.

The first entry in the table is the performance baseline goal. Note: There is no baseline goal for NP data quantities, single shot RMS, and normal point RMS.

Additional Notes: Blanks in any columns mean either that there was no data or that there was insufficient data. Only stations that have supplied data within the last year are included in the table. The table is sorted in descending order by total data volume.

		Data Volume								Data Quality					Operational Compliance			
Column 1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
System	Station	LEO Pass Total	LAG Pass Total	High Pass Total	Pass Total	LEO NP Total	LAGEOS NP Total	High NP Total	Total NP	SS RMS	NP RMS	Short Term	Long Term	% of accepted LAGEOS data	Delivery Days	Format Revision	Conf. Files	Bin Size Compliance
Baseline		**1000**	**400**	**100**	**1500**							**20**	**20**	**95**	**1**	**1**	**yes**	**yes**
Monument Peak	7110	5579	1525	896	8000	86079	18344	8029	112452	8	2	11	5	98	1	1	yes	yes
Yarragadee	7090	3709	1052	1063	5824	58238	12562	8797	79597	10	2	11	5	97	1	1	yes	yes
Mt. Stromlo	7849	3370	1185	978	5533	35394	11259	4955	51608	11	2	15	6	98	1	1	yes	yes
Herstmonceux	7840	3085	984	751	4820	37704	12364	3553	53621	18	3	9	7	100	1	1	yes	yes
Greenbelt	7105	3347	833	375	4555	48031	9266	2418	59715	11	2	9	6	99	1	1	yes	yes
Graz	7839	2544	647	1091	4282	54342	10094	7626	72062	9	2	8	8	99	1	1	yes	yes
Wettzell	8834	1835	702	735	3272	29901	7144	4089	41134	28	6	18	10	99	1	1	yes	yes
Grasse	7835	2346	406	3	2755	46372	4924	44	51340	12	2	11	13	99	1	1	yes	yes
McDonald	7080	1755	497	396	2648	23558	4855	1615	30028	14	3	11	10	99	1	1	yes	yes
Changchun	7237	1584	463	466	2513	22281	4621	2755	29657	15	7	20	13	94	1	1	yes	yes
San Fernando	7824	1916	428	0	2344	28056	3422	0	31478	54	11	30	50	84	1	1	yes	yes
Potsdam	7836	1635	330	103	2068	21966	3029	480	25475	16	5	21	15	99	1	1	yes	yes
Zimmerwald	7810	1253	418	314	1985	17937	5463	2446	25846	45	11	11	10	98	1	1	yes	yes
Matera	7939	1216	449	0	1665	20949	5470	0	26419	145	29	38	9	54	1	1	yes	yes
Arequipa	7403	1319	209	0	1528	16024	1876	0	17900	7	3	20	15	96	1	1	yes	yes
Shanghai	7837	841	245	372	1458	12014	2472	2261	16747	18	7	25	14	94	1	1	yes	yes
Helwan	7831	1331	56	0	1387	15214	300	0	15514					19	1	0	yes	yes
Tahiti	7124	827	235	38	1100	10803	2317	293	13413							1	yes	
Borowiec	7811	719	292	42	1053	11662	3443	161	15266	33	8	18	16	98	1	1	yes	yes
Beijing	7249	694	187	96	977	9225	1443	493	11161	29	7	44		70	1	1	yes	yes
Koganei	7328	587	242	73	902	6849	2355	362	9566	12	4	19	12	99	1	1	yes	yes
Riga	1884	581	222	0	803	12587	3070	0	15657	25	7	47	18	75	1	1	yes	yes
Grasse (LLR)	7845	0	229	538	767	0	4083	3873	7956	26	4	12	12	99	1	1	yes	yes
Simosato	7838	572	120	25	717	9458	1249	162	10869	25	8	21		89	1	0	no	yes
Komsomolsk	1868	442	116	115	673	5092	725	374	6191		19	21		74	5	0	no	no
Haleakala	7210	403	130	138	671	5300	1260	1319	7879								yes	
Tateyama	7339	427	152	69	648	4922	1829	305	7056	14	3	14		100	1	1	yes	yes
Maidanak 2	1864	214	209	222	645	2682	1565	760	5007		8	19	17	93	2	0	no	no
Kashima	7335	409	131	54	594	5289	1293	216	6798	12	3	15		98	1	1	yes	yes
Metsahovi2	7806	480	71	15	566	8377	862	52	9291	33	8	25		95	1	1	yes	yes
Mendeleevo	1870	439	0	0	439	3334	0	0	3334						2	0	no	no
Cagliari	7548	340	76	8	424	5522	506	39	6067					22	1	0	no	yes
Kunming	7820	154	201	63	418	2408	2024	351	4783	36	8	87		21	1	0	no	yes
Miura	7337	263	74	10	347	3019	671	47	3737	12	3	13		100	1	1	yes	yes
Wuhan	7236	9	18	30	57	75	147	261	483								no	
Katsively	1893	7	25	9	41	131	173	35	339	57	9	31		91	2	0	no	no

8.5 ILRS NETWORK STATISTICS

8.5.1 SLR POINT TOTALS BY STATION FOR 1999

Site Name	*Station*	*GFZ-1*	*SUNSAT*	*ERS-1*	*ERS-2*	*GEOS-3*	*STAR*	*STEL*	*WEST*	*GFO-1*	*BE-C*	*TOPEX*	*AJISAI*	*LAG-1*	*LAG-2*	*ETA-1*	*ETA-2*	*GPS-35*	*GPS-36*	*Moon*	*Totals*
Arequipa	7403	0	39	117	122	13	180	155	2	74	76	273	268	94	116	0	0	0	0	0	1,529
Beijing	7249	0	6	47	41	17	80	76	11	33	81	137	165	107	89	3	10	0	0	0	903
Borowiec	7811	0	1	103	97	36	68	72	16	45	21	158	102	183	112	0	0	1	0	0	1,015
Cagliari	7548	0	1	46	56	7	25	27	1	11	1	62	103	35	41	0	0	0	0	0	416
Changchun	7237	0	6	97	103	88	247	133	10	65	150	317	368	247	217	41	53	0	0	0	2,142
Grasse	7835	4	54	346	355	60	275	285	164	129	65	393	216	213	193	0	2	0	1	0	2,755
Grasse	7845	0	0	0	0	0	0	0	0	0	0	0	0	132	97	51	46	119	89	627	1,161
Graz	7839	1	63	297	308	130	310	272	116	130	86	482	354	369	280	58	74	68	53	0	3,451
Greenbelt	7105	0	125	241	223	107	583	258	90	259	279	472	710	489	372	22	27	1	6	0	4,264
Haleakala	7210	0	0	49	45	24	43	48	14	26	7	73	74	69	68	5	0	3	0	0	548
Helwan	7831	0	20	101	113	29	151	150	2	46	201	225	294	33	26	0	0	0	0	0	1,391
Herstmonceux	7840	6	103	293	302	118	398	329	179	220	81	560	496	565	419	70	78	55	46	0	4,318
Kashima	7335	0	8	9	16	1	80	44	9	2	52	53	135	59	72	4	4	0	0	0	548
Katzively	1893	0	0	0	0	0	0	0	0	0	1	4	2	14	11	0	0	0	0	0	32
Koganei	7328	0	5	20	36	3	98	70	14	8	67	88	178	107	135	7	14	0	0	0	850
Komsomolsk	1868	0	0	67	60	0	38	53	12	0	5	104	103	68	62	35	18	0	5	0	630
Kunming	7820	0	0	0	0	0	7	16	0	0	8	55	68	73	128	4	4	0	3	0	366
Maidanak	1864	0	0	26	72	0	0	0	53	0	0	63	0	128	104	34	32	19	18	0	549
Matera	7939	0	0	76	106	31	214	81	1	51	68	294	294	265	185	0	0	0	0	0	1,666
McDonald	7080	0	24	161	166	83	188	157	17	105	194	331	329	256	269	14	15	4	6	166	2,485
Mendeleevo	1870	0	0	93	84	0	34	51	44	37	0	56	41	0	0	0	0	0	0	0	440
Metsahovi	7806	0	12	70	74	23	26	48	3	68	0	90	66	37	34	4	2	0	0	0	557
Miura	7337	0	0	3	12	2	34	28	1	2	42	46	93	41	33	0	0	0	0	0	337
Monument Peak	7110	0	160	391	398	159	858	458	173	379	536	818	1,249	875	727	63	88	20	20	0	7,372
Mt. Stromlo	7849	0	37	258	284	56	696	318	144	93	1	566	918	647	544	91	70	3	13	0	4,739
Tahiti	7124	0	5	75	74	37	108	99	39	51	9	150	180	117	120	0	0	0	0	0	1,064
Potsdam	7836	1	74	205	193	72	181	196	51	100	26	319	217	208	123	0	0	2	0	0	1,968
Riga	1884	1	0	206	207	1	0	0	14	31	9	81	31	151	71	0	0	0	0	0	803
San Fernando	7824	0	79	215	203	1	265	238	45	127	141	259	344	253	180	0	0	0	0	0	2,350
Sarapul	1871	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Shanghai	7837	0	19	39	47	13	108	99	19	29	93	133	243	124	121	17	15	0	0	0	1,119
Simosato	7838	0	7	42	40	20	76	56	8	18	54	78	173	50	70	8	8	0	0	0	708
Tateyama	7339	0	3	12	23	3	71	53	17	3	56	65	121	70	82	6	12	0	0	0	597
Wettzell	8834	0	16	112	147	16	304	184	17	75	83	464	417	411	309	71	87	70	43	0	2,826
Wuhan	7236	0	0	0	0	0	1	2	0	0	0	3	2	8	10	3	0	0	0	0	29
Yarragadee	7090	1	176	325	327	144	528	331	206	345	0	547	777	571	490	179	149	54	52	0	5,202
Zimmerwald	7810	2	23	90	102	41	196	137	59	68	64	228	243	250	169	27	19	14	9	0	1,741
Totals:		16	1,066	4,232	4,436	1,335	6,471	4,524	1,551	2,630	2,557	8,048	9,374	7,319	6,079	817	827	433	364	793	62,872

Name	*Station*	*GLO-62*	*GLO-64*	*GLO-65*	*GLO-66*	*GLO-67*	*GLO-68*	*GLO-69*	*GLO-70*	*GLO-71*	*GLO-72*	*GLO-75*	*GLO-76*	*GLO-77*	*GLO-79*	*GLO-80*	*GLO-81*	*GLO-82*	*Totals*	*Grand*
Arequipa	7403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,529
Beijing	7249	4	0	0	11	0	5	9	7	5	7	3	3	5	10	7	3	5	84	987
Borowiec	7811	1	0	0	11	0	1	5	4	2	10	0	0	0	11	0	0	0	45	1,060
Cagliari	7548	0	0	0	0	0	1	0	1	0	4	0	0	0	3	0	0	0	9	425
Changchun	7237	13	0	0	23	2	21	28	24	10	67	20	22	37	51	36	13	14	381	2,523
Grasse	7835	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,755
Grasse	7845	30	0	0	32	0	19	34	85	85	131	0	0	0	119	5	0	0	540	1,701
Graz	7839	60	0	0	74	0	46	64	62	68	108	57	66	83	70	27	29	27	841	4,292
Greenbelt	7105	9	0	0	22	0	36	28	64	19	126	0	0	0	111	25	17	6	463	4,727
Haleakala	7210	22	0	0	18	0	28	6	32	22	25	0	0	0	18	0	1	0	172	720
Helwan	7831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,391
Herstmonceux	7840	29	0	1	37	40	46	45	70	30	88	0	0	0	104	13	0	0	503	4,821
Kashima	7335	0	0	0	6	0	2	6	9	2	3	0	0	0	7	4	4	3	46	594
Katzively	1893	0	0	0	0	0	0	0	0	0	2	0	0	0	6	1	0	0	9	41
Koganei	7328	2	0	0	1	0	3	2	4	6	18	0	0	0	10	5	1	0	52	902
Komsomolsk	1868	0	0	0	18	0	0	0	0	15	13	0	0	0	5	10	0	0	61	691
Kunming	7820	2	1	0	2	0	1	9	5	6	16	1	2	1	6	0	0	0	52	418
Maidanak	1864	3	0	0	14	0	10	15	20	10	29	1	0	0	32	5	0	0	139	688

Matera	7939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,666
McDonald	7080	19	0	0	21	1	14	16	41	26	56	0	0	0	59	6	11	3	273	2,758
Mendeleevo	1870	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	440
Metsahovi	7806	0	0	0	0	0	1	0	0	0	4	0	0	0	1	3	0	0	9	566
Miura	7337	2	0	0	0	0	1	0	0	0	5	0	0	0	1	0	0	1	10	347
Monument Peak	7110	65	0	0	64	0	94	81	192	63	356	0	0	0	312	37	37	22	1,323	8,695
Mt. Stromlo	7849	65	0	0	63	0	51	50	112	56	192	0	0	0	183	26	7	3	808	5,547
Potsdam	7836	4	0	0	13	0	8	11	12	10	18	0	0	0	26	0	0	0	102	2,070
Riga	1884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	803
San Fernando	7824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,350
Sarapul	1871	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Shanghai	7837	12	0	0	31	7	24	28	23	19	41	25	20	29	40	12	12	18	341	1,460
Simosato	7838	0	0	0	1	0	0	1	1	1	3	0	0	0	2	0	0	0	9	717
Tahiti	7124	11	0	0	2	0	4	6	26	3	12	0	0	0	6	0	1	0	71	1,135
Tateyama	7339	5	0	0	2	0	5	1	4	2	12	0	0	0	15	5	0	0	51	648
Wettzell	8834	41	0	0	19	0	49	55	101	30	124	26	24	28	155	9	0	0	661	3,487
Wuhan	7236	0	0	0	2	4	5	2	6	1	1	2	1	1	2	0	0	0	27	56
Yarragadee	7090	108	0	0	113	0	53	68	157	120	337	0	0	0	302	76	25	4	1,363	6,565
Zimmerwald	7810	18	0	0	15	0	20	24	44	21	45	0	0	0	52	6	0	0	245	1,986
Totals:		525	1	1	615	54	548	594	1,106	632	1,853	135	138	184	1,719	318	161	106	8,690	71,562

Table 8.5.1-1

Site Name	*Station*	*GFZ-1*	*SUNSAT*	*ERS-1*	*ERS-2*	*GEOS-3*	*STAR*	*STEL*	*WEST*	*GFO-1*	*BE-C*	*TOPEX*	*AJISAI*	*LAG-1*	*LAG-2*	*ETA-1*	*ETA-2*	*GPS-35*	*GPS-36*	*Moon*	*Totals*
Arequipa	7403	0	282	1,161	1,266	92	1,494	1,015	5	447	988	5,840	3,434	760	1,116	0	0	0	0	0	17,900
Beijing	7249	0	28	495	389	53	637	503	65	233	1,308	3,167	2,347	747	697	16	61	0	0	0	10,746
Borowiec	7811	0	5	1,557	1,471	346	611	591	94	378	280	4,613	1,718	2,097	1,346	0	0	2	0	0	15,109
Cagliari	7548	0	4	659	737	75	169	110	2	52	3	1,760	1,951	215	291	0	0	0	0	0	6,028
Changchun	7237	0	35	1,039	1,167	683	2,333	979	52	412	2,699	7,405	5,477	2,399	2,222	276	413	0	0	0	27,591
Grasse	7835	49	828	7,322	7,549	727	3,926	3,169	1,494	1,265	1,787	14,038	4,219	2,434	2,490	0	41	0	3	0	51,341
Grasse	7845	0	0	0	0	0	0	0	0	0	0	0	0	2,226	1,851	239	206	450	351	627	5,950
Graz	7839	26	1,168	6,540	6,934	1,689	4,458	3,123	1,370	1,472	2,781	17,619	7,071	5,426	4,697	435	568	537	418	0	66,332
Greenbelt	7105	0	1,427	3,091	3,053	803	5,679	1,959	476	1,764	6,608	12,304	10,867	4,789	4,477	120	130	5	20	0	57,572
Haleakala	7210	0	0	761	643	201	383	357	115	196	59	1,812	773	608	652	24	0	19	0	0	6,603
Helwan	7831	0	149	1,025	1,154	200	1,105	943	8	280	2,850	3,930	3,576	183	117	0	0	0	0	0	15,520
Herstmonceux	7840	37	1,073	3,543	3,632	925	3,802	2,248	1,133	1,462	1,060	11,848	6,938	6,883	5,482	333	423	294	168	0	51,284
Kashima	7335	0	63	80	208	7	726	335	37	8	953	1,053	1,819	619	674	20	23	0	0	0	6,625
Katzively	1893	0	0	0	0	0	0	0	0	0	8	105	18	95	78	0	0	0	0	0	304
Koganei	7328	0	55	203	407	28	833	481	76	46	1,025	1,540	2,155	988	1,367	33	59	0	0	0	9,296
Komsomolsk	1868	0	0	635	595	0	468	443	55	0	65	1,394	1,437	371	352	122	53	0	9	0	5,999
Kunming	7820	0	0	0	0	0	61	102	0	0	135	1,165	945	723	1,301	32	21	0	17	0	4,502
Maidanak	1864	0	0	289	931	0	0	0	316	0	0	1,146	0	861	704	94	92	74	65	0	4,572
Matera	7939	0	0	1,191	1,692	306	2,435	780	17	443	1,341	7,747	4,997	3,035	2,435	0	0	0	0	0	26,419
McDonald	7080	0	177	1,625	1,773	1,127	1,512	908	73	595	4,075	7,821	3,876	2,154	2,701	66	75	16	29	243	28,846
Mendeleevo	1870	0	0	630	688	0	274	427	93	241	0	595	386	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	121	1,238	1,269	237	194	442	23	649	0	3,088	1,116	450	412	20	6	0	0	0	9,265
Miura	7337	0	0	16	102	21	249	171	3	12	600	717	1,128	325	346	0	0	0	0	0	3,690
Monument Peak	7110	0	1,743	5,409	5,571	1,480	8,510	3,712	1,113	2,793	12,777	23,292	19,681	9,367	8,977	286	446	78	111	0	105,346
Mt. Stromlo	7849	0	275	2,559	2,764	297	5,250	1,653	507	459	1	10,304	11,326	5,964	5,295	532	401	8	63	0	47,658
Potsdam	7836	4	798	2,816	2,606	544	1,761	1,487	319	646	207	7,784	2,976	1,924	1,105	0	0	9	0	0	24,986
Riga	1884	18	0	4,392	4,321	10	0	0	63	283	119	2,768	613	2,121	949	0	0	0	0	0	15,657
San Fernando	7824	0	815	3,277	2,978	15	2,896	1,739	184	1,170	2,910	6,715	5,334	1,859	1,563	0	0	0	0	0	31,455
Shanghai	7837	0	167	544	614	122	1,040	817	124	212	1,718	3,287	3,369	1,168	1,304	118	111	0	0	0	14,715
Simosato	7838	0	83	618	633	202	738	492	65	147	1,257	2,134	3,089	416	833	45	57	0	0	0	10,809
Tahiti	7124	0	44	896	1,053	289	987	733	209	352	73	3,612	2,552	1,029	1,282	0	0	0	0	0	13,111
Tateyama	7339	0	22	121	230	22	562	350	142	17	924	1,177	1,355	835	994	31	61	0	0	0	6,843
Wettzell	8834	0	141	1,588	1,954	147	3,220	1,323	117	548	1,615	12,678	6,570	4,067	3,077	316	393	343	176	0	38,273
Wuhan	7236	0	0	0	0	0	6	15	0	0	0	30	18	64	83	19	0	0	0	0	235
Yarragadee	7090	21	2,330	5,713	5,866	1,456	5,914	3,071	1,687	3,181	0	16,787	12,161	6,164	6,398	960	696	251	250	0	72,906
Zimmerwald	7810	17	215	1,227	1,450	626	2,087	1,062	374	472	1,446	5,048	3,913	3,193	2,270	179	105	108	38	0	23,830
Totals:		172	12,048	62,260	65,700	12,730	64,320	35,540	10,411	20,235	51,672	206,323	139,205	76,559	69,938	4,316	4,441	2,194	1,718	870	840,652

Name	*Station*	*GLO-62*	*GLO-64*	*GLO-65*	*GLO-66*	*GLO-67*	*GLO-68*	*GLO-69*	*GLO-70*	*GLO-71*	*GLO-72*	*GLO-75*	*GLO-76*	*GLO-77*	*GLO-79*	*GLO-80*	*GLO-81*	*GLO-82*	*Totals*	*Grand*
Arequipa	7403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17,900
Beijing	7249	39	0	0	67	0	20	50	53	53	42	14	14	18	46	31	14	29	490	11,236
Borowiec	7811	2	0	0	38	0	4	17	16	8	32	0	0	0	42	0	0	0	159	15,268
Cagliari	7548	0	0	0	0	0	2	0	3	0	17	0	0	0	17	0	0	0	39	6,067
Changchun	7237	82	0	0	132	12	140	185	158	63	494	137	138	204	321	246	61	72	2,445	30,036
Grasse	7835	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51,341
Grasse	7845	105	0	0	115	0	67	122	328	310	531	0	0	0	487	17	0	0	2,082	8,032
Graz	7839	464	0	0	521	0	367	483	520	555	809	368	446	601	529	207	206	186	6,262	72,594
Greenbelt	7105	40	0	0	125	0	156	138	287	90	674	0	0	0	636	143	89	33	2,411	59,983
Haleakala	7210	130	0	0	155	0	236	59	204	194	200	0	0	0	98	0	2	0	1,278	7,881
Helwan	7831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,520
Herstmonceux	7840	153	0	2	158	174	224	214	322	166	419	0	0	0	503	53	0	0	2,388	53,672
Kashima	7335	0	0	0	30	0	14	28	43	10	14	0	0	0	34	25	22	14	234	6,859
Katzively	1893	0	0	0	0	0	0	0	0	0	10	0	0	0	25	4	0	0	39	343
Koganei	7328	14	0	0	4	0	13	10	30	40	93	0	0	0	66	26	10	0	306	9,602
Komsomolsk	1868	0	0	0	38	0	0	0	0	108	37	0	0	0	7	16	0	0	206	6,205
Kunming	7820	13	5	0	9	0	4	67	22	35	83	4	8	6	25	0	0	0	281	4,783
Maidanak	1864	8	0	0	47	0	21	33	49	84	91	3	0	0	99	8	0	0	443	5,015
Matera	7939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,419
McDonald	7080	99	0	0	88	10	58	64	188	118	259	0	0	0	302	29	48	12	1,275	30,121

Mendeleevo	1870	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	0	0	0	0	7	0	0	0	16	0	0	0	3	20	0	0	46	9,311
Miura	7337	9	0	0	0	0	5	0	0	0	30	0	0	0	3	0	0	5	52	3,742
Monument Peak	7110	326	0	0	322	0	536	493	1,008	366	2,205	0	0	0	1,849	155	219	109	7,588	112,934
Mt. Stromlo	7849	298	0	0	289	0	246	234	547	300	1,036	0	0	0	1,001	125	44	15	4,135	51,793
Potsdam	7836	15	0	0	59	0	47	57	53	54	81	0	0	0	105	0	0	0	471	25,457
Riga	1884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,657
San Fernando	7824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,455
Shanghai	7837	85	0	0	231	58	139	182	195	97	314	148	120	220	243	72	58	97	2,259	16,974
Simosato	7838	0	0	0	7	0	0	7	6	7	17	0	0	0	16	0	0	0	60	10,869
Tahiti	7124	58	0	0	14	0	17	31	102	11	43	0	0	0	17	0	2	0	295	13,406
Tateyama	7339	25	0	0	7	0	25	4	19	9	61	0	0	0	63	27	0	0	240	7,083
Wettzell	8834	159	0	0	78	0	259	234	450	125	540	115	104	120	677	39	0	0	2,900	41,173
Wuhan	7236	0	0	0	18	35	48	16	50	14	9	20	9	9	14	0	0	0	242	477
Yarragadee	7090	609	0	0	495	0	235	304	826	573	1,863	0	0	0	1,747	416	121	20	7,209	80,115
Zimmerwald	7810	193	0	0	100	0	188	208	361	114	337	0	0	0	515	45	0	0	2,061	25,891
Totals:		2,926	5	2	3,147	289	3,078	3,240	5,840	3,504	10,357	809	839	1,178	9,490	1,704	896	592	47,896	888,548

Table 8.5.1-2

Site Name	*Station*	*GFZ-1*	*SUNSAT*	*ERS-1*	*ERS-2*	*GEOS-3*	*STAR*	*STEL*	*WEST*	*GFO-1*	*BE-C*	*TOPEX*	*AJISAI*	*LAG-1*	*LAG-2*	*ETA-1*	*ETA-2*	*GPS-35*	*GPS-36*	*Moon*	*Totals*
Arequipa	7403	0	39	117	122	13	180	155	2	74	76	273	268	94	116	0	0	0	0	0	1,529
Beijing	7249	0	6	47	41	17	80	76	11	33	81	137	165	107	89	3	10	0	0	0	903
Borowiec	7811	0	1	103	97	36	68	72	16	45	21	158	102	183	112	0	0	1	0	0	1,015
Cagliari	7548	0	1	46	56	7	25	27	1	11	1	62	103	35	41	0	0	0	0	0	416
Changchun	7237	0	6	97	103	88	247	133	10	65	150	317	368	247	217	41	53	0	0	0	2,142
Grasse	7835	4	54	346	355	60	275	285	164	129	65	393	216	213	193	0	2	0	1	0	2,755
Grasse	7845	0	0	0	0	0	0	0	0	0	0	0	0	132	97	51	46	119	89	627	1,161
Graz	7839	1	63	297	308	130	310	272	116	130	86	482	354	369	280	58	74	68	53	0	3,451
Greenbelt	7105	0	125	241	223	107	583	258	90	259	279	472	710	489	372	22	27	1	6	0	4,264
Haleakala	7210	0	0	49	45	24	43	48	14	26	7	73	74	69	68	5	0	3	0	0	548
Helwan	7831	0	20	101	113	29	151	150	2	46	201	225	294	33	26	0	0	0	0	0	1,391
Herstmonceux	7840	6	103	293	302	118	398	329	179	220	81	560	496	565	419	70	78	55	46	0	4,318
Kashima	7335	0	8	9	16	1	80	44	9	2	52	53	135	59	72	4	4	0	0	0	548
Katzively	1893	0	0	0	0	0	0	0	0	0	1	4	2	14	11	0	0	0	0	0	32
Koganei	7328	0	5	20	36	3	98	70	14	8	67	88	178	107	135	7	14	0	0	0	850
Komsomolsk	1868	0	0	67	60	0	38	53	12	0	5	104	103	68	62	35	18	0	5	0	630
Kunming	7820	0	0	0	0	0	7	16	0	0	8	55	68	73	128	4	4	0	3	0	366
Maidanak	1864	0	0	26	72	0	0	0	53	0	0	63	0	128	104	34	32	19	18	0	549
Matera	7939	0	0	76	106	31	214	81	1	51	68	294	294	265	185	0	0	0	0	0	1,666
McDonald	7080	0	24	161	166	83	188	157	17	105	194	331	329	256	269	14	15	4	6	166	2,485
Mendeleevo	1870	0	0	93	84	0	34	51	44	37	0	56	41	0	0	0	0	0	0	0	440
Metsahovi	7806	0	12	70	74	23	26	48	3	68	0	90	66	37	34	4	2	0	0	0	557
Miura	7337	0	0	3	12	2	34	28	1	2	42	46	93	41	33	0	0	0	0	0	337
Monument Peak	7110	0	160	391	398	159	858	458	173	379	536	818	1,249	875	727	63	88	20	20	0	7,372
Mt. Stromlo	7849	0	37	258	284	56	696	318	144	93	1	566	918	647	544	91	70	3	13	0	4,739
Potsdam	7836	1	74	205	193	72	181	196	51	100	26	319	217	208	123	0	0	2	0	0	1,968
Riga	1884	1	0	206	207	1	0	0	14	31	9	81	31	151	71	0	0	0	0	0	803
San Fernando	7824	0	79	215	203	1	265	238	45	127	141	259	344	252	180	0	0	0	0	0	2,349
Shanghai	7837	0	19	39	47	13	108	99	19	29	93	133	242	124	121	17	15	0	0	0	1,118
Simosato	7838	0	7	42	40	20	76	56	8	18	54	78	173	50	70	8	8	0	0	0	708
Tahiti	7124	0	5	75	74	37	108	99	39	51	9	150	180	117	120	0	0	0	0	0	1,064
Tateyama	7339	0	3	12	23	3	71	53	17	3	56	65	121	70	82	6	12	0	0	0	597
Wettzell	8834	0	16	112	147	16	304	184	17	75	83	464	417	411	309	71	87	70	43	0	2,826
Wuhan	7236	0	0	0	0	0	1	2	0	0	0	3	2	8	10	3	0	0	0	0	29
Yarragadee	7090	1	176	325	327	144	528	331	206	345	0	547	777	571	490	179	149	54	52	0	5,202
Zimmerwald	7810	2	23	90	102	41	196	137	59	68	64	228	243	249	169	27	19	14	9	0	1,740
Totals:		16	1,066	4,232	4,436	1,335	6,471	4,524	1,551	2,630	2,557	8,047	9,373	7,317	6,079	817	827	433	364	793	62,868

Name	*Station*	*GLO-62*	*GLO-64*	*GLO-65*	*GLO-66*	*GLO-67*	*GLO-68*	*GLO-69*	*GLO-70*	*GLO-71*	*GLO-72*	*GLO-75*	*GLO-76*	*GLO-77*	*GLO-79*	*GLO-80*	*GLO-81*	*GLO-82*	*Totals*	*Grand*
Arequipa	7403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,529
Beijing	7249	4	0	0	11	0	5	9	7	5	7	3	3	5	10	7	3	5	84	987
Borowiec	7811	1	0	0	11	0	1	5	4	2	10	0	0	0	11	0	0	0	45	1,060
Cagliari	7548	0	0	0	0	0	1	0	1	0	4	0	0	0	3	0	0	0	9	425
Changchun	7237	13	0	0	23	2	21	28	24	10	67	20	22	37	51	36	13	14	381	2,523
Grasse	7835	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,755
Grasse	7845	30	0	0	32	0	19	34	85	85	131	0	0	0	119	5	0	0	540	1,701
Graz	7839	60	0	0	74	0	46	64	62	68	108	57	66	83	70	27	29	27	841	4,292
Greenbelt	7105	9	0	0	22	0	36	28	64	19	126	0	0	0	111	25	17	6	463	4,727
Haleakala	7210	22	0	0	18	0	28	6	32	22	25	0	0	0	18	0	1	0	172	720
Helwan	7831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,391
Herstmonceux	7840	29	0	1	37	40	46	45	70	30	88	0	0	0	104	13	0	0	503	4,821
Kashima	7335	0	0	0	6	0	2	6	9	2	3	0	0	0	7	4	4	3	46	594
Katzively	1893	0	0	0	0	0	0	0	0	0	2	0	0	0	6	1	0	0	9	41
Koganei	7328	2	0	0	1	0	3	2	4	6	18	0	0	0	10	5	1	0	52	902
Komsomolsk	1868	0	0	0	18	0	0	0	0	15	13	0	0	0	5	10	0	0	61	691
Kunming	7820	2	1	0	2	0	1	9	5	6	16	1	2	1	6	0	0	0	52	418
Maidanak	1864	3	0	0	14	0	10	15	20	10	29	1	0	0	32	5	0	0	139	688
Matera	7939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,666
McDonald	7080	19	0	0	21	1	14	16	41	26	56	0	0	0	59	6	11	3	273	2,758

Mendeleevo	1870	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	440
Metsahovi	7806	0	0	0	0	0	1	0	0	0	4	0	0	0	1	3	0	0	9	566
Miura	7337	2	0	0	0	0	1	0	0	0	5	0	0	0	1	0	0	1	10	347
Monument Peak	7110	65	0	0	64	0	94	81	192	63	356	0	0	0	312	37	37	22	1,323	8,695
Mt. Stromlo	7849	65	0	0	63	0	51	50	112	56	192	0	0	0	183	26	7	3	808	5,547
Potsdam	7836	4	0	0	13	0	8	11	12	10	18	0	0	0	26	0	0	0	102	2,070
Riga	1884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	803
San Fernando	7824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,349
Shanghai	7837	12	0	0	31	7	24	28	23	19	41	25	20	29	40	12	12	18	341	1,459
Simosato	7838	0	0	0	1	0	0	1	1	1	3	0	0	0	2	0	0	0	9	717
Tahiti	7124	11	0	0	2	0	4	6	26	3	12	0	0	0	6	0	1	0	71	1,135
Tateyama	7339	5	0	0	2	0	5	1	4	2	12	0	0	0	15	5	0	0	51	648
Wettzell	8834	41	0	0	19	0	49	55	101	30	124	26	24	28	155	9	0	0	661	3,487
Wuhan	7236	0	0	0	2	4	5	2	6	1	1	2	1	1	2	0	0	0	27	56
Yarragadee	7090	108	0	0	113	0	53	68	157	120	337	0	0	0	302	76	25	4	1,363	6,565
Zimmerwald	7810	18	0	0	15	0	20	24	44	21	45	0	0	0	52	6	0	0	245	1,985
Totals:		525	1	1	615	54	548	594	1,106	632	1,853	135	138	184	1,719	318	161	106	8,690	71,558

Table 8.5.1-3

8.5.2 SLR PASS TOTALS BY STATION FOR 1999

Site Name	*Station*	*GFZ-1*	*SUNSAT*	*ERS-1*	*ERS-2*	*GEOS-3*	*STAR*	*STEL*	*WEST*	*GFO-1*	*BE-C*	*TOPEX*	*AJISAI*	*LAG-1*	*LAG-2*	*ETA-1*	*ETA-2*	*GPS-35*	*GPS-36*	*Moon*	*Totals*
Arequipa	7403	0	282	1,161	1,266	92	1,494	1,015	5	447	988	5,840	3,434	760	1,116	0	0	0	0	0	17,900
Beijing	7249	0	28	495	389	53	637	503	65	233	1,308	3,167	2,347	747	697	16	61	0	0	0	10,746
Borowiec	7811	0	5	1,557	1,471	346	611	591	94	378	280	4,613	1,718	2,097	1,346	0	0	2	0	0	15,109
Cagliari	7548	0	4	659	737	75	169	110	2	52	3	1,760	1,951	215	291	0	0	0	0	0	6,028
Changchun	7237	0	35	1,039	1,167	683	2,333	979	52	412	2,699	7,405	5,477	2,399	2,222	276	413	0	0	0	27,591
Grasse	7835	49	828	7,322	7,549	727	3,926	3,169	1,494	1,265	1,787	14,038	4,219	2,434	2,490	0	41	0	3	0	51,341
Grasse	7845	0	0	0	0	0	0	0	0	0	0	0	0	2,226	1,851	239	206	450	351	627	5,950
Graz	7839	26	1,168	6,540	6,934	1,689	4,458	3,123	1,370	1,472	2,781	17,619	7,071	5,426	4,697	435	568	537	418	0	66,332
Greenbelt	7105	0	1,427	3,091	3,053	803	5,679	1,959	476	1,764	6,608	12,304	10,867	4,789	4,477	120	130	5	20	0	57,572
Haleakala	7210	0	0	761	643	201	383	357	115	196	59	1,812	773	608	652	24	0	19	0	0	6,603
Helwan	7831	0	149	1,025	1,154	200	1,105	943	8	280	2,850	3,930	3,576	183	117	0	0	0	0	0	15,520
Herstmonceux	7840	37	1,073	3,543	3,632	925	3,802	2,248	1,133	1,462	1,060	11,848	6,938	6,883	5,482	333	423	294	168	0	51,284
Kashima	7335	0	63	80	208	7	726	335	37	8	953	1,053	1,819	619	674	20	23	0	0	0	6,625
Katzively	1893	0	0	0	0	0	0	0	0	0	8	105	18	95	78	0	0	0	0	0	304
Koganei	7328	0	55	203	407	28	833	481	76	46	1,025	1,540	2,155	988	1,367	33	59	0	0	0	9,296
Komsomolsk	1868	0	0	635	595	0	468	443	55	0	65	1,394	1,437	371	352	122	53	0	9	0	5,999
Kunming	7820	0	0	0	0	0	61	102	0	0	135	1,165	945	723	1,301	32	21	0	17	0	4,502
Maidanak	1864	0	0	289	931	0	0	0	316	0	0	1,146	0	861	704	94	92	74	65	0	4,572
Matera	7939	0	0	1,191	1,692	306	2,435	780	17	443	1,341	7,747	4,997	3,035	2,435	0	0	0	0	0	26,419
McDonald	7080	0	177	1,625	1,773	1,127	1,512	908	73	595	4,075	7,821	3,876	2,154	2,701	66	75	16	29	243	28,846
Mendeleevo	1870	0	0	630	688	0	274	427	93	241	0	595	386	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	121	1,238	1,269	237	194	442	23	649	0	3,088	1,116	450	412	20	6	0	0	0	9,265
Miura	7337	0	0	16	102	21	249	171	3	12	600	717	1,128	325	346	0	0	0	0	0	3,690
Monument Peak	7110	0	1,743	5,409	5,571	1,480	8,510	3,712	1,113	2,793	12,777	23,292	19,681	9,367	8,977	286	446	78	111	0	105,346
Mt. Stromlo	7849	0	275	2,559	2,764	297	5,250	1,653	507	459	1	10,304	11,326	5,964	5,295	532	401	8	63	0	47,658
Potsdam	7836	4	798	2,816	2,606	544	1,761	1,487	319	646	207	7,784	2,976	1,924	1,105	0	0	9	0	0	24,986
Riga	1884	18	0	4,392	4,321	10	0	0	63	283	119	2,768	613	2,121	949	0	0	0	0	0	15,657
San Fernando	7824	0	815	3,277	2,978	15	2,896	1,739	184	1,170	2,910	6,715	5,334	1,859	1,563	0	0	0	0	0	31,455
Sarapul	1871	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	16
Shanghai	7837	0	167	544	614	122	1,040	817	124	212	1,718	3,287	3,369	1,168	1,304	118	111	0	0	0	14,715
Simosato	7838	0	83	618	633	202	738	492	65	147	1,257	2,134	3,089	416	833	45	57	0	0	0	10,809
Tahiti	7124	0	44	896	1,053	289	987	733	209	352	73	3,612	2,552	1,029	1,282	0	0	0	0	0	13,111
Tateyama	7339	0	22	121	230	22	562	350	142	17	924	1,177	1,355	835	994	31	61	0	0	0	6,843
Wettzell	8834	0	141	1,588	1,954	147	3,220	1,323	117	548	1,615	12,678	6,570	4,067	3,077	316	393	343	176	0	38,273
Wuhan	7236	0	0	0	0	0	6	15	0	0	0	30	18	64	83	19	0	0	0	0	235
Yarragadee	7090	21	2,330	5,713	5,866	1,456	5,914	3,071	1,687	3,181	0	16,787	12,161	6,164	6,398	960	696	251	250	0	72,906
Zimmerwald	7810	17	215	1,227	1,450	626	2,087	1,062	374	472	1,446	5,048	3,913	3,193	2,270	179	105	108	38	0	23,830
Totals:		172	12,048	62,260	65,700	12,730	64,320	35,540	10,411	20,235	51,672	206,339	139,205	76,559	69,938	4,316	4,441	2,194	1,718	870	840,668

Name	*Station*	*GLO-62*	*GLO-64*	*GLO-65*	*GLO-66*	*GLO-67*	*GLO-68*	*GLO-69*	*GLO-70*	*GLO-71*	*GLO-72*	*GLO-75*	*GLO-76*	*GLO-77*	*GLO-79*	*GLO-80*	*GLO-81*	*GLO-82*	*Totals*	*Grand*
Arequipa	7403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17,900
Beijing	7249	39	0	0	67	0	20	50	53	53	42	14	14	18	46	31	14	29	490	11,236
Borowiec	7811	2	0	0	38	0	4	17	16	8	32	0	0	0	42	0	0	0	159	15,268
Cagliari	7548	0	0	0	0	0	2	0	3	0	17	0	0	0	17	0	0	0	39	6,067
Changchun	7237	82	0	0	132	12	140	185	158	63	494	137	138	204	321	246	61	72	2,445	30,036
Grasse	7835	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51,341
Grasse	7845	105	0	0	115	0	67	122	328	310	531	0	0	0	487	17	0	0	2,082	8,032
Graz	7839	464	0	0	521	0	367	483	520	555	809	368	446	601	529	207	206	186	6,262	72,594
Greenbelt	7105	40	0	0	125	0	156	138	287	90	674	0	0	0	636	143	89	33	2,411	59,983
Haleakala	7210	130	0	0	155	0	236	59	204	194	200	0	0	0	98	0	2	0	1,278	7,881
Helwan	7831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,520
Herstmonceux	7840	153	0	2	158	174	224	214	322	166	419	0	0	0	503	53	0	0	2,388	53,672
Kashima	7335	0	0	0	30	0	14	28	43	10	14	0	0	0	34	25	22	14	234	6,859
Katzively	1893	0	0	0	0	0	0	0	0	0	10	0	0	0	25	4	0	0	39	343

Koganei	7328	14	0	0	4	0	13	10	30	40	93	0	0	0	66	26	10	0	306	9,602
Komsomolsk	1868	0	0	0	38	0	0	0	0	108	37	0	0	0	7	16	0	0	206	6,205
Kunming	7820	13	5	0	9	0	4	67	22	35	83	4	8	6	25	0	0	0	281	4,783
Maidanak	1864	8	0	0	47	0	21	33	49	84	91	3	0	0	99	8	0	0	443	5,015
Matera	7939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,419
McDonald	7080	99	0	0	88	10	58	64	188	118	259	0	0	0	302	29	48	12	1,275	30,121
Mendeleevo	1870	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	0	0	0	0	7	0	0	0	16	0	0	0	3	20	0	0	46	9,311
Miura	7337	9	0	0	0	0	5	0	0	0	30	0	0	0	3	0	0	5	52	3,742
Monument Peak	7110	326	0	0	322	0	536	493	1,008	366	2,205	0	0	0	1,849	155	219	109	7,588	112,934
Mt. Stromlo	7849	298	0	0	289	0	246	234	547	300	1,036	0	0	0	1,001	125	44	15	4,135	51,793
Potsdam	7836	15	0	0	59	0	47	57	53	54	81	0	0	0	105	0	0	0	471	25,457
Riga	1884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,657
San Fernando	7824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,455
Sarapul	1871	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
Shanghai	7837	85	0	0	231	58	139	182	195	97	314	148	120	220	243	72	58	97	2,259	16,974
Simosato	7838	0	0	0	7	0	0	7	6	7	17	0	0	0	16	0	0	0	60	10,869
Tahiti	7124	58	0	0	14	0	17	31	102	11	43	0	0	0	17	0	2	0	295	13,406
Tateyama	7339	25	0	0	7	0	25	4	19	9	61	0	0	0	63	27	0	0	240	7,083
Wettzell	8834	159	0	0	78	0	259	234	450	125	540	115	104	120	677	39	0	0	2,900	41,173
Wuhan	7236	0	0	0	18	35	48	16	50	14	9	20	9	9	14	0	0	0	242	477
Yarragadee	7090	609	0	0	495	0	235	304	826	573	1,863	0	0	0	1,747	416	121	20	7,209	80,115
Zimmerwald	7810	193	0	0	100	0	188	208	361	114	337	0	0	0	515	45	0	0	2,061	25,891
Totals:		2,926	5	2	3,147	289	3,078	3,240	5,840	3,504	10,357	809	839	1,178	9,490	1,704	896	592	47,896	888,564

Table 8.5.2-1

Site Name	*Station*	*GFZ-1*	*SUNSAT*	*ERS-1*	*ERS-2*	*GEOS-3*	*STAR*	*STEL*	*WEST*	*GFO-1*	*BE-C*	*TOPEX*	*AJISAI*	*LAG-1*	*LAG-2*	*ETA-1*	*ETA-2*	*GPS-35*	*GPS-36*	*Moon*	*Totals*
Arequipa	7403	0	282	1,161	1,266	92	1,494	1,015	5	447	988	5,840	3,434	760	1,116	0	0	0	0	0	17,900
Beijing	7249	0	28	495	389	53	637	503	65	233	1,308	3,167	2,347	747	697	16	61	0	0	0	10,746
Borowiec	7811	0	5	1,557	1,471	346	611	591	94	378	280	4,613	1,718	2,097	1,346	0	0	2	0	0	15,109
Cagliari	7548	0	4	659	737	75	169	110	2	52	3	1,760	1,951	215	291	0	0	0	0	0	6,028
Changchun	7237	0	35	1,039	1,167	683	2,333	979	52	412	2,699	7,405	5,477	2,399	2,222	276	413	0	0	0	27,591
Grasse	7835	49	828	7,322	7,549	727	3,926	3,169	1,494	1,265	1,787	14,038	4,219	2,434	2,490	0	41	0	3	0	51,341
Grasse	7845	0	0	0	0	0	0	0	0	0	0	0	0	2,226	1,851	239	206	450	351	627	5,950
Graz	7839	26	1,168	6,540	6,934	1,689	4,458	3,123	1,370	1,472	2,781	17,619	7,071	5,426	4,697	435	568	537	418	0	66,332
Greenbelt	7105	0	1,427	3,091	3,053	803	5,679	1,959	476	1,764	6,608	12,304	10,867	4,789	4,477	120	130	5	20	0	57,572
Haleakala	7210	0	0	761	643	201	383	357	115	196	59	1,812	773	608	652	24	0	19	0	0	6,603
Helwan	7831	0	149	1,025	1,154	200	1,105	943	8	280	2,850	3,930	3,576	183	117	0	0	0	0	0	15,520
Herstmonceux	7840	37	1,073	3,543	3,632	925	3,802	2,248	1,133	1,462	1,060	11,848	6,938	6,883	5,482	333	423	294	168	0	51,284
Kashima	7335	0	63	80	208	7	726	335	37	8	953	1,053	1,819	619	674	20	23	0	0	0	6,625
Katzively	1893	0	0	0	0	0	0	0	0	0	8	105	18	95	78	0	0	0	0	0	304
Koganei	7328	0	55	203	407	28	833	481	76	46	1,025	1,540	2,155	988	1,367	33	59	0	0	0	9,296
Komsomolsk	1868	0	0	635	595	0	468	443	55	0	65	1,394	1,437	371	352	122	53	0	9	0	5,999
Kunming	7820	0	0	0	0	0	61	102	0	0	135	1,165	945	723	1,301	32	21	0	17	0	4,502
Maidanak	1864	0	0	289	931	0	0	0	316	0	0	1,146	0	861	704	94	92	74	65	0	4,572
Matera	7939	0	0	1,191	1,692	306	2,435	780	17	443	1,341	7,747	4,997	3,035	2,435	0	0	0	0	0	26,419
McDonald	7080	0	177	1,625	1,773	1,127	1,512	908	73	595	4,075	7,821	3,876	2,154	2,701	66	75	16	29	243	28,846
Mendeleevo	1870	0	0	630	688	0	274	427	93	241	0	595	386	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	121	1,238	1,269	237	194	442	23	649	0	3,088	1,116	450	412	20	6	0	0	0	9,265
Miura	7337	0	0	16	102	21	249	171	3	12	600	717	1,128	325	346	0	0	0	0	0	3,690
Monument Peak	7110	0	1,743	5,409	5,571	1,480	8,510	3,712	1,113	2,793	12,777	23,292	19,681	9,367	8,977	286	446	78	111	0	105,346
Mt. Stromlo	7849	0	275	2,559	2,764	297	5,250	1,653	507	459	1	10,304	11,326	5,964	5,295	532	401	8	63	0	47,658
Tahiti	7124	0	44	896	1,053	289	987	733	209	352	73	3,612	2,552	1,029	1,282	0	0	0	0	0	13,111
Potsdam	7836	4	798	2,816	2,606	544	1,761	1,487	319	646	207	7,784	2,976	1,924	1,105	0	0	9	0	0	24,986
Riga	1884	18	0	4,392	4,321	10	0	0	63	283	119	2,768	613	2,121	949	0	0	0	0	0	15,657
San Fernando	7824	0	815	3,277	2,978	15	2,896	1,739	184	1,170	2,910	6,715	5,334	1,859	1,563	0	0	0	0	0	31,455
Shanghai	7837	0	167	544	614	122	1,040	817	124	212	1,718	3,287	3,369	1,168	1,304	118	111	0	0	0	14,715
Simosato	7838	0	83	618	633	202	738	492	65	147	1,257	2,134	3,089	416	833	45	57	0	0	0	10,809
Tateyama	7339	0	22	121	230	22	562	350	142	17	924	1,177	1,355	835	994	31	61	0	0	0	6,843
Wettzell	8834	0	141	1,588	1,954	147	3,220	1,323	117	548	1,615	12,678	6,570	4,067	3,077	316	393	343	176	0	38,273
Wuhan	7236	0	0	0	0	0	6	15	0	0	0	30	18	64	83	19	0	0	0	0	235
Yarragadee	7090	21	2,330	5,713	5,866	1,456	5,914	3,071	1,687	3,181	0	16,787	12,161	6,164	6,398	960	696	251	250	0	72,906
Zimmerwald	7810	17	215	1,227	1,450	626	2,087	1,062	374	472	1,446	5,048	3,913	3,193	2,270	179	105	108	38	0	23,830
Totals:		172	12,048	62,260	65,700	12,730	64,320	35,540	10,411	20,235	51,672	206,323	139,205	76,559	69,938	4,316	4,441	2,194	1,718	870	840,652

Name	*Station*	*GLO-62*	*GLO-64*	*GLO-65*	*GLO-66*	*GLO-67*	*GLO-68*	*GLO-69*	*GLO-70*	*GLO-71*	*GLO-72*	*GLO-75*	*GLO-76*	*GLO-77*	*GLO-79*	*GLO-80*	*GLO-81*	*GLO-82*	*Totals*	*Grand*
Arequipa	7403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17,900
Beijing	7249	39	0	0	67	0	20	50	53	53	42	14	14	18	46	31	14	29	490	11,236
Borowiec	7811	2	0	0	38	0	4	17	16	8	32	0	0	0	42	0	0	0	159	15,268
Cagliari	7548	0	0	0	0	0	2	0	3	0	17	0	0	0	17	0	0	0	39	6,067
Changchun	7237	82	0	0	132	12	140	185	158	63	494	137	138	204	321	246	61	72	2,445	30,036
Grasse	7835	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51,341
Grasse	7845	105	0	0	115	0	67	122	328	310	531	0	0	0	487	17	0	0	2,082	8,032
Graz	7839	464	0	0	521	0	367	483	520	555	809	368	446	601	529	207	206	186	6,262	72,594
Greenbelt	7105	40	0	0	125	0	156	138	287	90	674	0	0	0	636	143	89	33	2,411	59,983
Haleakala	7210	130	0	0	155	0	236	59	204	194	200	0	0	0	98	0	2	0	1,278	7,881
Helwan	7831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,520
Herstmonceux	7840	153	0	2	158	174	224	214	322	166	419	0	0	0	503	53	0	0	2,388	53,672
Kashima	7335	0	0	0	30	0	14	28	43	10	14	0	0	0	34	25	22	14	234	6,859

Katzively	1893	0	0	0	0	0	0	0	0	0	10	0	0	0	25	4	0	0	39	343
Koganei	7328	14	0	0	4	0	13	10	30	40	93	0	0	0	66	26	10	0	306	9,602
Komsomolsk	1868	0	0	0	38	0	0	0	0	108	37	0	0	0	7	16	0	0	206	6,205
Kunming	7820	13	5	0	9	0	4	67	22	35	83	4	8	6	25	0	0	0	281	4,783
Maidanak	1864	8	0	0	47	0	21	33	49	84	91	3	0	0	99	8	0	0	443	5,015
Matera	7939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,419
McDonald	7080	99	0	0	88	10	58	64	188	118	259	0	0	0	302	29	48	12	1,275	30,121
Mendeleevo	1870	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	0	0	0	0	7	0	0	0	16	0	0	0	3	20	0	0	46	9,311
Miura	7337	9	0	0	0	0	5	0	0	0	30	0	0	0	3	0	0	5	52	3,742
Monument Peak	7110	326	0	0	322	0	536	493	1,008	366	2,205	0	0	0	1,849	155	219	109	7,588	112,934
Mt. Stromlo	7849	298	0	0	289	0	246	234	547	300	1,036	0	0	0	1,001	125	44	15	4,135	51,793
Potsdam	7836	15	0	0	59	0	47	57	53	54	81	0	0	0	105	0	0	0	471	25,457
Riga	1884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,657
San Fernando	7824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,455
Shanghai	7837	85	0	0	231	58	139	182	195	97	314	148	120	220	243	72	58	97	2,259	16,974
Simosato	7838	0	0	0	7	0	0	7	6	7	17	0	0	0	16	0	0	0	60	10,869
Tahiti	7124	58	0	0	14	0	17	31	102	11	43	0	0	0	17	0	2	0	295	13,406
Tateyama	7339	25	0	0	7	0	25	4	19	9	61	0	0	0	63	27	0	0	240	7,083
Wettzell	8834	159	0	0	78	0	259	234	450	125	540	115	104	120	677	39	0	0	2,900	41,173
Wuhan	7236	0	0	0	18	35	48	16	50	14	9	20	9	9	14	0	0	0	242	477
Yarragadee	7090	609	0	0	495	0	235	304	826	573	1,863	0	0	0	1,747	416	121	20	7,209	80,115
Zimmerwald	7810	193	0	0	100	0	188	208	361	114	337	0	0	0	515	45	0	0	2,061	25,891
Totals:		2,926	5	2	3,147	289	3,078	3,240	5,840	3,504	10,357	809	839	1,178	9,490	1,704	896	592	47,896	888,548

Table 8.5.2-2

Site Name	*Station*	*GFZ-1*	*SUNSAT*	*ERS-1*	*ERS-2*	*GEOS-3*	*STAR*	*STEL*	*WEST*	*GFO-1*	*BE-C*	*TOPEX*	*AJISAI*	*LAG-1*	*LAG-2*	*ETA-1*	*ETA-2*	*GPS-35*	*GPS-36*	*Moon*	*Totals*
Arequipa	7403	0	282	1,161	1,266	92	1,494	1,015	5	447	988	5,840	3,434	760	1,116	0	0	0	0	0	17,900
Beijing	7249	0	28	495	389	53	637	503	65	233	1,308	3,167	2,347	747	697	16	61	0	0	0	10,746
Borowiec	7811	0	5	1,557	1,471	346	611	591	94	378	280	4,613	1,718	2,097	1,346	0	0	2	0	0	15,109
Cagliari	7548	0	4	659	737	75	169	110	2	52	3	1,760	1,951	215	291	0	0	0	0	0	6,028
Changchun	7237	0	35	1,039	1,167	683	2,333	979	52	412	2,699	7,405	5,477	2,399	2,222	276	413	0	0	0	27,591
Grasse	7835	49	828	7,322	7,549	727	3,926	3,169	1,494	1,265	1,787	14,038	4,219	2,434	2,490	0	41	0	3	0	51,341
Grasse	7845	0	0	0	0	0	0	0	0	0	0	0	0	2,226	1,851	239	206	450	351	627	5,950
Graz	7839	26	1,168	6,540	6,934	1,689	4,458	3,123	1,370	1,472	2,781	17,619	7,071	5,426	4,697	435	568	537	418	0	66,332
Greenbelt	7105	0	1,427	3,091	3,053	803	5,679	1,959	476	1,764	6,608	12,304	10,867	4,789	4,477	120	130	5	20	0	57,572
Haleakala	7210	0	0	761	643	201	383	357	115	196	59	1,812	773	608	652	24	0	19	0	0	6,603
Helwan	7831	0	149	1,025	1,154	200	1,105	943	8	280	2,850	3,930	3,576	183	117	0	0	0	0	0	15,520
Herstmonceux	7840	37	1,073	3,543	3,632	925	3,802	2,248	1,133	1,462	1,060	11,848	6,938	6,883	5,482	333	423	294	168	0	51,284
Kashima	7335	0	63	80	208	7	726	335	37	8	953	1,053	1,819	619	674	20	23	0	0	0	6,625
Katzively	1893	0	0	0	0	0	0	0	0	0	8	105	18	95	78	0	0	0	0	0	304
Koganei	7328	0	55	203	407	28	833	481	76	46	1,025	1,540	2,155	988	1,367	33	59	0	0	0	9,296
Komsomolsk	1868	0	0	635	595	0	468	443	55	0	65	1,394	1,437	371	352	122	53	0	9	0	5,999
Kunming	7820	0	0	0	0	0	61	102	0	0	135	1,165	945	723	1,301	32	21	0	17	0	4,502
Maidanak	1864	0	0	289	931	0	0	0	316	0	0	1,146	0	861	704	94	92	74	65	0	4,572
Matera	7939	0	0	1,191	1,692	306	2,435	780	17	443	1,341	7,747	4,997	3,035	2,435	0	0	0	0	0	26,419
McDonald	7080	0	177	1,625	1,773	1,127	1,512	908	73	595	4,075	7,821	3,876	2,154	2,701	66	75	16	29	243	28,846
Mendeleevo	1870	0	0	630	688	0	274	427	93	241	0	595	386	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	121	1,238	1,269	237	194	442	23	649	0	3,088	1,116	450	412	20	6	0	0	0	9,265
Miura	7337	0	0	16	102	21	249	171	3	12	600	717	1,128	325	346	0	0	0	0	0	3,690
Monument Peak	7110	0	1,743	5,409	5,571	1,480	8,510	3,712	1,113	2,793	12,777	23,292	19,681	9,367	8,977	286	446	78	111	0	105,346
Mt. Stromlo	7849	0	275	2,559	2,764	297	5,250	1,653	507	459	1	10,304	11,326	5,964	5,295	532	401	8	63	0	47,658
Tahiti	7124	0	44	896	1,053	289	987	733	209	352	73	3,612	2,552	1,029	1,282	0	0	0	0	0	13,111
Potsdam	7836	4	798	2,816	2,606	544	1,761	1,487	319	646	207	7,784	2,976	1,924	1,105	0	0	9	0	0	24,986
Riga	1884	18	0	4,392	4,321	10	0	0	63	283	119	2,768	613	2,121	949	0	0	0	0	0	15,657
San Fernando	7824	0	815	3,277	2,978	15	2,896	1,739	184	1,170	2,910	6,715	5,334	1,859	1,563	0	0	0	0	0	31,455
Shanghai	7837	0	167	544	614	122	1,040	817	124	212	1,718	3,287	3,369	1,168	1,304	118	111	0	0	0	14,715
Simosato	7838	0	83	618	633	202	738	492	65	147	1,257	2,134	3,089	416	833	45	57	0	0	0	10,809
Tateyama	7339	0	22	121	230	22	562	350	142	17	924	1,177	1,355	835	994	31	61	0	0	0	6,843
Wettzell	8834	0	141	1,588	1,954	147	3,220	1,323	117	548	1,615	12,678	6,570	4,067	3,077	316	393	343	176	0	38,273
Wuhan	7236	0	0	0	0	0	6	15	0	0	0	30	18	64	83	19	0	0	0	0	235
Yarragadee	7090	21	2,330	5,713	5,866	1,456	5,914	3,071	1,687	3,181	0	16,787	12,161	6,164	6,398	960	696	251	250	0	72,906
Zimmerwald	7810	17	215	1,227	1,450	626	2,087	1,062	374	472	1,446	5,048	3,913	3,193	2,270	179	105	108	38	0	23,830
Totals:		172	12,048	62,260	65,700	12,730	64,320	35,540	10,411	20,235	51,672	206,323	139,205	76,559	69,938	4,316	4,441	2,194	1,718	870	840,652

Name	*Station*	*GLO-62*	*GLO-64*	*GLO-65*	*GLO-66*	*GLO-67*	*GLO-68*	*GLO-69*	*GLO-70*	*GLO-71*	*GLO-72*	*GLO-75*	*GLO-76*	*GLO-77*	*GLO-79*	*GLO-80*	*GLO-81*	*GLO-82*	*Totals*	*Grand*
Arequipa	7403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17,900
Beijing	7249	39	0	0	67	0	20	50	53	53	42	14	14	18	46	31	14	29	490	11,236
Borowiec	7811	2	0	0	38	0	4	17	16	8	32	0	0	0	42	0	0	0	159	15,268
Cagliari	7548	0	0	0	0	0	2	0	3	0	17	0	0	0	17	0	0	0	39	6,067
Changchun	7237	82	0	0	132	12	140	185	158	63	494	137	138	204	321	246	61	72	2,445	30,036
Grasse	7835	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51,341
Grasse	7845	105	0	0	115	0	67	122	328	310	531	0	0	0	487	17	0	0	2,082	8,032
Graz	7839	464	0	0	521	0	367	483	520	555	809	368	446	601	529	207	206	186	6,262	72,594
Greenbelt	7105	40	0	0	125	0	156	138	287	90	674	0	0	0	636	143	89	33	2,411	59,983
Haleakala	7210	130	0	0	155	0	236	59	204	194	200	0	0	0	98	0	2	0	1,278	7,881
Helwan	7831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,520
Herstmonceux	7840	153	0	2	158	174	224	214	322	166	419	0	0	0	503	53	0	0	2,388	53,672
Kashima	7335	0	0	0	30	0	14	28	43	10	14	0	0	0	34	25	22	14	234	6,859
Katzively	1893	0	0	0	0	0	0	0	0	0	10	0	0	0	25	4	0	0	39	343
Koganei	7328	14	0	0	4	0	13	10	30	40	93	0	0	0	66	26	10	0	306	9,602

Komsomolsk	1868	0	0	0	38	0	0	0	0	108	37	0	0	0	7	16	0	0	206	6,205
Kunming	7820	13	5	0	9	0	4	67	22	35	83	4	8	6	25	0	0	0	281	4,783
Maidanak	1864	8	0	0	47	0	21	33	49	84	91	3	0	0	99	8	0	0	443	5,015
Matera	7939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,419
McDonald	7080	99	0	0	88	10	58	64	188	118	259	0	0	0	302	29	48	12	1,275	30,121
Mendeleevo	1870	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,334
Metsahovi	7806	0	0	0	0	0	7	0	0	0	16	0	0	0	3	20	0	0	46	9,311
Miura	7337	9	0	0	0	0	5	0	0	0	30	0	0	0	3	0	0	5	52	3,742
Monument Peak	7110	326	0	0	322	0	536	493	1,008	366	2,205	0	0	0	1,849	155	219	109	7,588	112,934
Mt. Stromlo	7849	298	0	0	289	0	246	234	547	300	1,036	0	0	0	1,001	125	44	15	4,135	51,793
Potsdam	7836	15	0	0	59	0	47	57	53	54	81	0	0	0	105	0	0	0	471	25,457
Riga	1884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,657
San Fernando	7824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,455
Shanghai	7837	85	0	0	231	58	139	182	195	97	314	148	120	220	243	72	58	97	2,259	16,974
Simosato	7838	0	0	0	7	0	0	7	6	7	17	0	0	0	16	0	0	0	60	10,869
Tahiti	7124	58	0	0	14	0	17	31	102	11	43	0	0	0	17	0	2	0	295	#REF!
Tateyama	7339	25	0	0	7	0	25	4	19	9	61	0	0	0	63	27	0	0	240	7,083
Wettzell	8834	159	0	0	78	0	259	234	450	125	540	115	104	120	677	39	0	0	2,900	41,173
Wuhan	7236	0	0	0	18	35	48	16	50	14	9	20	9	9	14	0	0	0	242	477
Yarragadee	7090	609	0	0	495	0	235	304	826	573	1,863	0	0	0	1,747	416	121	20	7,209	80,115
Zimmerwald	7810	193	0	0	100	0	188	208	361	114	337	0	0	0	515	45	0	0	2,061	25,891
Totals:		2,926	5	2	3,147	289	3,078	3,240	5,840	3,504	10,357	809	839	1,178	9,490	1,704	896	592	47,896	888,548

Table 8.5.2-3

8.6 ILRS COMPONENTS

ILRS Central Bureau
NASA Goddard Space Flight Center (GSFC), USA
Global Data Centers
Crustal Dynamics Data Information System (CDDIS), NASA GSFC, USA
EUROLAS Data Center (EDC), Deutsches Geodätisches ForschungsInstitut (DGFI), Germany
Regional Data Centers
Shanghai Observatory, Academia Sinica, China
Operations Center
Russian Mission Control Center (MCC), Russia
University of Texas at Austin, Center for Space Research (CSR), USA
NASA Goddard Space Flight Center (NASA GSFC), USA
University of Texas at Austin, USA
Analysis Centers
Delft University of Technology (DUT), The Netherlands
Russian Mission Control Center (MCC), Russia
University of Texas at Austin, Center for Space Research (CSR), USA
Lunar Analysis Centers
Observatoire de Paris, France
Forschungseinrichting Satellitengeodäsie (FESG), Germany
Jet Propulsion Laboratory (JPL), USA
University of Texas at Austin, USA
Associate Analysis Centers
Austrian Academy of Sciences, Austria
Australian Surveying and Land Information Group (AUSLIG), Australia
Academia Sinica, China
Observatoire de la Côte d'Azur/Centre d'Etudes et de Recherches Géodynamiques et Astrométrie (OCA/CERGA), France
Bundesamt für Kartographie und Geodäsie (BKG), Germany
Deutsches Geodätisches ForschungsInstitut (DGFI), Germany
European Space Agency/ESA Space Operations Center (ESA/ESOC), Germany
GeoForschungsZentrum, Germany
Agenzia Spaziale Italiana/Centro de Geodesia Spaziale (ASI/CGS), Italy
Forsvarets ForskningsInstitutt (Norwegian Defence Research Establishment), Norway
Institute of Applied Astronomy, Russia
Institute of Astronomy of the Russian Academy of Sciences, Russia
Institute of Metrology for Time and Space, Russia
Astronomical Institute, University of Berne (AIUB), Switzerland
Main Astronomical Observatory of the National Academy of Sciences of the Ukraine (GAOUA), Ukraine
Aston University, United Kingdom
Natural Environment Research Council, United Kingdom
NASA Goddard Space Flight Center (GSFC), USA
Stations/Subnetworks
MOBLAS-5 (AUSLIG and NASA), Australia
Mt. Stromlo (AUSLIG), Australia
Graz (Austrian Academy of Sciences), Austria
Beijing (Chinese Academy of Surveying and Mapping), China

Changchun, Kunming, Shanghai (Chinese Academy of Sciences), China
Wuhan (State Seismological Bureau), China
Helwan Observatory, Egypt
Metsahovi (Finnish Geodetic Institute), Finland
FTLRS, Grasse LLR and SLR (GRGS/CNES), France
MTLRS-1, TIGO-SLR, WLRS (BKG), Germany
Potsdam (GFZ), Germany
MLRO and SAO-1 Matera (ASI/CGS), Italy
Astronomical Observatory of Cagliari, Italy
KEYSTONE (CRL), Japan
Simosato (JHD), Japan
Riga (Astronomical Institute of University of Latvia), Latvia
MTLRS-2 (DUT), The Netherlands
TLRS-3 (NASA), Peru
Borowiec (Space Research Centre of PAS), Poland
Mendeleevo (IMVP VNIIFTRI), Russia
Komsomolsk (RSA and SRI for Precision Instrument Engineering), Russia
SALRO (KACST), Saudi Arabia
San Fernando (Real Intituto y Observatorio de la Armada), Spain
Zimmerwald (AIUB), Switzerland
Katzively (RSA and SRI for Precision Instrument Engineering), Ukraine
Kiev (GAOUA), Ukraine
Simeiz, Ukraine
Herstmonceux (NERC), United Kingdom
MOBLAS-8 (NASA and UPF), French Polynesia
MOBLAS-4, -6, -7, TLRS-4, HOLLAS, MLRS (NASA), USA
Maidanak (RSA and SRI for Precision Instrument Engineering), Uzbekistan

8.7 ILRS PARTICIPATING INSTITUTIONS

Agency	Country
Australian Surveying and Land Information Group (AUSLIG)	Australia
Austrian Academy of Sciences	Austria
Academia Sinica	China
Chinese Academy of Surveying and Mapping	China
State Seismological Bureau	China
Yunnan Observatory	China
Technical University of Prague	Czech Republic
National Research Institute of Astronomy and Geophysic (NRIAG)	Egypt
Finnish Geodetic Institute	Finland
Observatoire de la Côte d'Azur/Center d'Etudes et de Recherches Géodynamiques et Astrométrie (OCA/CERGA)	France
Observatoire de Paris	France
Bundesamt für Kartographie und Geodäsie (BKG)	Germany
Deutsches Geodätisches ForschungsInstitut (DGFI)	Germany
European Space Agency (ESA)	Germany
Forschungseinrichting Satellitengeodäsie (FESG), Technical University of Munich	Germany
GeoForschungsZentrum (GFZ)	Germany
Astronomical Observatory of Cagliari	Italy
Italian Space Agency (ASI)	Italy
Communications Research Laboratory (CRL)	Japan
Japanese Hydrographic Department (JHD)	Japan
Astronomical Observatory, University of Latvia	Latvia
Division for Electronics, Forsvarets ForskningsInstitutt (FFI)	Norway
Space Research Center of the Polish Academy of Sciences (PAS)	Poland
Institute of Applied Astronomy (IAA)	Russia
Institute of Astronomy of the Russian Academy of Sciences (INASAN)	Russia
Institute of Metrology for Time and Space (IMVP)	Russia
Mission Control Center (MCC)	Russia
Space Research Institute (SRI) for Precision Instrument Engineering	Russia
King Abdulaziz City for Science and Technology (KACST)	Saudi Arabia
Real Instituto y Observatorio de la Armada	Spain
Astronomical Institute, University of Berne (AIUB)	Switzerland
Delft University of Technology (DUT)	The Netherlands
Crimean Astronomical Observatory	Ukraine
Lebedev Physical Institute in the Crimea	Ukraine
Main Astronomical Observatory (MAO) of the National Academy of Sciences of Ukraine	Ukraine
Aston University	United Kingdom

Natural Environment Research Council (NERC)	United Kingdom
University of Newcastle Upon Tyne	United Kingdom
Jet Propulsion Laboratory (JPL)	USA
National Aeronautics and Space Administration Goddard Space Flight Center (NASA GSFC)	USA
University of Hawaii	USA
University of Texas at Austin	USA
University of Texas, Center for Space Research (CSR)	USA

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8.9 LIST OF ACRONYMS

AAC	Associate Analysis Center
AASTR	Advanced Along Track Scanning Radiometer
AC	Analysis Center
ACT	Australian Capital Territory
ADEOS	Advanced Earth Observing Satellite
AFSPC	Air Force Space Command (USA)
AGU	American Geophysical Union
AIUB	Astronomical Institute of Berne (Switzerland)
APD	Avalanche Photo Diode
APRGP	Asia-Pacific Regional Geodetic Project
APSG	Asia-Pacific Space Geodynamics Project
ASAR	Advanced Synthetic Aperture Radar
ASCII	American Standard Code for Information Interchange
ASI	Agenzia Spaziale Italiana (Italian Space Agency)
ATSC	AlliedSignal Technical Services Corporation (USA)
AUSLIG	Australian Surveying and Land Information Group
AWG	Analysis Working Group
Az/El	Azimuth/Elevation
BAE	British Aerospace (Australia)
BE-C	Beacon Explorer C
BFEC	Bendix Field Engineering Corporation (USA)
BIPM	Bureau International des Poids et Mesures (France)
BKG	Bundesamt für Kartographie und Geodäsie (Germany)
CB	Central Bureau
CCD	Charged Coupled Device
CDDIS	Crustal Dynamics Data Information System (USA)
CDP	Crustal Dynamics Project
CERGA	Centre d'Etudes et de Recherches Géodynamiques et Astrométrie (France)
CF	Constant Fraction
CfA	Center for Astrophysics (USA)
CGS	Centro de Geodesia Spaziale (Italy)
CHAMP	CHAllenging Mini-Satellite Payload
CIS	Conventional Inertial System
CMONOC	Crustal Movement Observation Network of China
CNES	Centre National d'Etudes Spatiales (France)
CNS	Communication, Navigation, Surveillance (USA)
CODE	Center for Orbit Determination in Europe
COM	Center Of Mass
CONAE	Comisión Nacional de Actividades Espaciales (Argentina)
CPU	Central Processing Unit
CRL	Communications Research Laboratory (Japan)
C-SPAD	Compensated Single Photoelectron Avalanche Detector
CSR	Center for Space Research (USA)
CSTG	International Coordination of Space Techniques for Geodesy and Geodynamics

CTLRS	Chinese Transportable Laser Ranging System
CTU FNSPE	Czech Technical University Faculty of Nuclear Science and Physical Engineering
DEC	Digital Equipment Corporation
DEOS	Delft Institute for Earth-Oriented Space Research (The Netherlands)
DFPWG	Data Formats and Procedures Working Group
DGFI	Deutsches Geodätisches ForschungsInstitut (Germany)
DGPS	Differential GPS
DMS	Data Measurement System
DOGS	DGFI Orbit and Geodetic Parameter Estimation System (Germany)
DOMES	Directory Of MERIT Sites
DORIS	Doppler Orbitography and Radiopositioning Integrated by Satellite
D-PAF	Germany Processing and Analysis Facility
DUT	Delft University of Technology (The Netherlands)
EDC	EUROLAS Data Center (Germany)
EGS	European Geophysical Society
ELV	Expendable Launch Vehicle
ENVISAT	ENVIronmental SATellite
EOP	Earth Orientation Parameter
EOS	Electro Optical Systems (Australia)
EOS	European Optical Society
ERA	Ephemeris Research in Astronomy (Russia)
ERS	European Remote Sensing Satellite
ESA	European Space Agency
ESOC	ESA Space Operations Center (Germany)
ESRIN	European Space Research Institute
ETS	Engineering Test Satellite
EUROLAS	European Laser Consortium
FAQ	Frequently Asked Question
FDR	Foundation for Research Development (South Africa)
FESG	Forschungseinrichting Satellitengeodäsie (Research Facility for Space Geodesy, Germany)
FFI	Forsvarets ForskningsInstitutt (Norwegian Defense Research Establishment)
FR	Full Rate
FTLRS	French Transportable Laser Ranging System
FTP	File Transfer Protocol
GAOUA	Main Astronomical Observatory of the National Academy of Sciences of Ukraine
GB	Gigabyte
GB	Governing Board
GDR	Geophysical Data Record
GeoDAF	Geodetical Data Archive Facility (Italy)
GeodIS	Geodetic Information System (Germany)
GEOS	Geodetic and Earth Orbiting Satellite
GEOSAT	Geodesy Satellite
GFO	GEOSAT Follow-On (USA)
GFZ	GeoForschungsZentrum (Germany)
GGAO	Goddard Geophysical and Astronomical Observatory (USA)
GIS	Geographic Information System
GLAS	Geoscience Laser Altimeter System
GLONASS	Global Navigation Satellite System

GLONASS	Global'naya Navigatsionnay Sputnikovaya Sistema
GM	Gravity Model
GOMOS	Global Ozone Monitoring by Occultation of Stars
GOSSTANDART	Russian Agency for Standardization
GP-B	Gravity Probe B
GPS	Global Positioning System
GRACE	Gravity Recovery And Climate Experiment
GRGS	Groupe de Recherches de Géodésie Spatiale (France)
GROSS	Geodynamics, Rotation of the Earth, Orbit determination Searching Software (Russia)
GSFC	Goddard Space Flight Center (USA)
HOLLAS	Haleakala Laser Station (USA)
HTSI	Honeywell Technology Solutions, Inc. (USA)
H/W	Hardware
IAA	Institute of Applied Astronomy, Russia
IAG	International Association of Geodesy
IAPG	Institut für Astronomische und Physikalische Geodäsie (Germany)
IAU	International Astronomical Union
ICESat	Ice Cloud and Land Elevation Satellite
ICRF	International Celestial Reference Frame
ICRS	International Celestial Reference System
IERS	International Earth Rotation Service
IGEX	International GLONASS EXperiment
IGN	Institut Geographique National (France)
IGS	International GPS Service for Geodynamics
ILRS	International Laser Ranging Service
IMVP	Institute of Metrology for Time and Space (Russia)
INASAN	Institute of Astronomy of the Russian Academy of Sciences
ION	Institute of Navigation
IPIE	Institute for Precision Instrument Engineering (Russia)
IRS	Indian Remote Sensing Satellite
IRV	Inter-Range Vector
ISRO	Indian Space Research Organization
ISTRAC	ISRO Telemetry Tracking and Command Network (India)
ITRF	International Terrestrial Reference Frame
ITRS	International Terrestrial Reference System
ITSM	Institute for Time and Space Metrology (Russia)
ITSS	Raytheon Information Technology and Scientific Services (USA)
IUGG	International Union of Geodesy and Geophysics
IVS	International VLBI Service for Geodesy and Astrometry
JCET	Joint Center for Earth Systems Technology (USA)v
JGM	Joint Gravity Model
JGR	Journal of Geophysical Research
JHD	Japanese Hydrographic Department
JPL	Jet Propulsion Laboratory (USA)
KACST	King Abdulaziz City for Science and Technology (Saudi Arabia)
LAGEOS	LAser GEOdynamics Satellite
LAN	Local Area Network

LEO	Low Earth Orbit
LIDAR	Light Detection and Ranging
LLR	Lunar Laser Ranging
LOD	Length Of Day
LPSC	Lunar and Planetary Science Conference
LRA	Laser Retroreflector Array
L+T	Swiss Federal Office of Topography
LURE	LUnar Ranging Experiment
MAO	Main Astronomical Observatory (Ukraine)
MCC	Mission Control Center (Russia)
MCEP	Mean Celestial Ephemeris Pole
MCP	Micro Channel Plate
MEDLAS	Mediterranean Laser Campaign
MEO	Medium Earth Orbit
MERIS	MEdium Resolution Imaging Spectrometer
MERIT	Monitoring of Earth Rotation and Intercomparison of Techniques
MIPAS	Michelson Interferometer for Passive Atmospheric Sounding
MIT	Massachusetts Institute of Technology (USA)
MLRO	Matera Laser Ranging Observatory (Italy)
MLRS	McDonald Laser Ranging System (USA)
MOBLAS	MOBile LASer Ranging Systemv
MOM	Mobile Optical Mount
MTLRS	Modular Transportable Laser Ranging System
MWG	Missions Working Group
MWV	MicroWave Radiometer
NASA	National Aeronautics and Space Administration (USA)
NASDA	National Space Development Agency (Japan)
NAVNET	Navy VLBI Network
NCL	University of Newcastle Upon Tyne (United Kingdom)
NERC	Natural Environment Research Council (United Kingdom)
NEWG	Networks and Engineering Working Group
Nd: YAG	Neodymium Yttrium Aluminum Garnet
NP	Normal Point
NRIAG	National Research Institute of Astronomy and Geophysics (Egypt)
OAC	Operational Analytic Center
OCA	Observatoire de la Côte d'Azur (France)
OMC	Observed Minus Computed
ONP	On-site Normal Point
OSC	Orbital Sciences Corporation (USA)
PAS	Polish Academy of Sciences
PC	Personal Computer
PCGIAP	Permanent Committee for GIS Infrastructure for Asia and the Pacific
PDF	Portable Document Format
PDF	Probability Density Function
PEP	Planetary Ephemeris Program
PM	Polar Motion
PMT	Photo Multiplier Tube
PM/UT	Polar Motion/Universal Time
POD	Precise Orbit Determination

POLAC	Paris Observatory Lunar Analysis Center (France)
PRARE	Precise Range and Range-rate Equipment
PRC	People's Republic of China
PRN	Pseudo Random Noise
QC	Quality Control
QL	Quick-Look
QLDAC	Quick-Look Data Analysis Center (The Netherlands)
QMCP	Quadrant Microchannel Plate
RA	Radar Altimeter
RAM	Random Access Memory
RISDE	Russian Institute of Space Device Engineering
RITSS	Raytheon Information Technology and Scientific Services (USA)
RMS	Root Mean Square
ROSAVIAKOSMOS	Russian Aerospace Agency
RRA	RetroReflector Array
RSA	Russian Space Agency
SAC	Astronomical Station of Cagliari (Italy)
SALRO	Saudi Arabian Laser Ranging Observatory (Saudi Arabia)
SAO	Smithsonian Astrophysical Observatory (USA)
SAR	Synthetic Aperture Radar
SCIAMACHY	SCanning Imaging Absorption spectrometer for AtMospheric CartograpHY
SENH	Solid Earth and Natural Hazards
SGF	Space Geodesy Facility (United Kingdom)
SGP	Space Geodesy Program
SI	International System of Units
SINEX	Software Independent Exchange Format
SLR	Satellite Laser Ranging
SNR	Signal to Noise Ratio
SOD	Site Occupation Designator
SP	Signal Processing
SPAD	Single Photoelectron Avalanche Detector
SPIE	International Society for Optical Engineering
SPWG	Signal Processing Working Group
SRDC	Shanghai Regional Data Center (China)
SRI	Space Research Institute (Russia)
SRP	System Reference Point
SSC	Set of Station Coordinates
SSV	Set of Station Velocities
STALAS	Stationary Laser Station
SUNSAT	Stellenbosch UNiversity SATellite (South Africa)
S/W	Software
TAC	Totally Accurate Clock
TB	TerraByte
TCP/IP	Transmission Control Protocol/INTERnet Protocol
TIGO	Transportable Integrated Geodetic Observatory
TLRS	Transportable Laser Ranging System
TOPEX	Ocean TOPography Experiment
T/P	TOPEX/Poseidon

T/R	Transfer/Receive
TRF	Terrestrial Reference Frame
TTandC	Tracking-Telemetry/Control
TUM	Technical University of Munich (Germany)
UK	United Kingdom
UMBC	University of Maryland Baltimore County (USA)
UPF	Université de la Polynésie Française (French Polynesia)
URL	Uniform Resource Locator
USA	United States of America
USNO	United States Naval Observatory
UT	Universal Time
UT`	University of Texas (USA)
UTC	Universal Coordinated Time
UTOPIA	University of Texas Orbit Processor (USA)
UTXM	University of Texas McDonald Observatory Lunar Analysis Center
VCL	Vegetation Canopy Lidar
VLBI	Very Long Baseline Interferometry
VNIIFTRI	All-Russian Scientific Research Institute for Physical-Technical and Radiotechnical Measurements (Russia)
VOL	Variation Of Latitude
WEGENER	Working Group of European Geoscientists for the Establishment of Networks for Earthquake Research
WESTPAC	Western Pacific Laser Tracking Network Satellite
WG	Working Group
WLRS	Wettzell Laser Ranging System (Germany)
WPLTN	Western Pacific Laser Tracking Network
WRMS	Weighted Root Mean Square
WWW	World Wide Web
Y2K	Year 2000