13-Po21

ILRS Website Update

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Abstract. *The ILRS website, http://ilrs.gsfc.nasa.gov, is the central source of information for all aspects of the service. The website provides information on the organization and operation of the ILRS and descriptions of ILRS components, data, and products. Furthermore, the website provides an entry point to the archive of these data and products available through the data centers. Links are provided to extensive information on the ILRS network stations including performance assessments and data quality evaluations. Descriptions of supported satellite missions (current, future, and past) are provided to aid in station acquisition and data analysis. The website was recently redesigned. Content was reviewed during the update process, ensuring information is current and useful. This poster will provide specific examples of key sections, applications, and webpages.*

Introduction

The redesigned ILRS website became operational in September 2012. The poster and summary paper reviews station and satellite performance information available through the website and introduces the new SiteLogViewer application, used for browsing the contents of the ILRS site logs.

ILRS Station and Satellite Performance Charts

The ILRS website provides access to reports that can be used to provide feedback to the missions and stations on the quality and quantity of laser ranging data.

The Central Bureau generates quarterly "Performance Report Cards" and posts them on the ILRS website (http://ilrs.gsfc.nasa.gov/network/system_performance/global_report_cards/index.html) accessible through the System Performance left navigation item under the Network section of the site. These reports provide feedback to the stations and aid data analysis by tabulating the previous 12 months of data quality, quantity, and operational compliance by station. The results include independent assessments of station performance from several of the ILRS analysis/associate analysis centers. The statistics are presented in two tables (one for artificial satellites and a second for lunar reflectors), listed by station and sorted by total passes in descending order. A portion of the satellite table is shown in Figure 1. Plots of data volume (passes, normal points, minutes of data) and RMS (LAGEOS, Starlette, calibration) are created from this information and available on the report card pages; examples of the plots are shown in Figures 2 and 3.
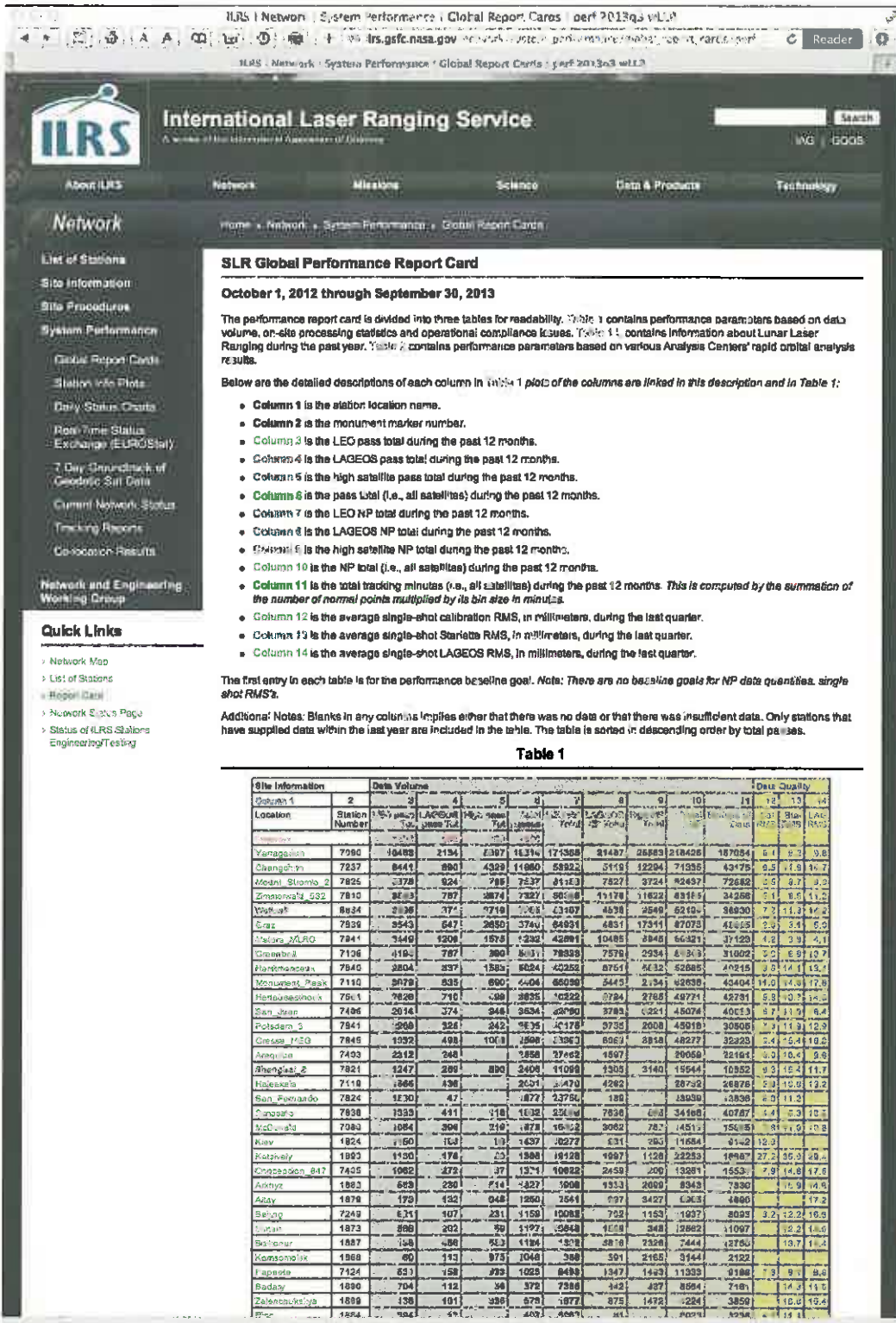
SLR Global Performance Report Card

October 1, 2012 through September 30, 2013

The performance report card is divided into three tables for readability. Table 1 contains performance parameters based on data volume, on-site processing statistics and operational compliance issues. Table 11 contains information about Lunar Laser Ranging during the past year. Table 2 contains performance parameters based on various Analysis Centers' rapid orbital analysis results.

Below are the detailed descriptions of each column in Table 1 *plots of the columns are linked in this description and in Table 1:*

- **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 total tracking minutes (i.e., all satellites) during the past 12 months. *This is computed by the summation of the number of normal points multiplied by its bin size in minutes.*
- Column 12 is the average single-shot calibration RMS, in millimeters, during the last quarter.
- Column 13 is the average single-shot Starlette RMS, in millimeters, during the last quarter.
- Column 14 is the average single-shot LAGEOS RMS, in millimeters, during the last quarter.

The first entry in each table is for the performance baseline goal. *Note: There are no baseline goals for NP data quantities. single shot RMS's.*

Additional Notes: Blanks in any columns implies 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 passes.

Table 1

Figure 1. A portion of the ILRS performance Report Card for the third quarter of 2013, spanning October 01, 2012 through September 30, 2013.
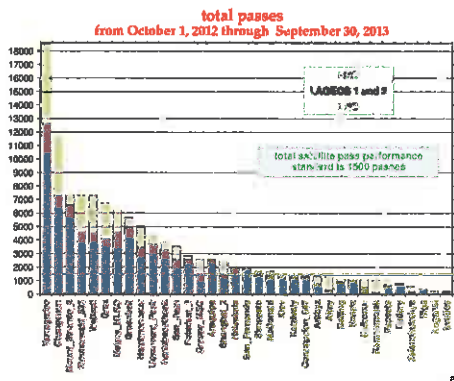
Figure 2. An example of a plot available for the quarterly ILRS report card. Here the total number of passes, categorized by low, LAGEOS, and high satellites, is shown for the 3rd quarter of 2013.
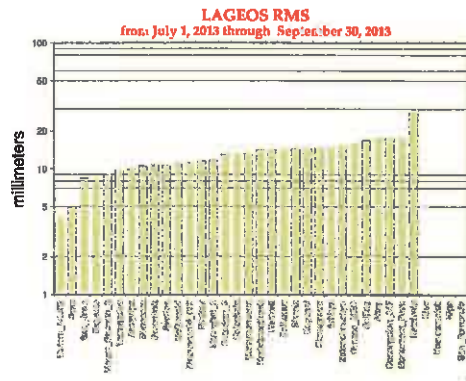
Figure 3. The graph shows the LAGEOS RMS values for the ILRS stations during the 3rd quarter of 2013.

To further aid analysis by station operators and users, the ILRS Central Bureau generates data plots summarizing station performance and environmental parameters. These plots, created for each active station in the network, are accessible through the Network section of the ILRS website (http://ilrs.gsfc.nasa.gov/network/stations/). After selecting a station from the List of Stations in the left navigation, the user is presented with several tabs. The "LAGEOS Performance" tab will yield several types of plots created to summarize station performance on LAGEOS: RMS, calibration RMS, system delay, observations per normal point, and full-rate observations per pass. For each parameter, two plots are generated, one covering the last year and a second showing the information from 2000 to the present.

The "Meteorological Data" tab within each station's section of the ILRS website presents plots of environmental parameters: temperature, humidity, and pressure; plots spanning the last year and since 2000 are also created for this category. Examples of the graphs showing station performance and summarizing meteorological data are shown in Figures 4 through 7.
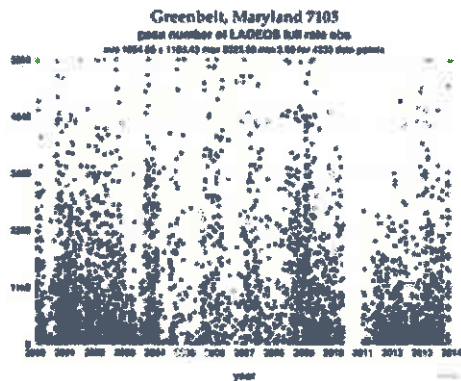

Figure 4. An example of performance plots available for stations in the ILRS network. Here the number of full-rate observations per normal point for the last ten years is shown for the Greenbelt MD station.
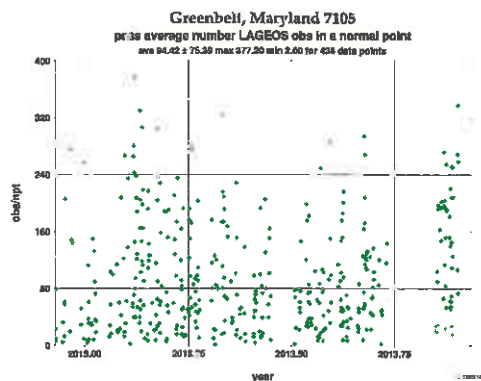
Figure 5. Number of LAGEOS observations per normal point for the Greenbelt MD station in 2013 .
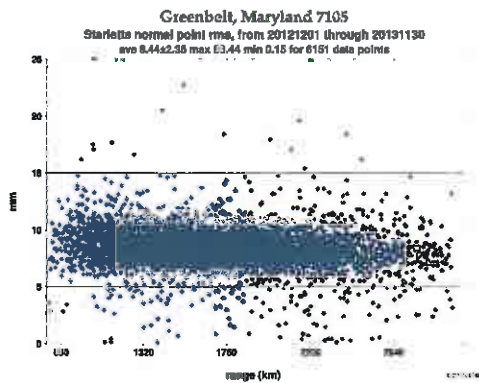
Figure 6. The graph shows an example of statistics on tracked satellites. Here the normal point RMS for Starlette as a function of satellite range for the Greenbelt MD station is shown.
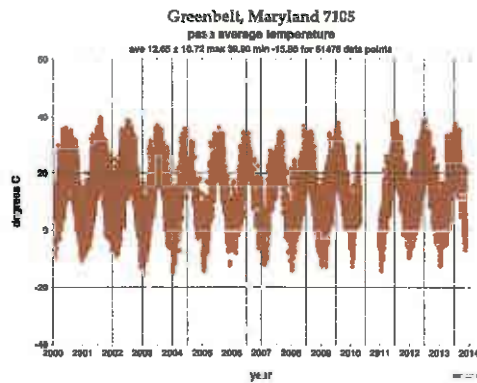
Figure 7. The graph shows the average temperature for the last ten years at the Greenbelt MD station.

The "Satellite Data Info" tab shows a table of plots providing statistics on all currently tracked satellites as a function of time for the station; full-rate observations per normal point and normal point rms are also computed as a function of range and time.

These plots of satellite statistics are consolidated into two other sections of the ILRS website. LAGEOS performance and station meteorological data plots are listed for all stations under the System Performance section of the site (http://ilrs.gsfc.nasa.gov/network/system_performance/station_LAGEOS_and_met_info.html). Furthermore, a matrix containing plots of all stations tracking a selected mission, station vs. mission, are accessible through the Satellite Missions section (http://ilrs.gsfc.nasa.gov/missions/satellite_missions/index.html).

ILRS SiteLogViewer

The ILRS Central Bureau has developed a web-based application for the enhanced display and comparison of the contents of the ILRS site logs. Through the SiteLogViewer application, users can:

- display and browse through a complete site log, section by section
- display contents of one section for all site logs
- search the contents of one section of a site log for a specified parameter value

The SiteLogViewer application is accessible within the Networks section of the ILRS website, under site information (http://ilrs.gsfc.nasa.gov/SiteLogViewer/). As part of their ILRS operational compliance, stations in the ILRS network complete and update official site logs that describe the system's configuration, environment, and contact information. These logs are also accessible on the individual station pages and now through the new web application, the SiteLogViewer.

The initial page of the SiteLogViewer application displays the two selection options, selecting to view the full site log or a particular section of the site log. Figure 8 shows the resulting page for opting to view the full site log for the station in Greenbelt MD (GODL). The page shows the location of the selected site on a zoom-able map and a picture of the station. The bottom half of the page lists the sections of the site log on the left and the contents of that section on the right. The

user can then select one of the sections to view the contents in a scrollable window. To view another site log or view a section of all logs, the user then presses the "New Query" button.
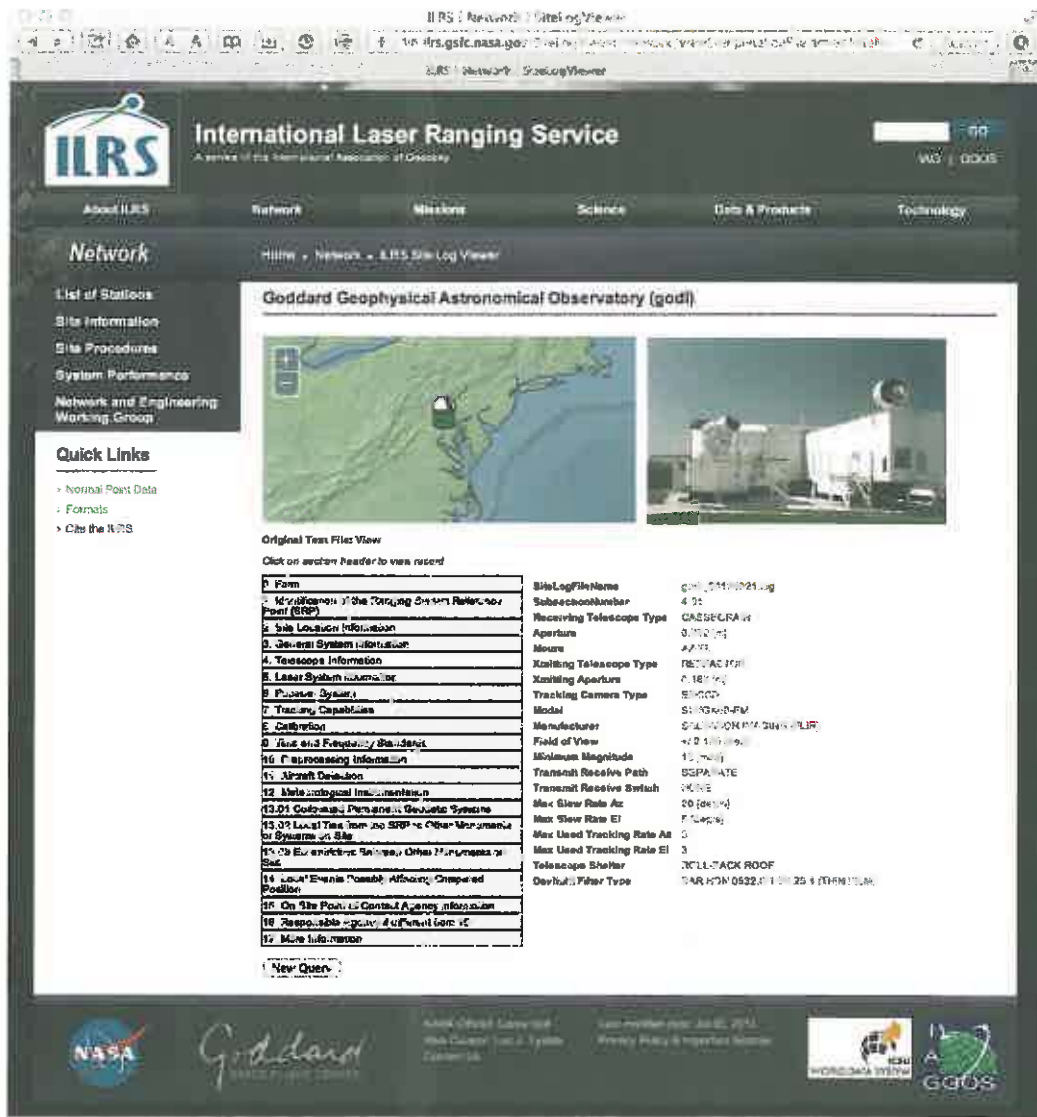

Figure 8. An example of output from the SiteLogViewer application showing how to browse a full site log after selecting an ILRS site of interest.

Alternatively, the user can select to view a particular section from all site logs; the results can be further subseted by picking a field and value within the section. With this option, the user can view the contents of a section of the ILRS site log for all stations in a scrollable display, vertically for all sites and horizontally for fields within the selected section of the site log. The user can further subset the information in the selected section by picking a field from a drop down list of topics. In Figure 9, an example is shown for one portion of the ILRS site log, the "Aircraft Detection" section. Here the user has selected the "Detection Type" field (one of the fields under the "Aircraft Detection" section in the log). A list of the possible entries for the "Detection Type" field in that section appears and the user selected "RADAR" to determine what sites in the network use radars for aircraft detection.

Figure 9. An example of output from the SiteLogViewer application showing those site logs with entries of "RADAR" for the "Aircraft Detection" field in the "Time and Frequency Standard" section of the site log.

The query then results in a page that lists the fields within the "Aircraft Detection" section of the site log for only those sites specifying a radar as the method for aircraft detection. Pressing the "Get CSV" button will create a file of these results in comma-separated values format for use in other, e.g., spreadsheet, applications.

Future Developments

The next phase in the development of the SiteLogViewer will be to add site logs from the other services (i.e., IDS/DORIS, IGS/GNSS, and IVS/VLBI) to the application, allowing users to choose a technique and then browse full site logs and selected site log sections. A map-based selection option will also be added.

Users are encouraged to provide any feedback on the SiteLogViewer application or the ILRS website in general to: ilrs-web@lists.nasa.gov.