

ILRS Web Site Update: Using the ILRS Web Site to Monitor Performance

C. Noll (1), M. Torrence (2)

(1) NASA Goddard Space Flight Center, Code 690, Greenbelt, MD 20771, USA
 Carey.Noll@nasa.gov/Fax: 301-614-6015

(2) SGT, Inc., 7701 Greenbelt Road, Suite 400, Greenbelt, MD 20770, USA
 mark.h.torrence.1@gsfc.nasa.gov

Abstract

The ILRS Web site, <http://ilrs.gsfc.nasa.gov>, is the central source of information for all aspects of the service. The Web site provides information on the organization and operation of ILRS and descriptions of ILRS components, data, and products. Furthermore, the Web site and 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. This poster will detail recent improvements made in several areas of the ILRS Web site including specific examples of key sections and webpages.

Station Performance Report Cards

The ILRS performance “report cards” are issued quarterly by the ILRS Central Bureau (CB). These reports tabulate the previous 12 months of data quality, quantity, and operational compliance by station. The statistics are presented in two tables (one for artificial satellites and a second for lunar reflectors) by station and sorted by total passes in descending order. 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 Web site. An excerpt from Table 1 of the 2008 second quarter report card (01-Jul-2007 through 30-Jun-2008), is shown in Figure 1; the full report card can be found on the ILRS Web site at: http://ilrs.gsfc.nasa.gov/stations/site_info/global_report_cards/perf_2008q2_wLLR.html.

Site Information		Data Volume									Data Quality		
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Location	Station Number	LEO pass Tot	LAGEOS pass Tot	High pass Tot	Total passes	LEO NP Total	LAGEOS NP Total	High NP Total	Total NP	Minutes of Data	Cal. RMS	Star RMS	LAG RMS
Baseline		1000	400	100	1500								
Yarragadee	7090	9638	1988	1373	12999	204021	25377	12731	242129	166320	4.7	8.9	9.4
San_Juan	7406	5255	1082	1303	7640	84520	13173	8659	106352	92649	13.1	13.9	15.2
Mount_Stromlo_2	7825	5297	1274	484	7055	70033	12860	3586	86479	66201	3.1	4.2	5.8
Graz	7839	4651	740	519	5910	92498	8291	4272	105061	61353	1.9	3.4	5.2
Wetzell	8834	4094	1033	411	5538	43417	7905	1727	53049	38825	4.6	12.1	19.1
Herstromcex	7840	3881	888	374	5143	61069	10396	1582	73047	44178	7.3	12.1	15.4
Changchun	7237	3954	593	570	5117	44205	4953	2970	52128	37099	13.0	13.8	16.7

Figure 1. Table 1 of the ILRS Report Card for the second quarter of 2008.

Summary plots for the values in columns 3-14 of Table 1 of each report card are also linked and available. Examples of selected plots are shown in Figure 2.

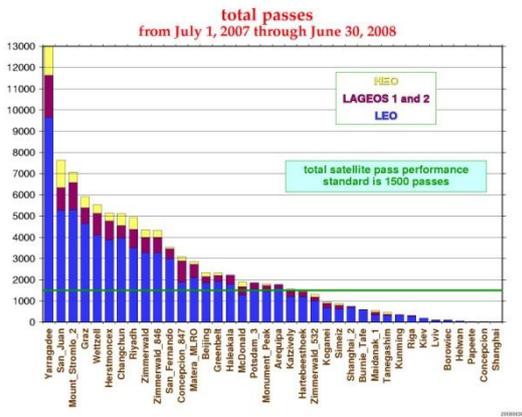


Figure 2a. Total passes for the second quarter of 2008.

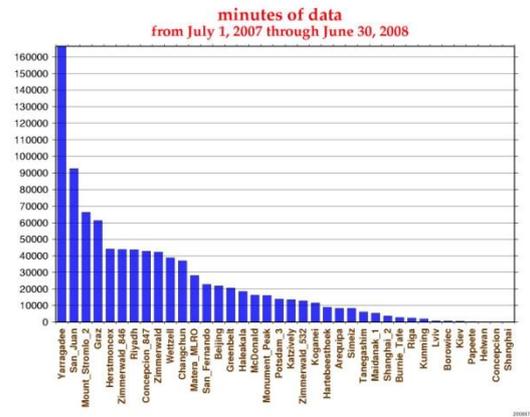


Figure 2b. Total minutes of data for the second quarter of 2008.

A third table in each ILRS report card summarizes the orbital analysis of the data as performed by five AC/AACs (DGFI, Hitotsubashi University, JCET, MCC, and the Shanghai Astronomical Observatory). An example of this table (Table 2) is shown in Figure 3; Figure 4 shows an example weekly report from Hitotsubashi University used in the computation of this summary table.

Site Information		DGFI Orbital Analysis				Hitotsubashi Univ. Orbital Analysis				JCET Orbital Analysis				MCC Orbital Analysis				SHAO Orbital Analysis			
Station Location	Station Number	LAG NP RMS (mm)	short term (mm)	long term (mm)	% good LAG NP	LAG NP RMS (mm)	short term (mm)	long term (mm)	% good LAG NP	LAG NP RMS (mm)	short term (mm)	long term (mm)	% good LAG NP	LAG NP RMS (mm)	short term (mm)	long term (mm)	% good LAG NP	LAG NP RMS (mm)	short term (mm)	long term (mm)	% good LAG NP
Baseline		10.0	20.0	20.0	95	10.0	20.0	20.0	95	10.0	20.0	20.0	95	10.0	20.0	20.0	95	10.0	20.0	20.0	95
Yarragadee	7090	2.8	23.8	3.6	100.0	1.7	8.4	2.1	100.0	3.1	18.1	3.6	99.8	2.1	10.7	1.8	98.6	2.1	12.7	1.5	95.6
San_Juan	7406	6.3	34.3	5.5	99.4	4.6	22.7	10.4	99.2	5.4	18.5		94.3	6.3	19.3	10.9	96.5	5.1	26.2	3.4	94.2
Mount_Stromlo_2	7825	2.9	20.2	5.5	99.2	2.8	8.8	5.6	99.7	3.6	16.6	3.0	99.3	3.2	14.7	4.5	96.0	2.5	13.0	2.7	96.0
Graz	7839	1.7	13.4	4.1	100.0	1.1	6.8	2.3	100.0	2.1	15.1	4.0	99.5	2.2	6.5	3.2	98.9	1.2	11.5	2.5	96.1
Wetzell	8834	3.2	24.2	16.0	99.9	3.1	13.4	8.8	99.8	3.6	17.4	4.4	97.5	3.1	13.2	1.9	97.0	2.4	21.5	4.7	95.6
Herstmoncex	7840	2.9	22.2	7.3	100.0	2.1	8.4	2.5	100.0	3.1	15.3	4.4	99.4	2.8	8.4	1.7	98.1	2.0	13.9	1.8	94.6
Changchun	7237	7.2	28.5	9.6	100.0	7.0	22.2	17.3	100.0	6.4	22.2	6.0	97.6	7.6	22.0	6.4	94.0	5.9	28.1	9.6	98.4

Figure 3. Table 3 of the ILRS Report Card for the second quarter of 2008.

The report card is used to assess the performance of the stations in the ILRS network. The CB maintains lists of the operational and associate stations, classified according to the results posted in the ILRS report cards. Performance guidelines, defined on the ILRS Web site, cover yearly data quantity (number of passes), data quality (normal point precision and short and long term bias stability) and operational compliance factors (timely data delivery, correct data formatting, required station documentation). Current operational vs. associate status can be viewed on the ILRS Web site at: <http://ilrs.gsfc.nasa.gov/stations/>.

```
# @createdAt 2008/08/13 00:31:48
#
# each line contains:
# sat = 4-char satellite name
# site = 4-char site name (CDP ID)
# date/time = pass starting time
# dur = pass duration (min)
# rb = estimated range bias (mm) with 1-sigma error
# tb = estimated time bias (microsec) with 1-sigma error
# prec = post-fit scattering rms (mm)
# bad/total = number of bad/total normal-points
# rms = single-shot rms (mm)
# pres/temp/humi = pressure (hPa), temperature (K) and humidity (%)
# sdelay = applied system delay (mm)
# shft = system delay shift (mm)
# rms = calibration single-shot rms (mm)
# cfg = system configuration flag; SCH and SCI
# r = data release flag
# wlen = laser wavelength (nm)
#
# 1824 = KIEV
# sat site date time dur rb mm error tb us error prec bad total rms pres temp hum sdelay shft rms cfg r wlen
ENVI 1824 2008/07/29 18:38 5 -141 ( 65 ) -56.2 ( 15.8 ) 28 0 / 16 41 998.6 289.1 59 16638 19 39 0 2 0 532
ERS2 1824 2008/07/29 19:09 4 -101 ( 71 ) -60.3 ( 19.5 ) 28 0 / 19 42 998.6 288.5 61 16637 14 39 0 2 0 532
ENVI 1824 2008/07/29 20:19 4 21 ( 148 ) -54.9 ( 72.5 ) 111 1 / 8 45 999.3 288.3 60 16637 14 39 0 2 0 532
ERS2 1824 2008/07/29 20:51 1 -9 ( ----- ) ----- ( ----- ) 0 1 / 2 39 999.3 288.0 61 16644 0 42 0 2 0 532
STEL 1824 2008/07/30 00:04 3 -98 ( 46 ) -33.5 ( 19.3 ) 14 0 / 9 42 999.3 286.2 71 16637 22 43 0 2 0 532
LAG1 1824 2008/07/30 00:41 2 -36 ( 79 ) ----- ( ----- ) 62 0 / 3 53 999.9 286.0 71 16638 20 43 0 2 0 532
ENVI 1824 2008/07/30 18:08 4 -25 ( 23 ) -43.2 ( 7.0 ) 5 1 / 8 42 996.6 291.4 51 16554 0 25 0 2 0 532
LAG2 1824 2008/07/30 18:37 14 223 ( 52 ) -22.4 ( 85.6 ) 14 0 / 9 69 996.7 291.3 51 16554 0 25 0 2 0 532
LAG1 1824 2008/07/30 19:09 20 178 ( 60 ) -38.1 ( 53.6 ) 32 0 / 12 58 996.8 291.3 52 16554 0 25 0 2 0 532
ENVI 1824 2008/07/30 19:46 5 -100 ( 35 ) -51.3 ( 8.8 ) 17 0 / 24 44 997.0 291.2 53 16554 0 25 0 2 0 532
ERS2 1824 2008/07/30 20:21 1 -317 ( 118 ) ----- ( ----- ) 31 0 / 6 54 997.3 290.1 53 16554 0 25 0 2 0 532
LAG1 1824 2008/07/30 22:45 22 15 ( 67 ) -74.5 ( 41.1 ) 18 1 / 11 55 997.0 288.5 59 16631 0 29 0 2 0 532
ENVI 1824 2008/07/31 19:20 1 -450 ( 14 ) ----- ( ----- ) 4 0 / 7 35 1002.6 290.6 58 16384 0 36 0 2 0 532
ERS2 1824 2008/07/31 19:45 5 -130 ( 22 ) -54.4 ( 4.3 ) 9 0 / 15 39 1002.6 290.5 59 16377 15 30 0 2 0 532
STEL 1824 2008/08/01 00:50 6 -89 ( 44 ) -29.3 ( 8.8 ) 25 0 / 14 31 1002.6 287.9 68 16364 10 28 0 2 0 532
STRL 1824 2008/08/01 01:18 3 -65 ( 50 ) -43.1 ( 21.9 ) 13 0 / 8 30 1002.6 287.7 68 16364 10 28 0 2 0 532
ENVI 1824 2008/08/01 18:45 2 -73 ( 6 ) ----- ( ----- ) 2 0 / 10 38 998.3 292.3 47 16395 0 29 0 2 0 532
:
:
```

Figure 4. Example of weekly station bias report from Hitotsubashi University.

Real-Time Daily Station Status Reports

Station status information is available on a daily and near-real time basis through the EUROSTAT utility. These reports allow the ILRS community to quickly view the status of the stations in the tracking network. ILRS stations can automatically upload status information to EUROSTAT (maintained by the Astronomical Institute of the University of Berne, AIUB) that is then used to generate an overview of the current activities of the tracking stations. The real-time report (Figure 5) shows actual station operations at that point in time. The daily report (Figure 6) provides a one-line entry per day showing if stations are currently staffed, operational, off-shift, off-line because of system problems, etc. The ILRS would like to encourage all stations in the network to participate in the daily and, if possible, real-time exchange of status information.

Station-Specific Performance Charts

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 Stations section of the ILRS Web site. After selecting a station, the user is presented with several tabs. The “LAGEOS Performance” tab will yield several 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. Examples of these plots for selected stations in the network are shown in Figure 7.

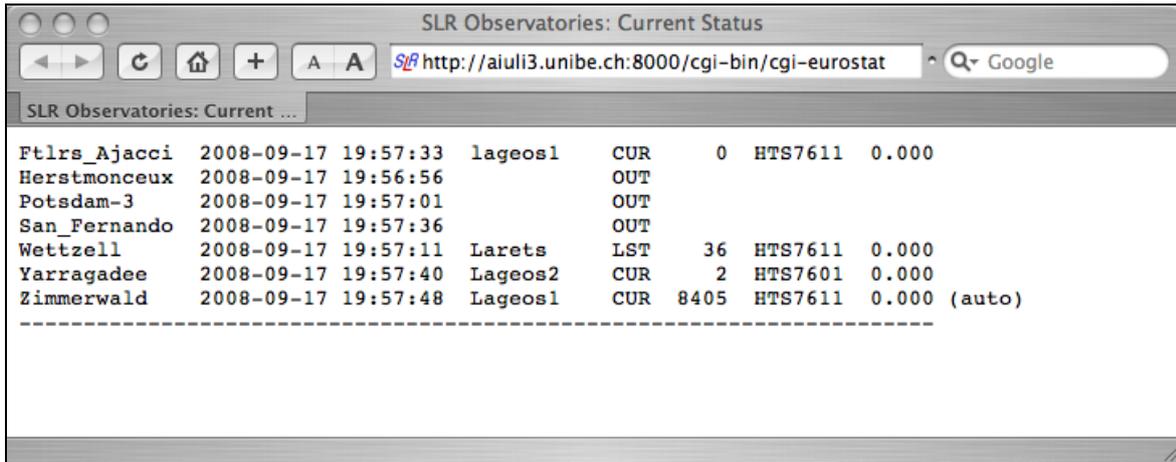


Figure 5. EUROSTAT real-time station status report.

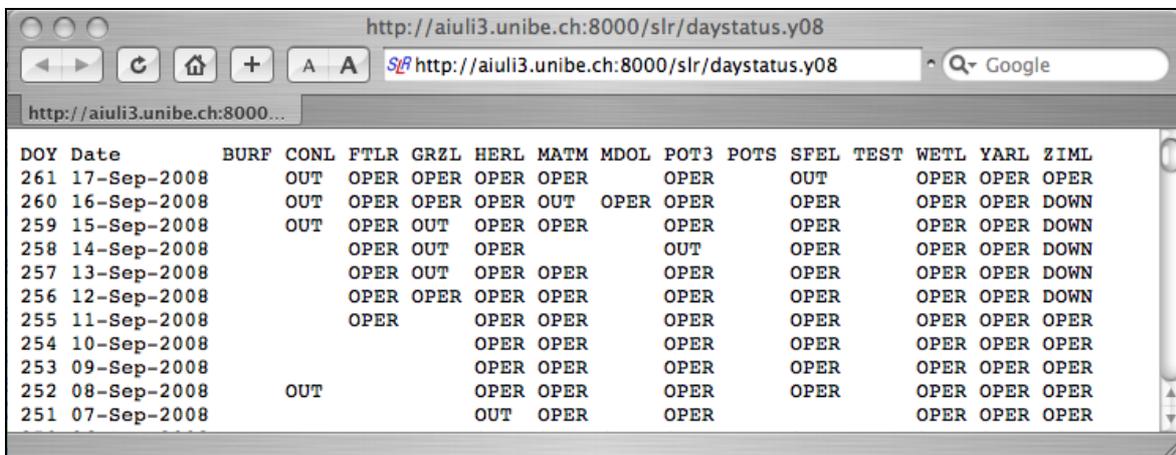


Figure 6. Daily station status report (for Sept. 17, 2008).

The “Satellite Data Info” tab shows a table of plots providing statistics on all currently tracked satellites as a function of time; full-rate observations per normal point and normal point rms are also computed as a function of range and time. Examples of these satellite plots for a selected station in the network are shown in Figure 8. These plots are also accessible through the Satellite Missions section of the ILRS Web site (organized by mission, matrix of all stations tracking mission).

The “Meteorological Data” tab 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 these met data plots are shown in Figure 9.

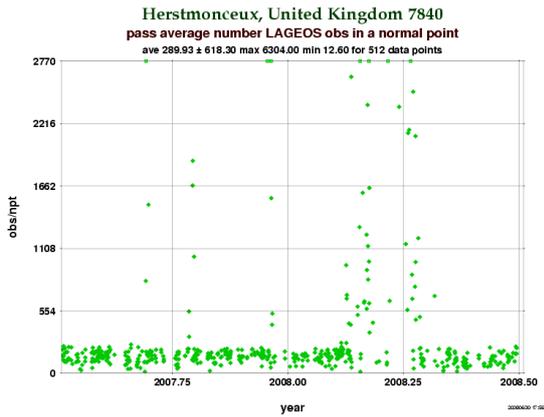


Figure 7a. Average number of LAGEOS observations per normal point at Herstmonceux for the past year.

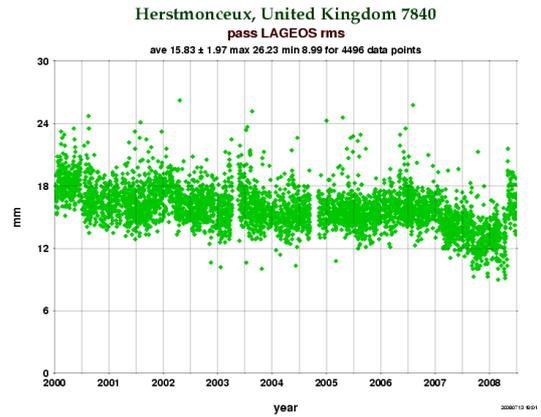


Figure 7b. Average LAGEOS pass RMS at Herstmonceux for the past ten years.

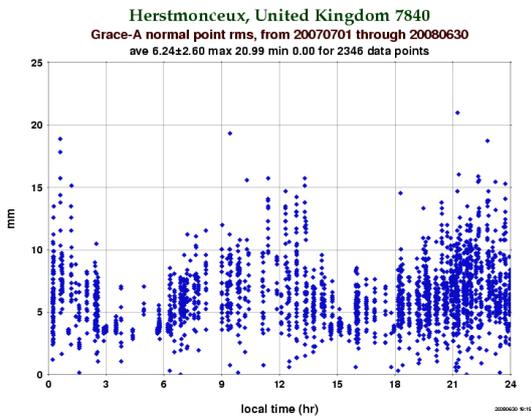


Figure 8a. GRACE-A normal point RMS at Herstmonceux (as a function of local time) for the past year.

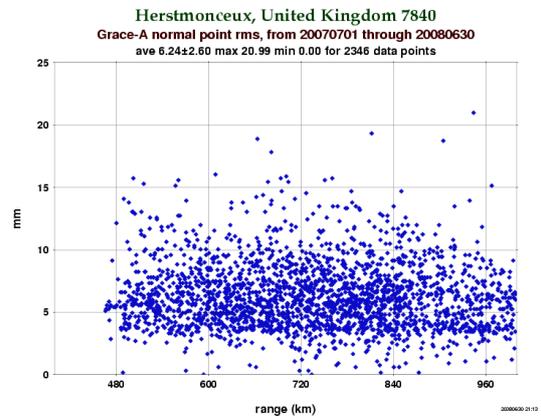


Figure 8b. GRACE-A normal point RMS at Herstmonceux (as a function of range) for the past year.

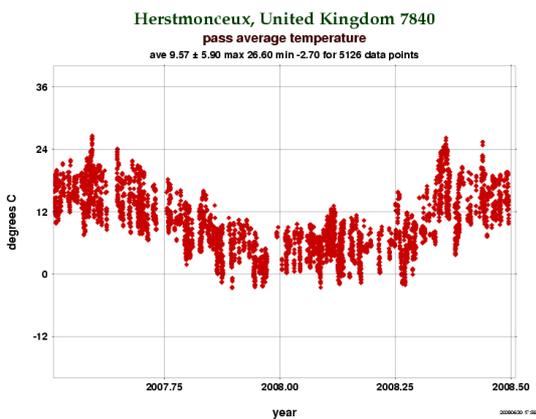


Figure 9a. Average temperature at Herstmonceux for the past year.

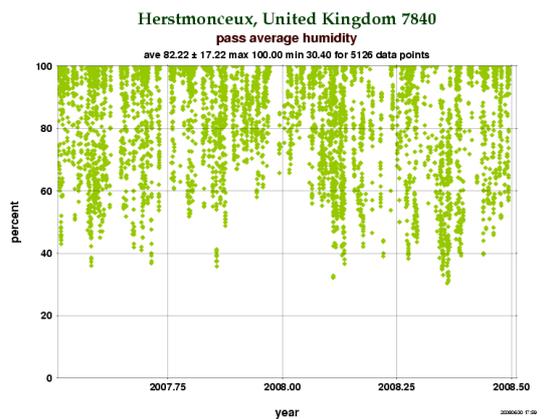


Figure 9b. Average humidity at Herstmonceux for the past year.