JCET Tools for the Assessment of the ILRS Stations' Performance

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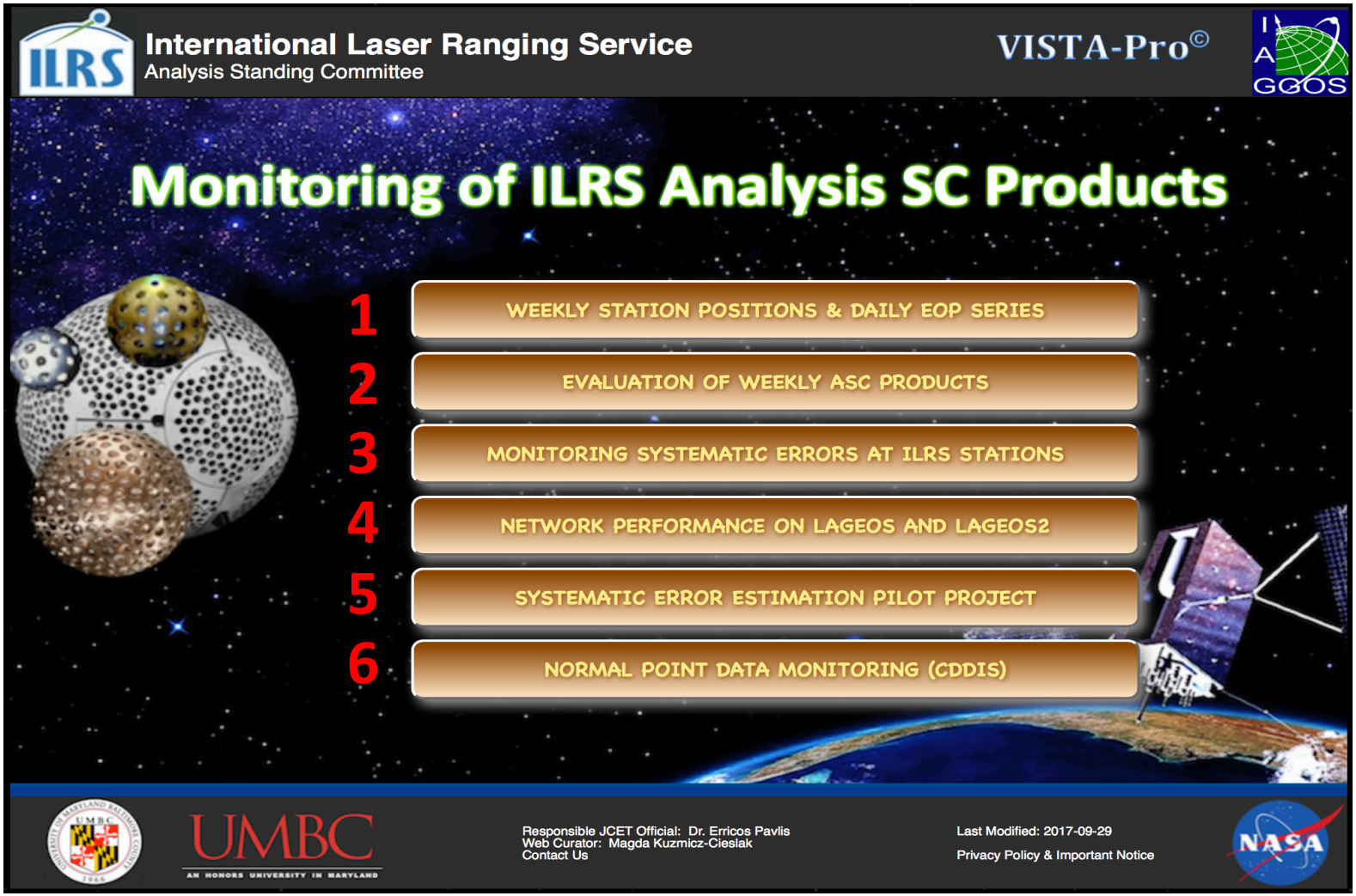
Riga, Latvia

JCET ASC Products Monitoring Portal

http://geodesy.jcet.umbc.edu/ILRS_AWG_MONITORING/



JCET SLR Data QC Products (1)

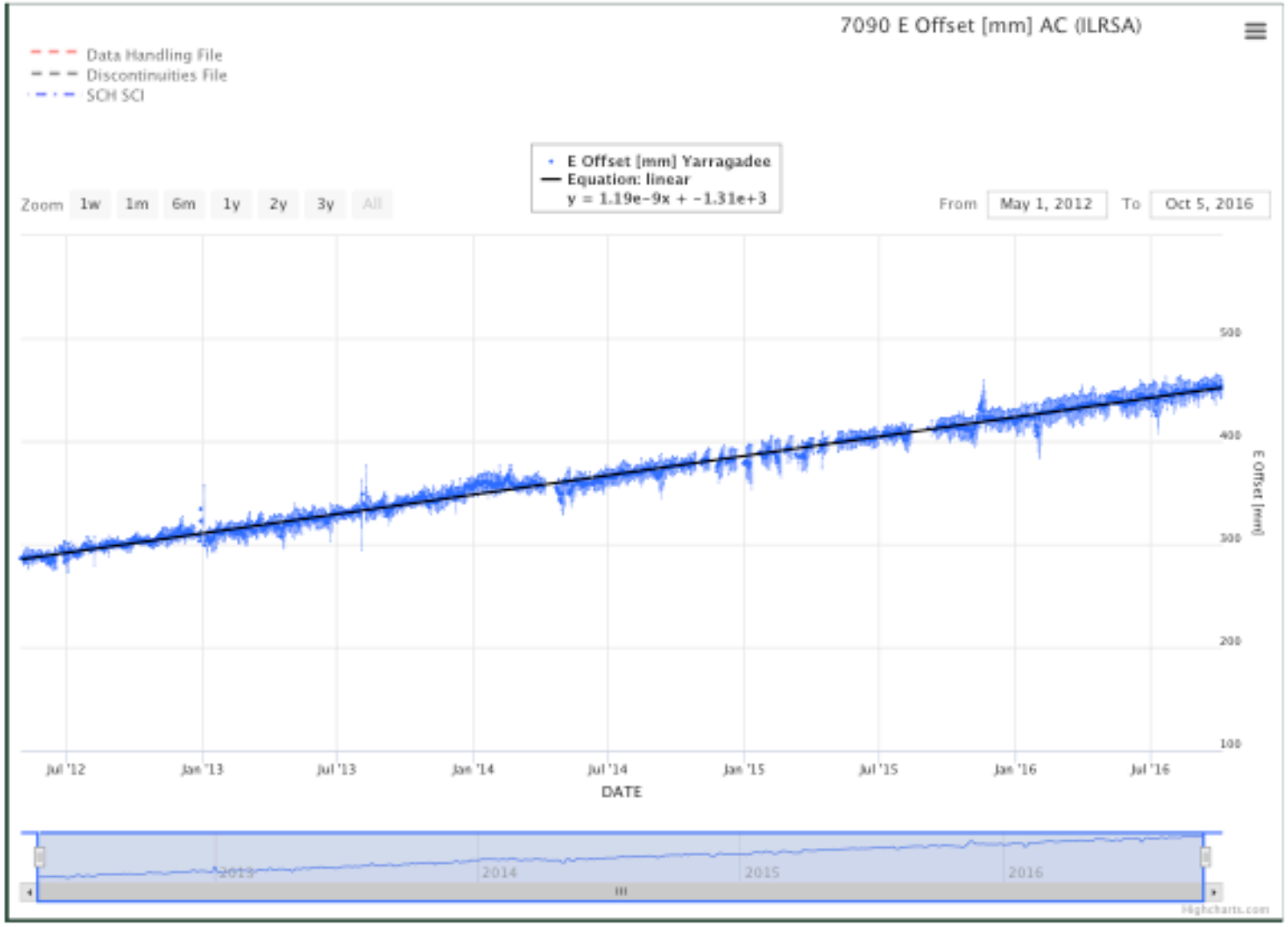
1. Daily/weekly product data base for QC of official ASC products (**for analysts**):
   - Station position (X-Y-Z or N-E-U) and EOP (PM & LOD) evolution over time
2. Evaluation of daily/weekly ASC results for QC of analysis and combination products (**for analysts**):
   - offset of position and EOP components from official TRF and IERS EOP series
   - Statistics of each AC performance wrt ITRF and to the combined products
3. Weekly analysis for (weekly-averaged) systematics for all active stations present in the weekly arc (**FIXED TRF**)
4. Tracking performance for all active sites in the GLTN (actual data yield compared to theoretically possible data per day)
5. **Station Systematic Error PP results online (preliminary version until this becomes an operational product; 2005 to 2008 results ONLY!!!)**
6. CRD-NP data content archived online, several parameters and flags are in the data base & can be visualized by station over time to identify changes in the configuration of stations or mistakes

JCET SLR Data QC Products (2)

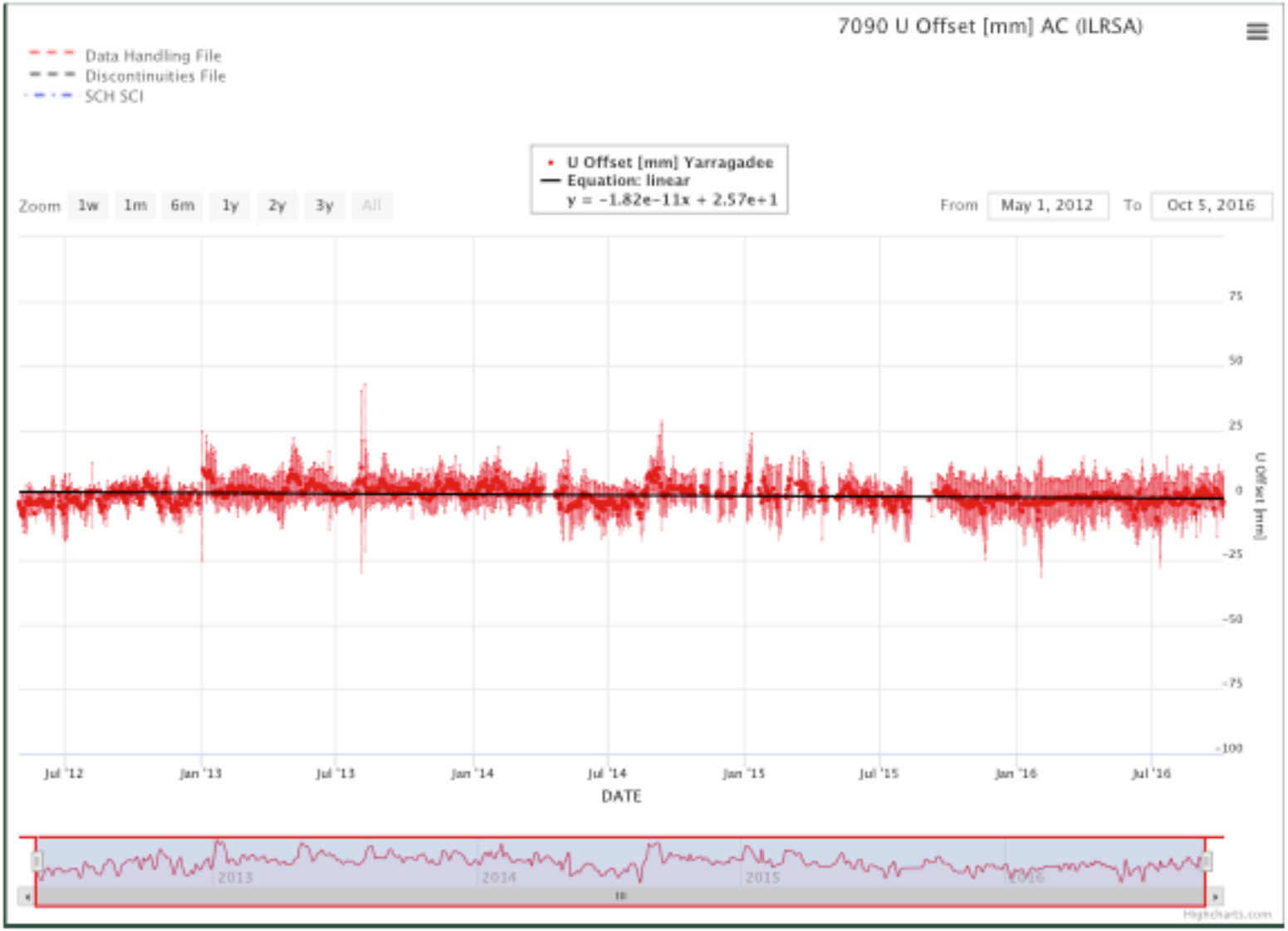
7. Data analysis with pass-by-pass estimation of systematics in LAGEOS & LAGEOS-2, and ETALON 1 & 2 (daily QC):
   - Report for the past 7 days (pass-by-pass systematics) generated daily
   - Report submitted to CDDIS and upon request to stations
   - Reports archived on CDDIS and JCET data base for visualization (see below)
8. ONLINE QC Viewer for all QC Reports including CODE and CNES reports (GNSS & Jason-2) with respect to SLRF2008 and SLRF2014 (incomplete):
   - **http://geodesy.jcet.umbc.edu/QC_SLRF2014/**
9. Station History Change Logs data base online, accessible via query:
   - **http://geodesy.jcet.umbc.edu/sch_sci_query/**
10. Quarterly Report Card data base and visualization website:
   - **http://geodesy.jcet.umbc.edu/ILRS_REPORT_CARD/**

(1) Example A: Yarragadee (7090) North

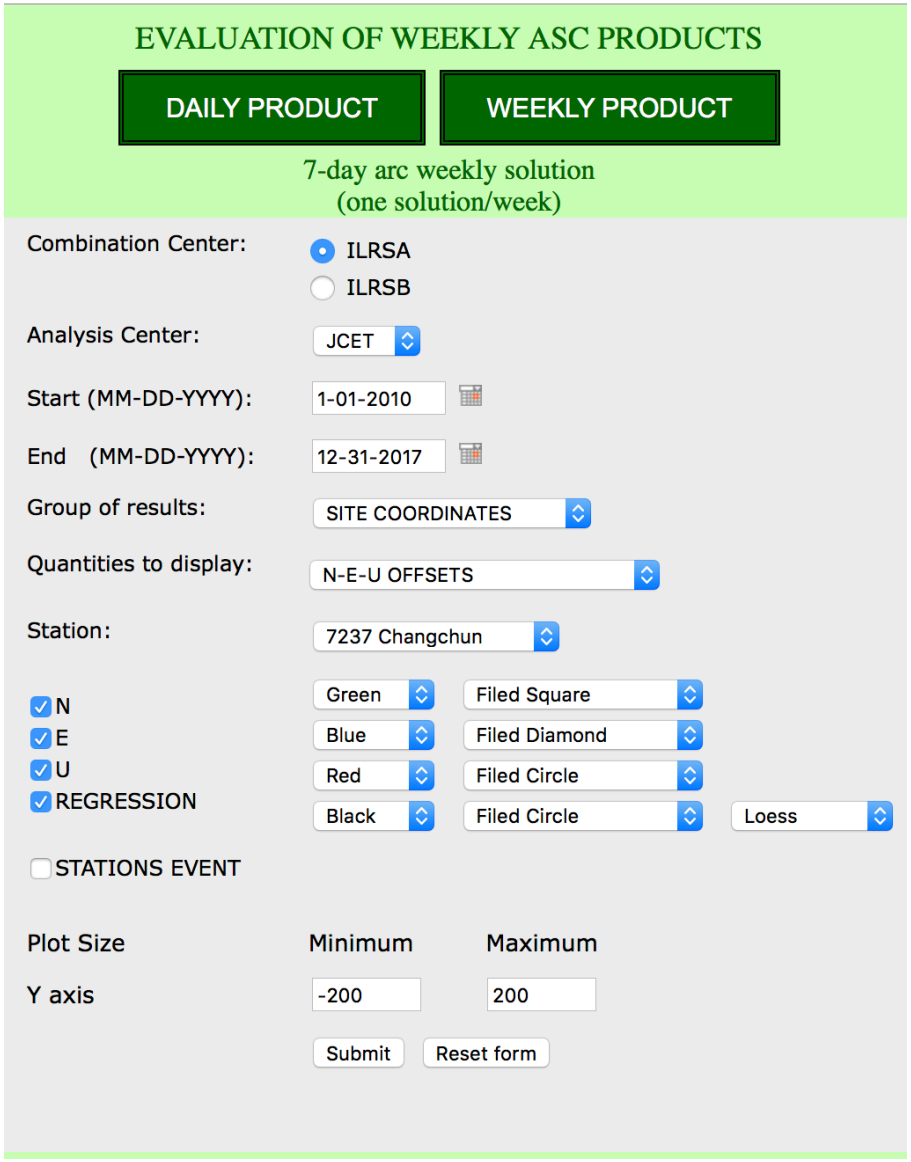
(1) Example B: Yarragadee (7090) East



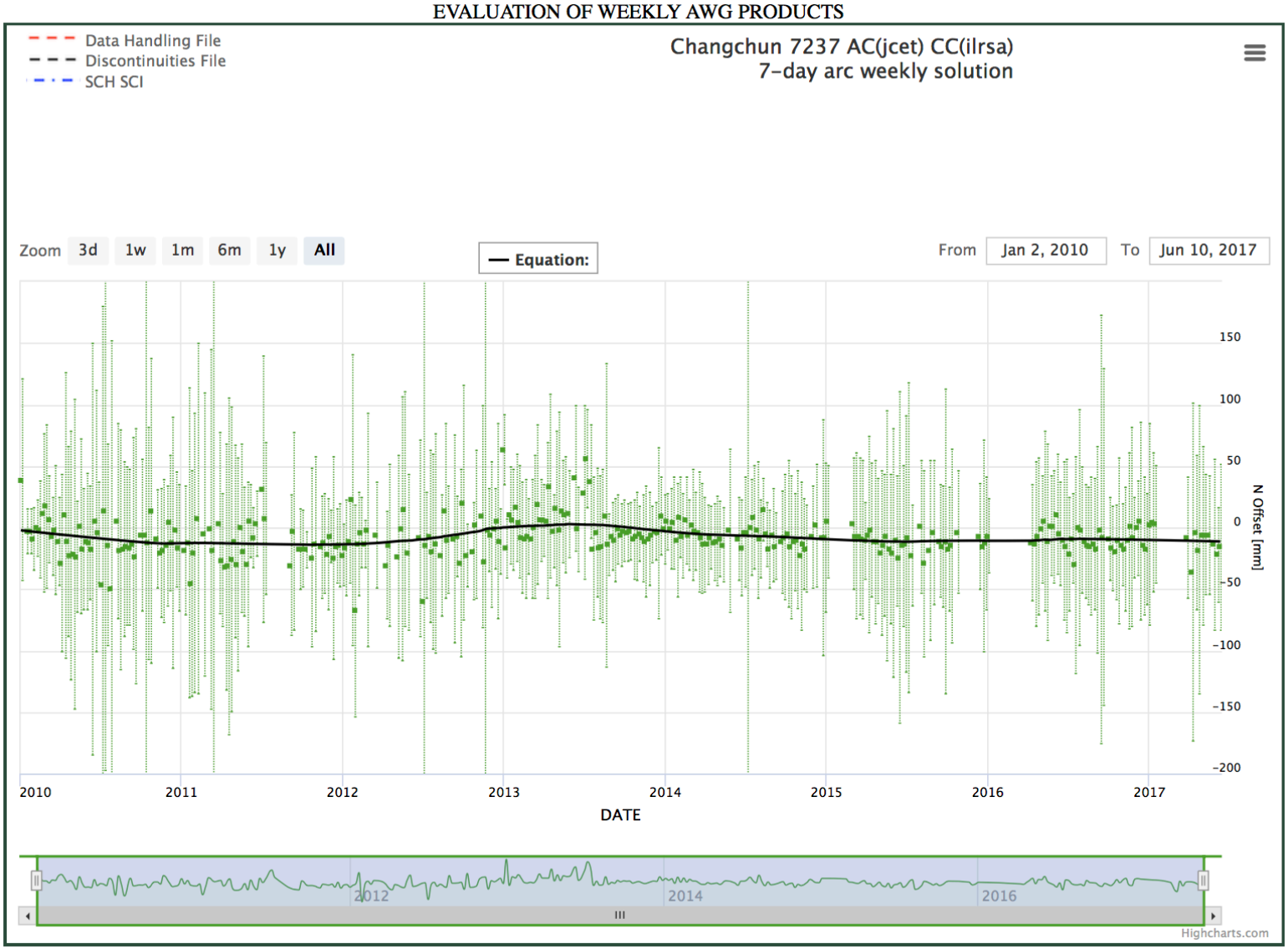
(1) Example C: Yarragadee (7090) Up



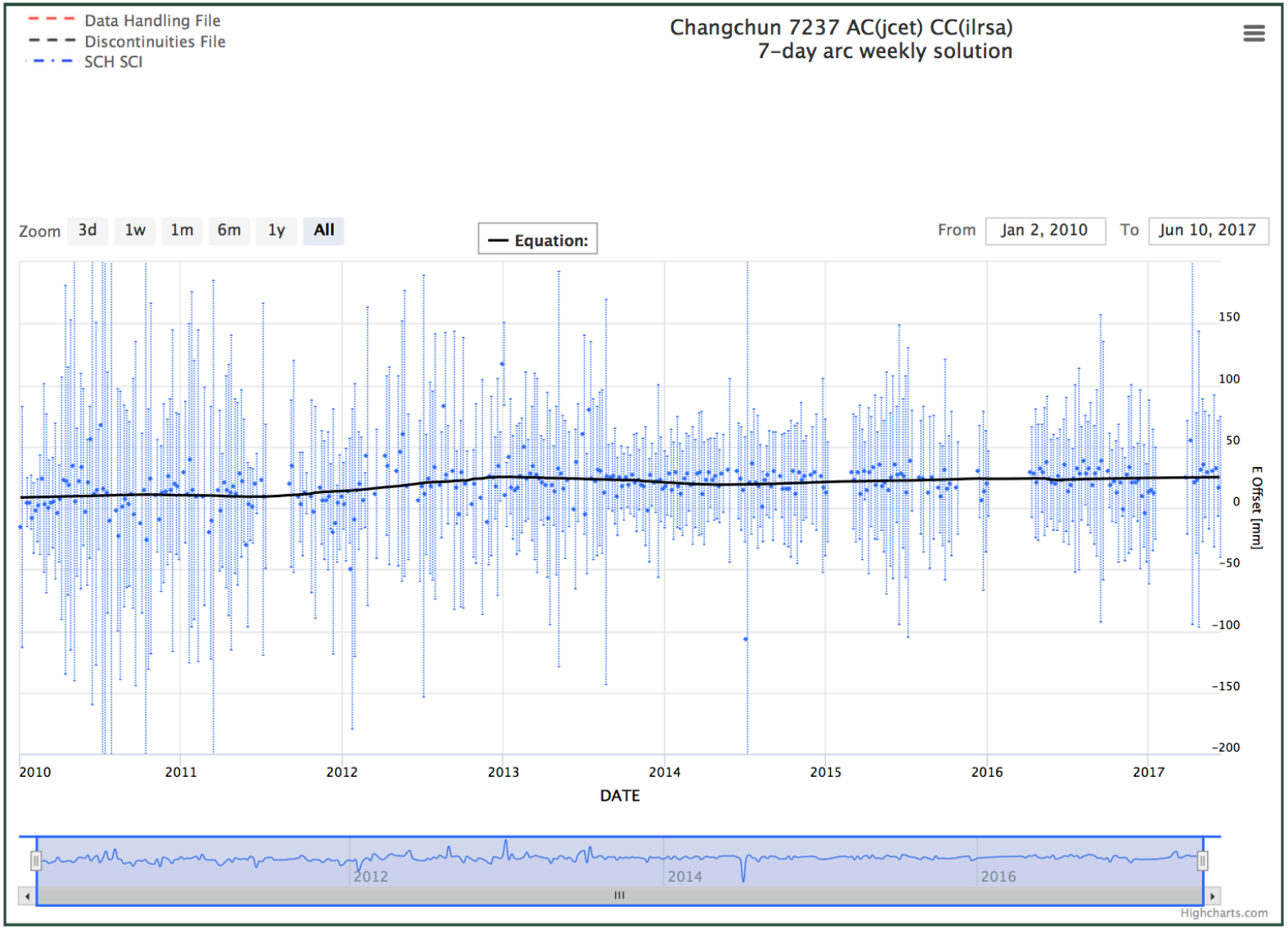
(2) Example D: Daily/Weekly ILRS Products



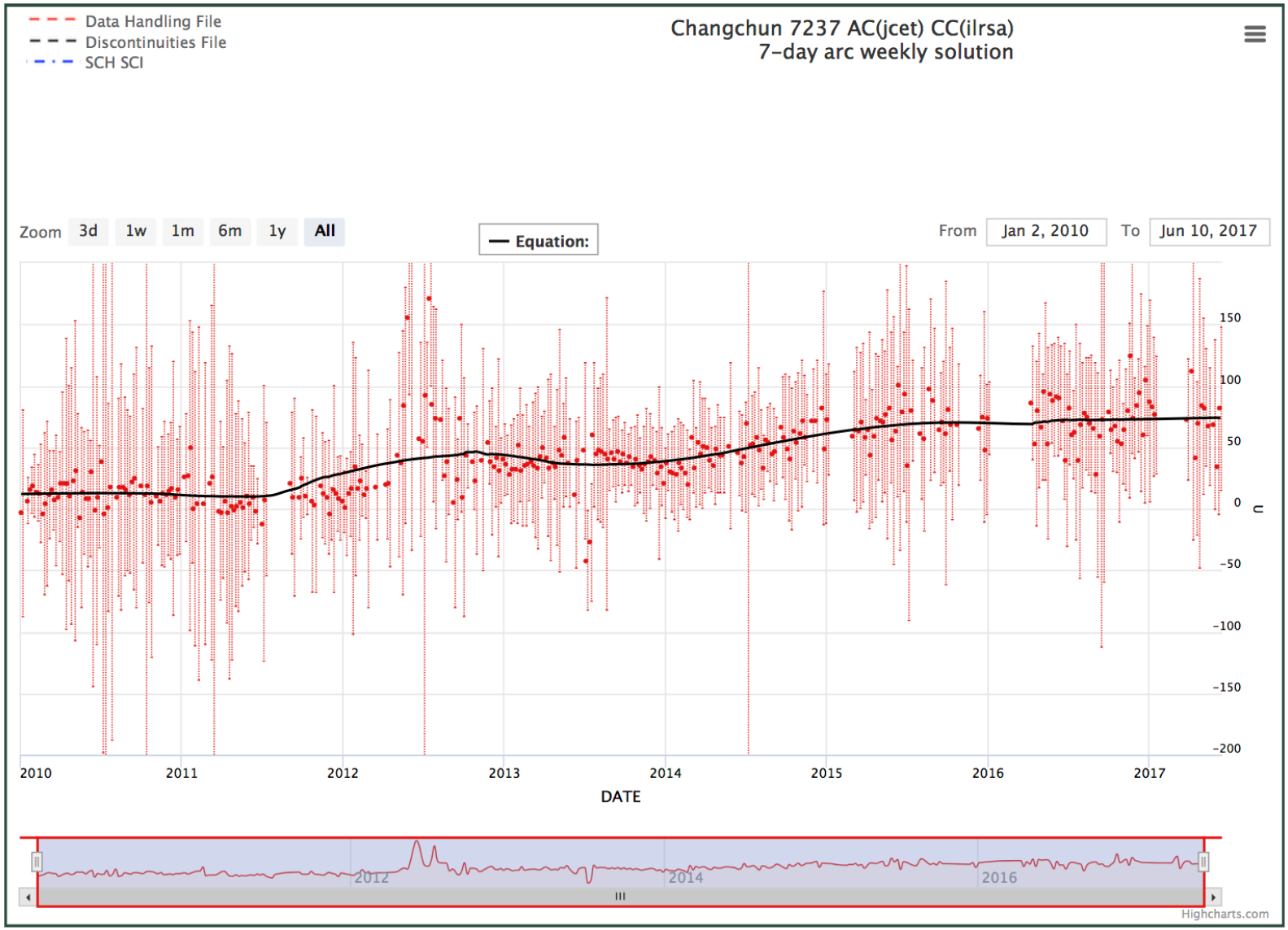
(2) Example B: Daily/Weekly ILRS Products – N



(2) Example B: Daily/Weekly ILRS Products – E

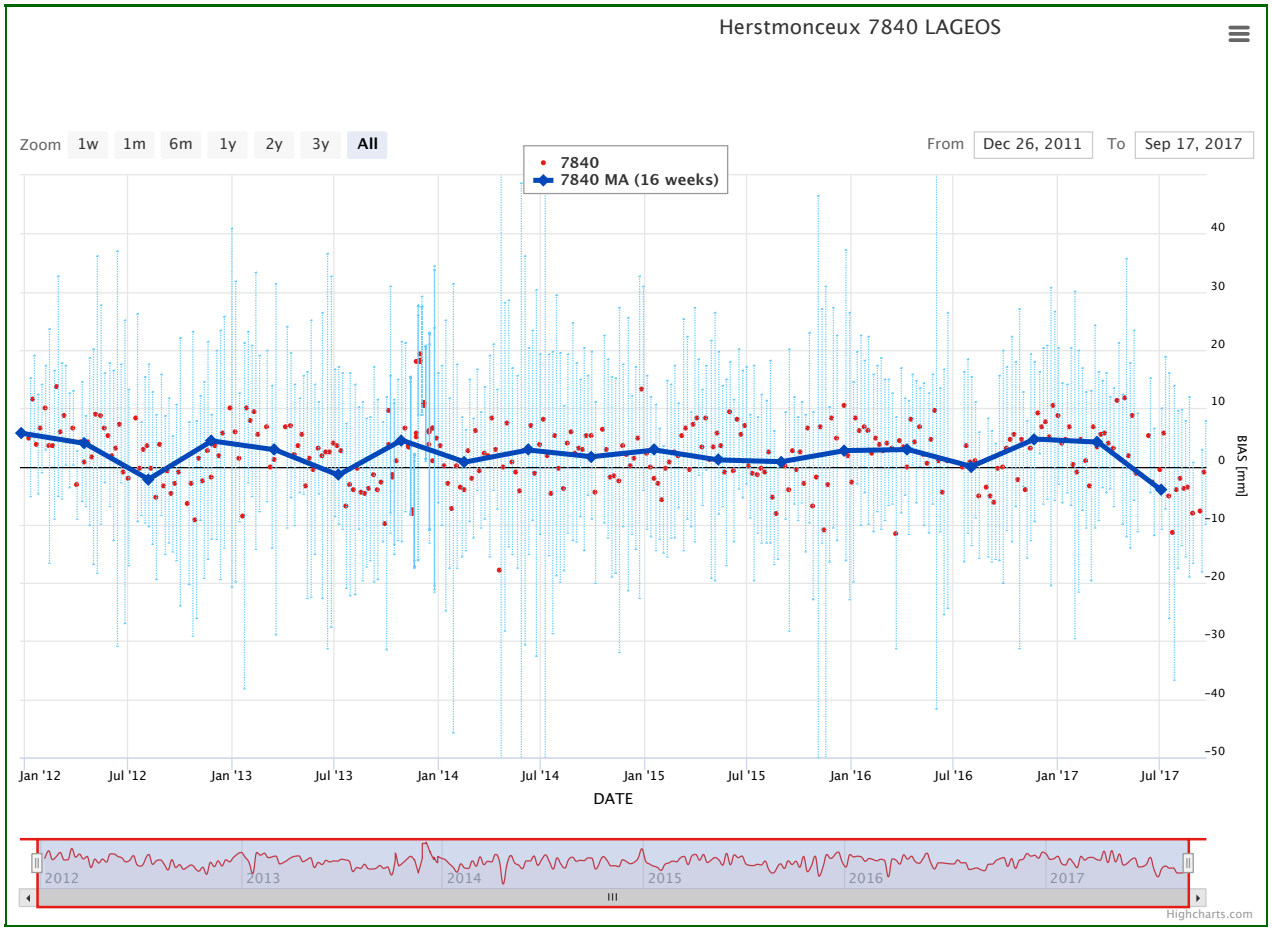


(2) Example B: Daily/Weekly ILRS Products – N



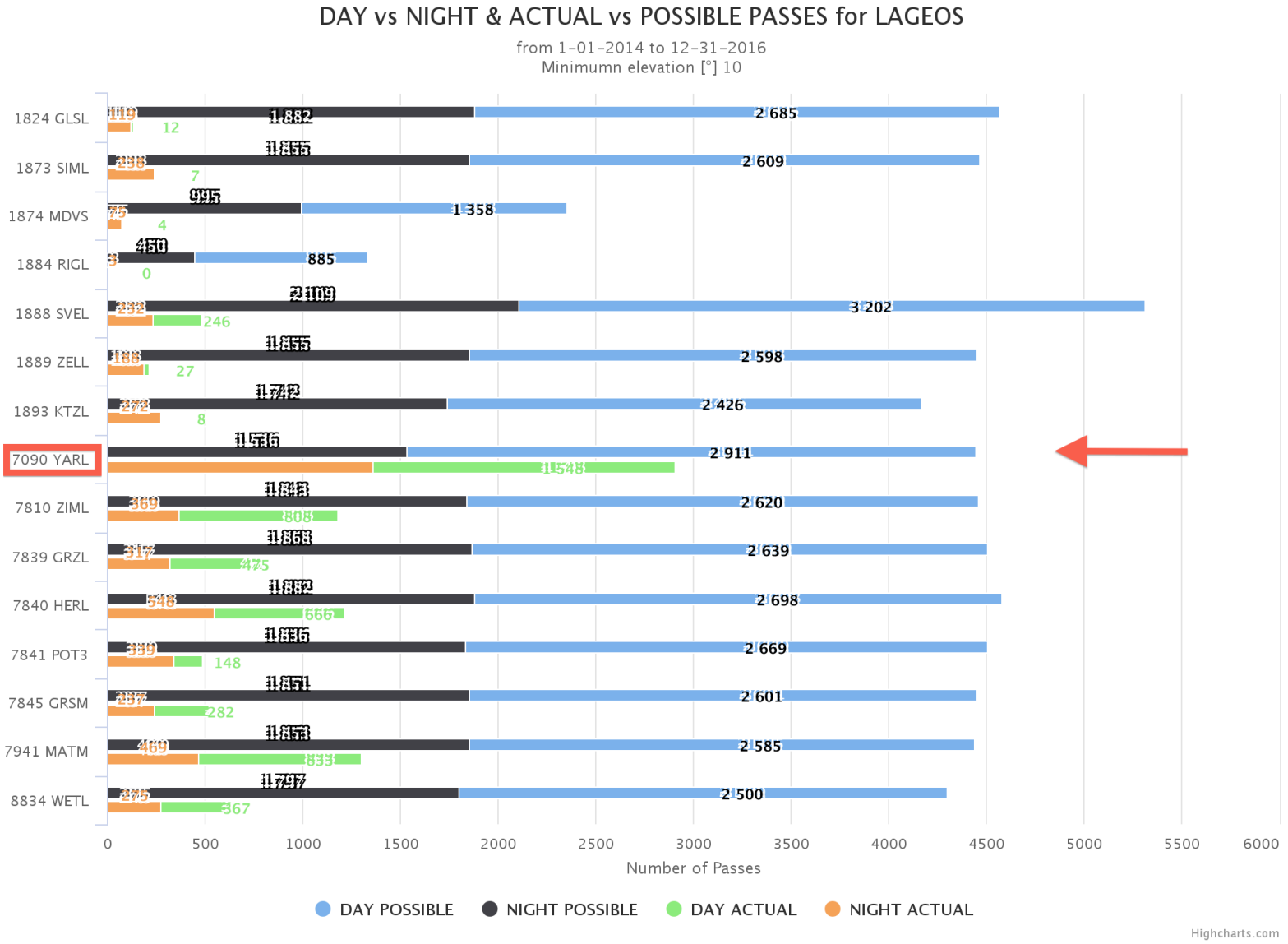
(3) Monitoring Systematics (FIXED TRF)

MONITORING SYSTEMATIC ERRORS AT ILRS STATIONS

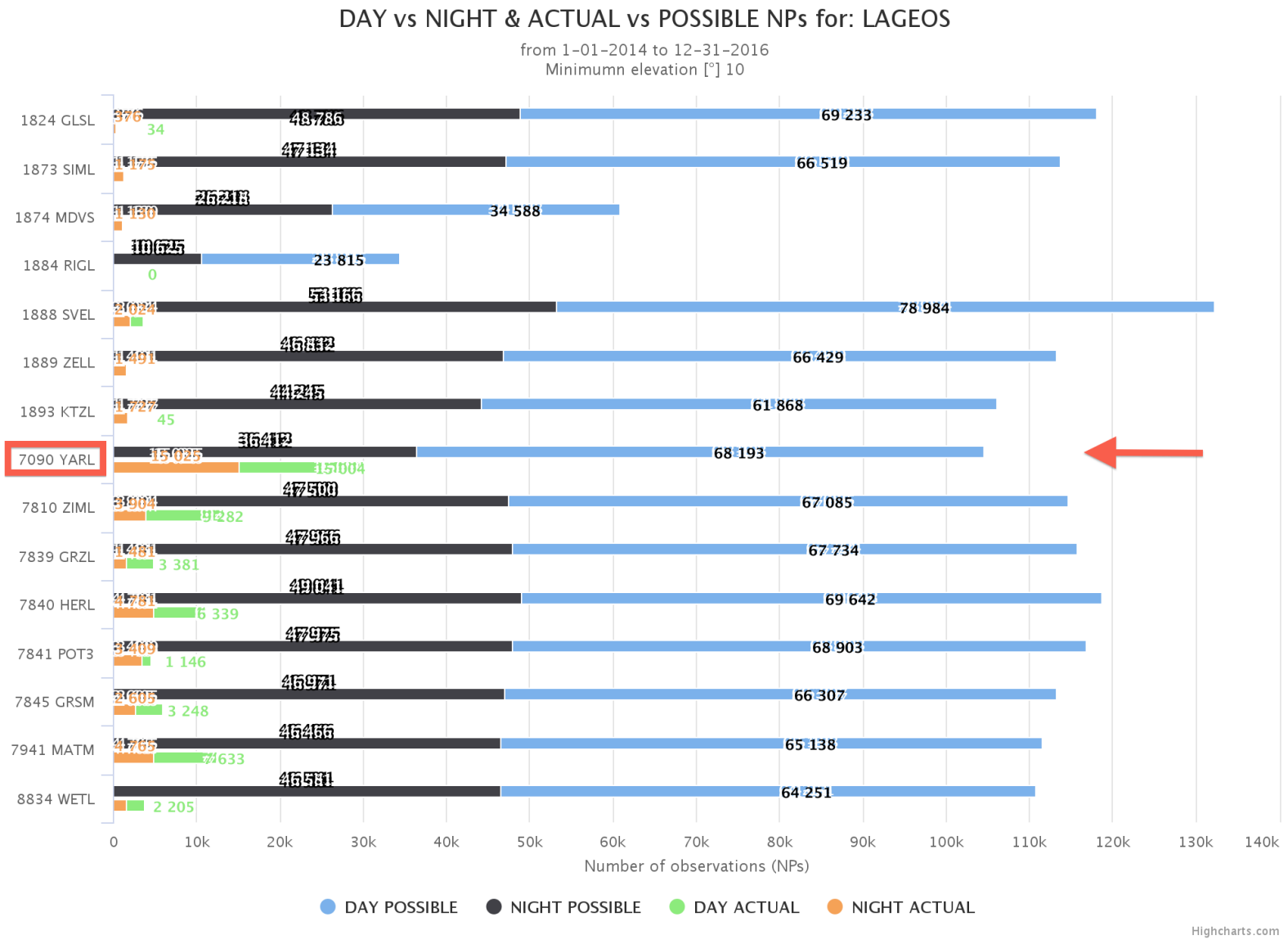


BIAS [mm] Herstmonceux 7840 LAGEOS
Mean/Std. Dev.: 2.29 ± 5.56 Count: 312

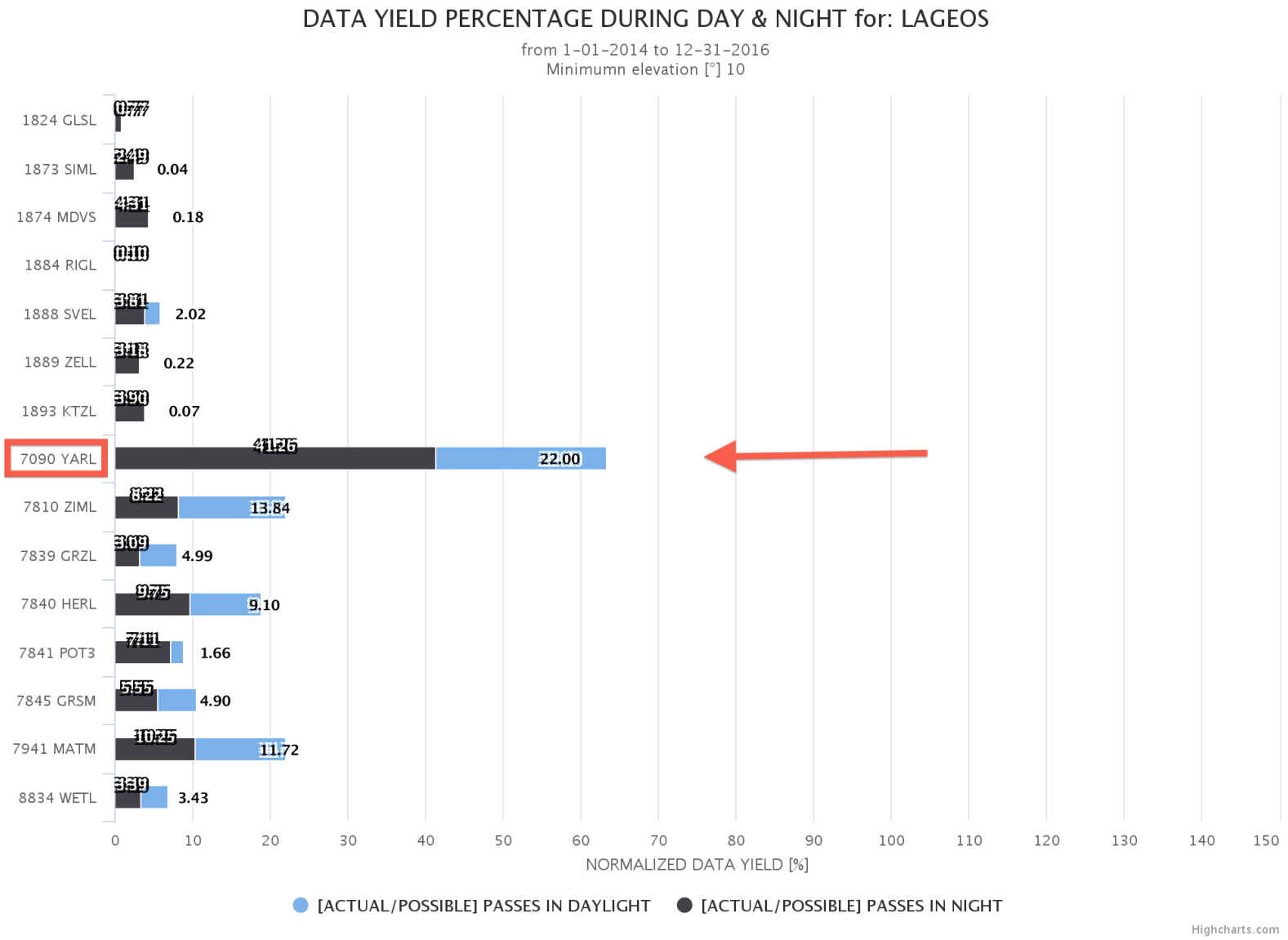
(4) Example A: European Network & Yarragadee



(4) Example B: European Network & Yarragadee



(4) Example C: European Network & Yarragadee



(5) Station Systematic Error PP - Input

Systematic Errors Estimated from LAGEOS and LAGEOS-2 SLR DATA
Pilot Project Results from period 2005-2009

INDIVIDUAL ESTIMATE L1	INDIVIDUAL ESTIMATE L2	COMBINED ESTIMATE L1+L2
ASI v203	**ASI v203**	**ASI v211**
BKG v201	**BKG v201**	*BKG v210**
DGFI v201	**DGFI v201**	**DGFI v210**
ESA v200	**ESA v200**	**ESA v210**
*GRGS v200**	*GRGS v200**	*GRGS v211**
GFZ v201	**GFZ v201**	**GFZ v210**
JCET v202	**JCET v202**	**JCET v212**
NSGF v200	**NSGF v200**	**NSGF v210**
ILRSA v201	**ILRSA v201**	*ILRSA v212**
ILRSB v200	**ILRSB v200**	**ILRSB v210**

Start (MM-DD-YYYY): 1-01-2005

End Date (MM-DD-YYYY) 12-31-2008

Station 7105 Greenbelt

"*" indicates no submission available from that AC

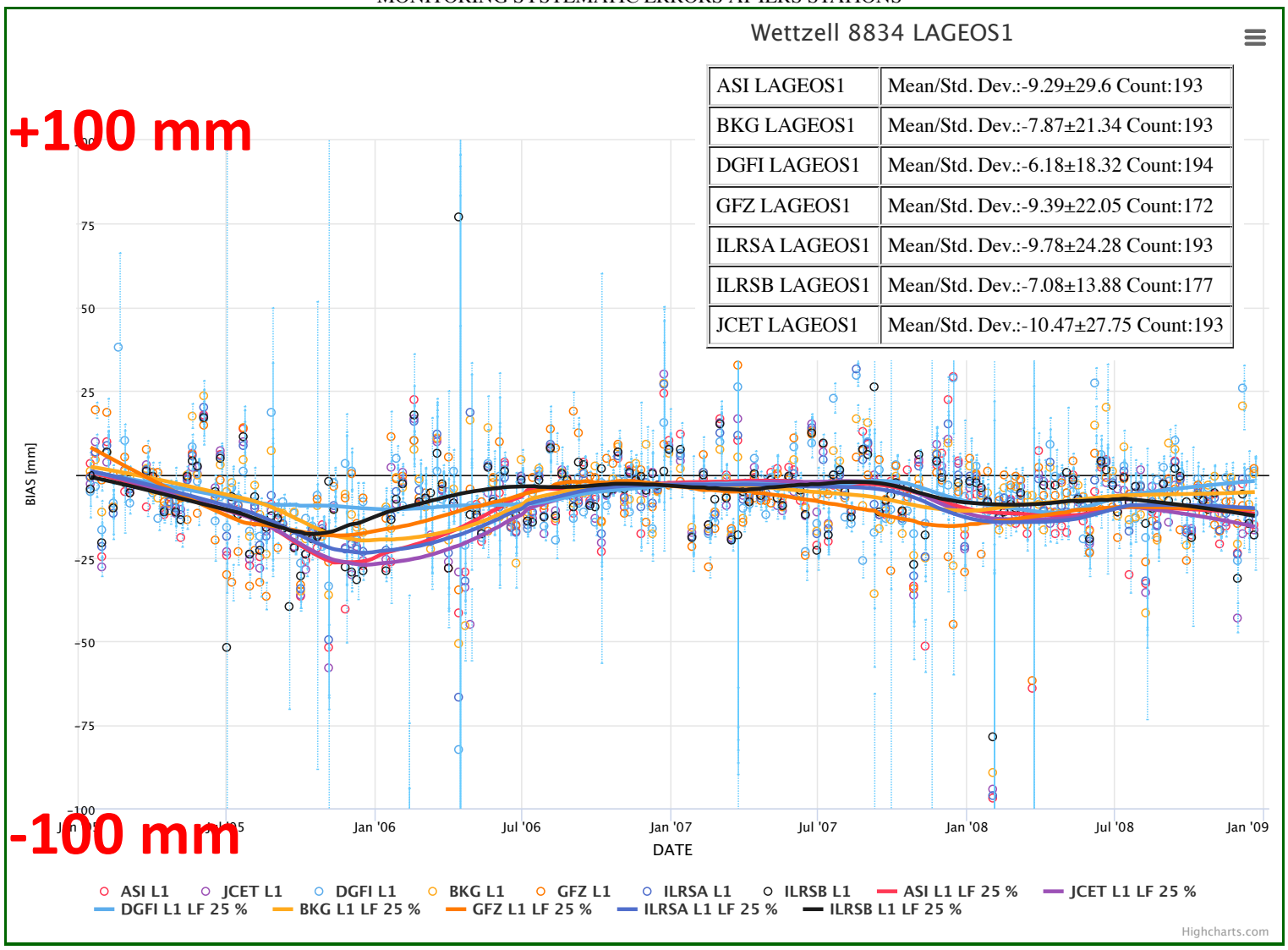
Plot Size	Minimum	Maximum
Y axis	-100	100
LOESS regression	15 %	

New feature for smoothing the input data

Submit Reset form

(5) Station Systematic Error PP - Results

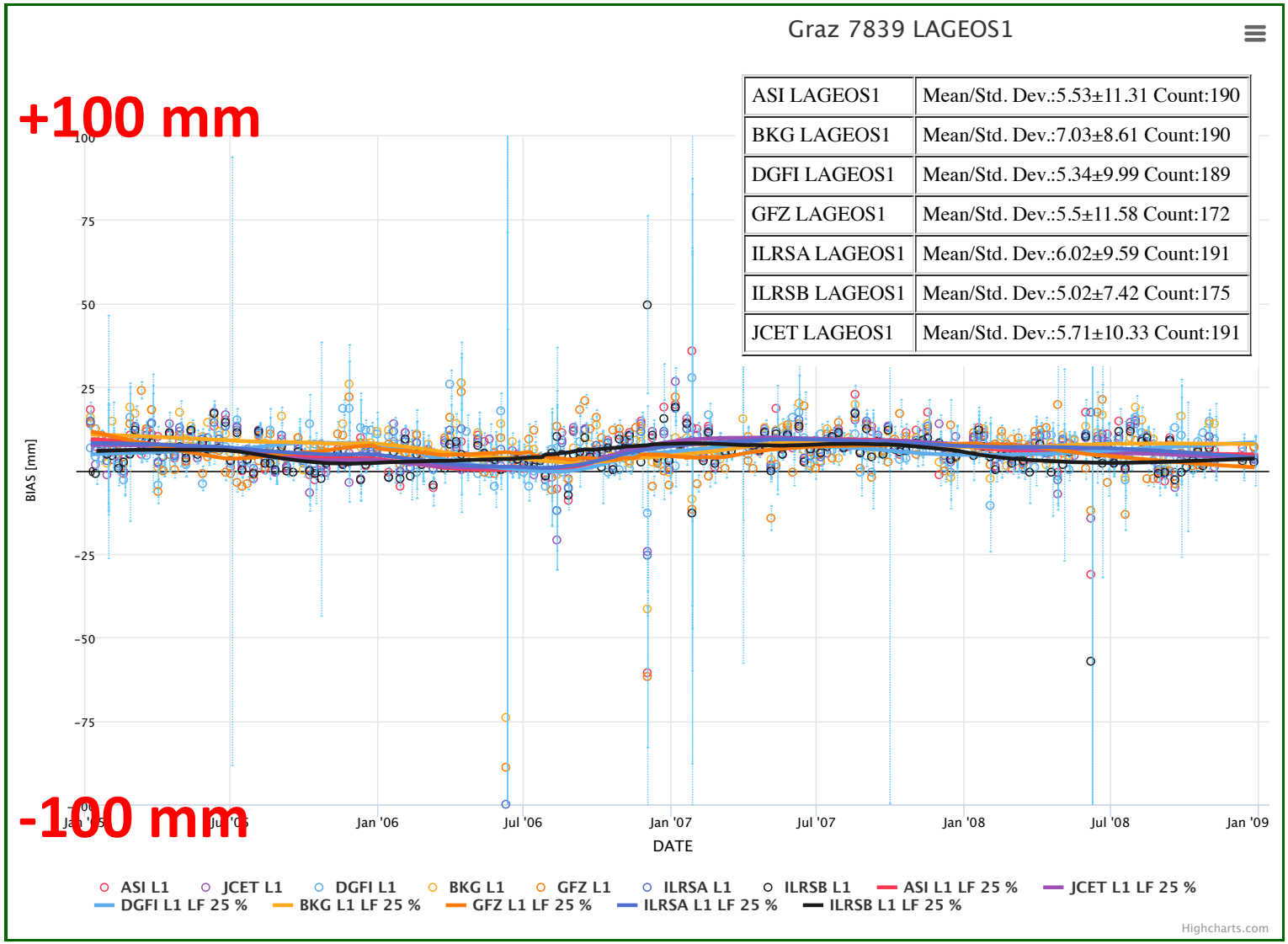
MONITORING SYSTEMATIC ERRORS AT ILRS STATIONS



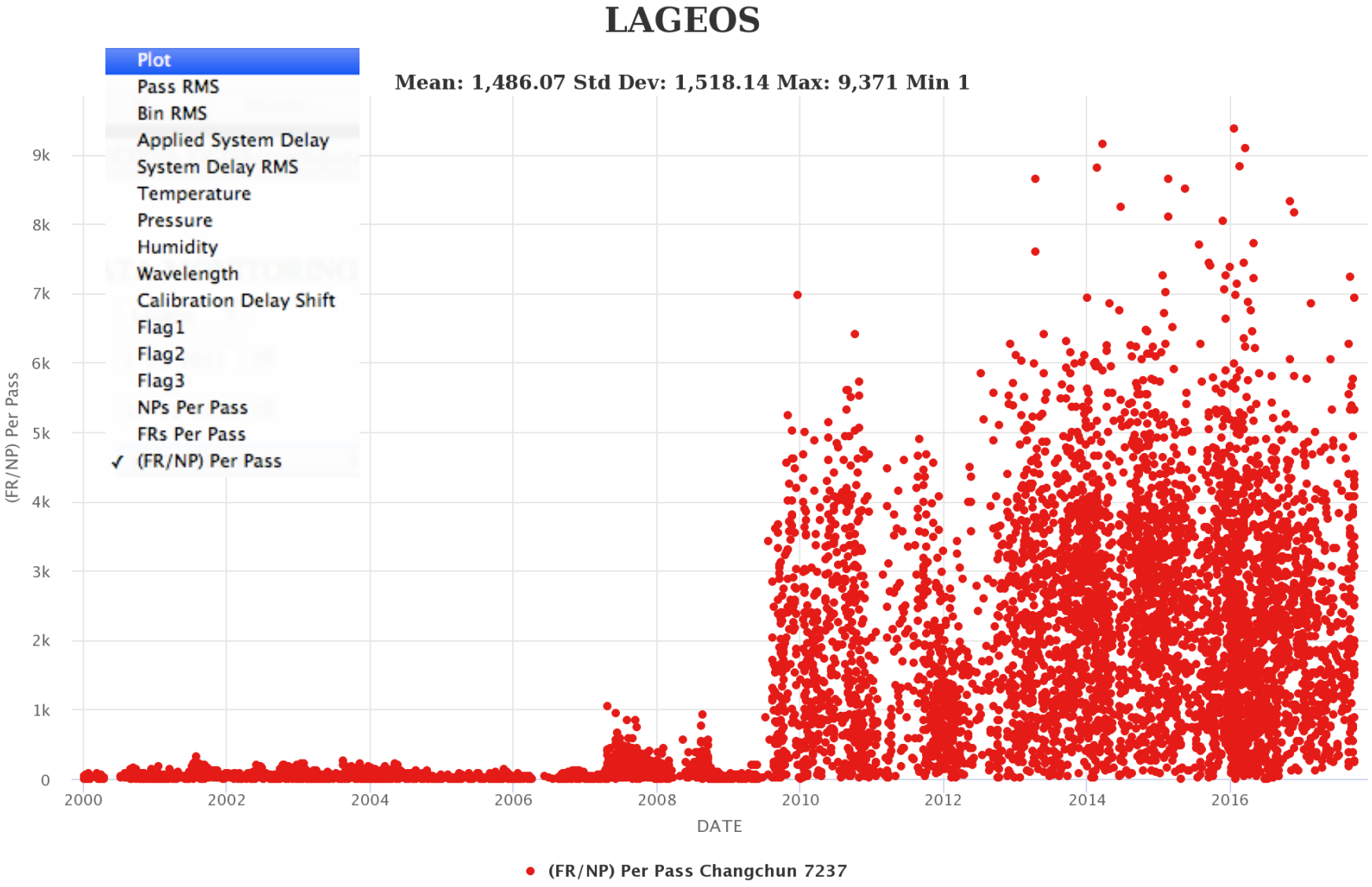
ASI LAGEOS1	Mean/Std. Dev.:-9.29±29.6 Count:193
BKG LAGEOS1	Mean/Std. Dev.:-7.87±21.34 Count:193
DGFI LAGEOS1	Mean/Std. Dev.:-6.18±18.32 Count:194
GFZ LAGEOS1	Mean/Std. Dev.:-9.39±22.05 Count:172
ILRSA LAGEOS1	Mean/Std. Dev.:-9.78±24.28 Count:193
ILRSB LAGEOS1	Mean/Std. Dev.:-7.08±13.88 Count:177
JCET LAGEOS1	Mean/Std. Dev.:-10.47±27.75 Count:193

(5) Station Systematic Error PP - Results

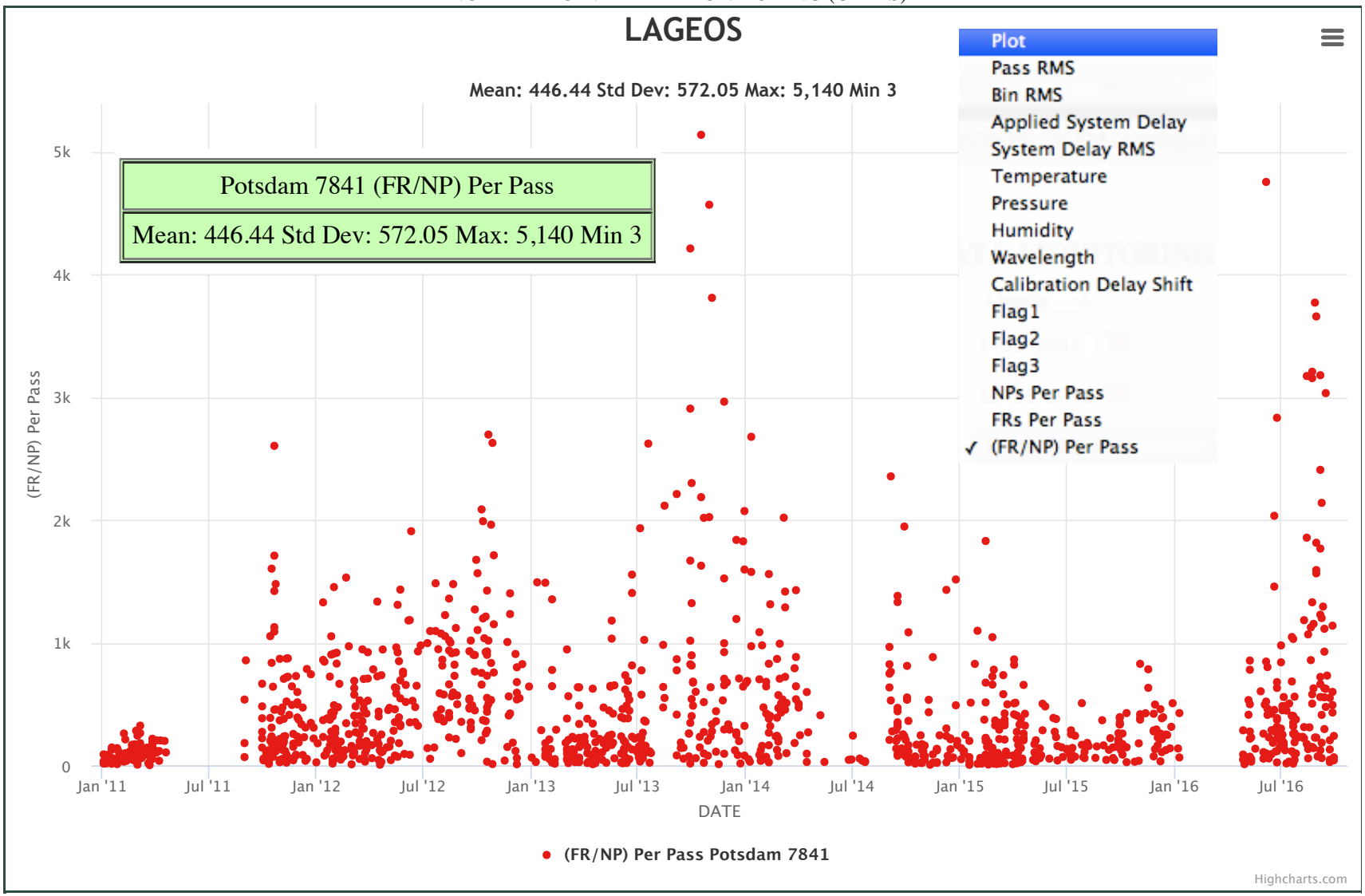
MONITORING SYSTEMATIC ERRORS AT ILRS STATIONS



(6) Example: Number of FR Ranges in a NP Range



(6) Example: Number of FR Ranges in a NP Range



(7) QC Reports (JCET)

```
# @Data span  141023-141030
# @contact epavlis@umbc.edu
# @website  http://geodesy.jcet.umbc.edu/
# ITRF used:   SLRF2008    (http://ilrs.gsfc.nasa.gov/working_groups/awg/SLRF2008.html)
# @version 1.0
#
# each line contains:
#
# STA ID           = site name
# YY/MM/DD HH:MM   = pass starting time
# SAT              = satellite name (L1: LAGEOS1; L2: LAGEOS2; E1: ETALO1; E2:ETALO2; S1: STARLETTE; A1: AJISAI; LR: LARES
# GOD OBS          = number of good normal points
# RAW RMS          = residual RMS before editing & bias application
# PREC EST         = post-fit scattering rms
# RANGE BIAS       = estimated range bias
# RANGE BIAS SIGMA = estimated range bias sigma
# TIME BIAS        = estimated time bias
# TIME BIAS SIGMA  = estimated time bias sigma
# PASS DUR         = pass duration
# EDIT OBS         = number of bad normal points
# CALIB+ MEAN      = mean Applied System Delay (ILRS FR format cols 97-104)
# CALIB SDEV       = mean System Calibration Method (ILRS FR format cols 126)
# CALIB SHIFT+     = mean Root Mean Square (ILRS FR format cols 111-114)
# STPASS RMS       = mean Pass RMS (ILRS FR format cols 58-64)
# TEMP             = mean surface temperature [K]
# HUM              = mean relative humidity of surface %
# PRES             = mean pressure [hPa]
# WLEN             = walelength [nm]
# SCH              = System Change Indicator (ILRS FR format cols 127)
# SCI              = System Configuration (ILRS FR format cols 128)
# DRF              = Data Release Flag (ILRS FR format cols 130)
# ELEVATION MAX    = maximum elevation for pass [degrees]
# ELEVATION MIN    = minimum elevation for pass [degrees]
#
#1824 Kiev  12356S001
#                          GOOD       RAW      PREC      RANGE     RANGE     TIME     TIME  PASS     EDIT    CALIB+  CALIB  CALIB++ STPASS    TEMP     HUM     PRES     WLEN   S S D       ELEVATION
#                           OBS       RMS       EST       BIAS      BIAS     BIAS     BIAS   DUR      OBS     MEAN    SDEV   SHIFT    RMS       [K]      %     [hPa]    [nm]   C C R      MAX       MIN
# STA ID YY/MM/DD HH:MM SAT  A         [mm]      [mm]      [mm]     SIGMA     [us]   SIGMA  [MIN]            [mm]    [mm]   [mm]    [mm]                                          H I F      [degrees]
#
18248101 14/10/29 15:53 A1     17       39.8      23.0      32.5       9.6     61.0     2.6     0        0  40122 E    18      0  P    36     277.6     68.0    1007.9    532.0  1 1 0      65.8      20.8
18248101 14/10/29 17:54 A1      9       86.4      34.3     -79.3      25.8     21.4     6.7     0        0  40122 E    18      0  P    42     274.8     76.0    1007.5    532.0  6 5 0      70.9      31.0
18248101 14/10/29 19:55 A1      2       84.6      40.0     -74.6      49.2      0.2     8.7     0        0  40122 E    18      0  P    30     273.7     81.0    1007.4    532.0  0 1 0      22.9      21.9
```

(8) QC Viewer Supported Reports:

DGFI – Data files for the Deutsches Geodaetisches Forschungsinstitut Analysis Center (AC). The online source for these files is http://ilrs.dgfi.badw.de/fileadmin/quality/weekly_biases/ Last updated 8/14/2014

JCET – Date files for the Joint Center for Earth Systems Technology Analysis Center. The online source for these files is ftp://cddis.gsfc.nasa.gov/pub/reports/slrjcet/ Last updated 8/14/2014

SLRCSR – Data files for the Center for Space Research Analysis Center. The online source for these files is ftp://cddis.gsfc.nasa.gov/pub/reports/slrcsr/ Last updated 8/14/2014 DISCONTINUED

SLRSAO – Data files for the Shanghai Astronomical Observatory Analysis Center. The online source for these files is ftp://cddis.gsfc.nasa.gov/pub/reports/slrsao/ Last updated 8/14/2014

SLRMCC – Data files for the Mission Control Center Analysis Center. The online source for these files is ftp://cddis.gsfc.nasa.gov/pub/reports/slrmcc/ Last updated 8/14/2014

SLRHITU – Data files for the Hitotsubashi Analysis Center. The online source for these files is ftp://cddis.gsfc.nasa.gov/pub/reports/slrhitu/ Last updated 8/14/2014

(8) QC Viewer Access Point

http://geodesy.jcet.umbc.edu/QC_SLRF2014/

ILRS QC Products on Station Systematic Errors

SLRF2014

Reference Frame used:	○ SLRF2008 ● SLRF2014
Analysis Center:	HITOT
Satellite	LAGEOS1
Start (MM-DD-YYYY):	1-01-2012
End (MM-DD-YYYY):	12-31-2017
Quantities to display:	Range Bias [mm]
Station:	7090 Yarragadee
Plot Size	Minimum Maximum
Y axis (units shown under "Quantities to display")	-100 100
	Blue Filled Square
Linear regression	NO Red
LOESS regression	15 %
	Submit Reset form

UMBC AN HONORS UNIVERSITY IN MARYLAND

International Laser Ranging Service

Responsible JCET Official: Dr. Erricos Pavlis

Last modified 2017-09-15
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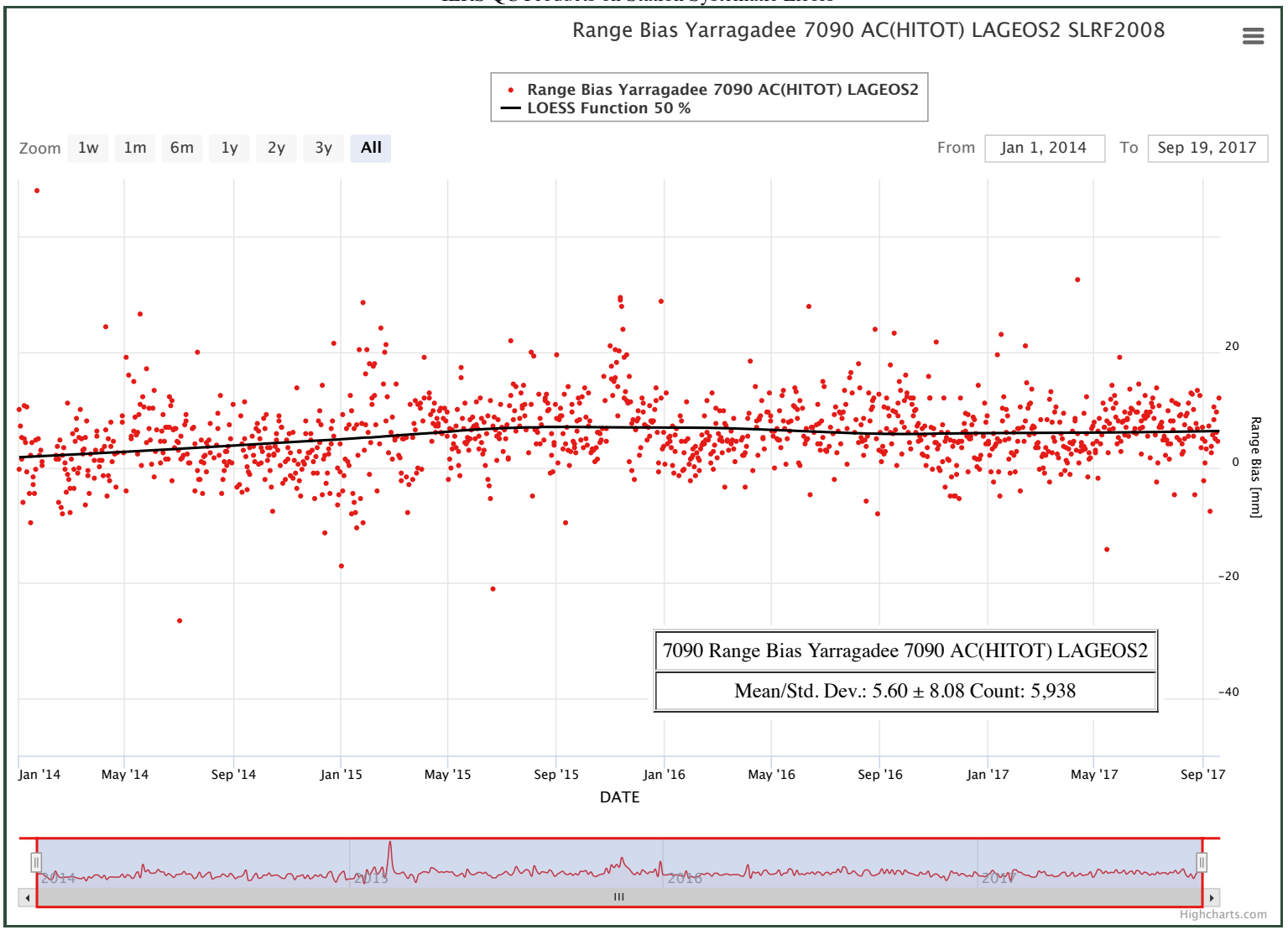
Maintained and Created by: Dr. Magda Kuzmicz-Cieslak

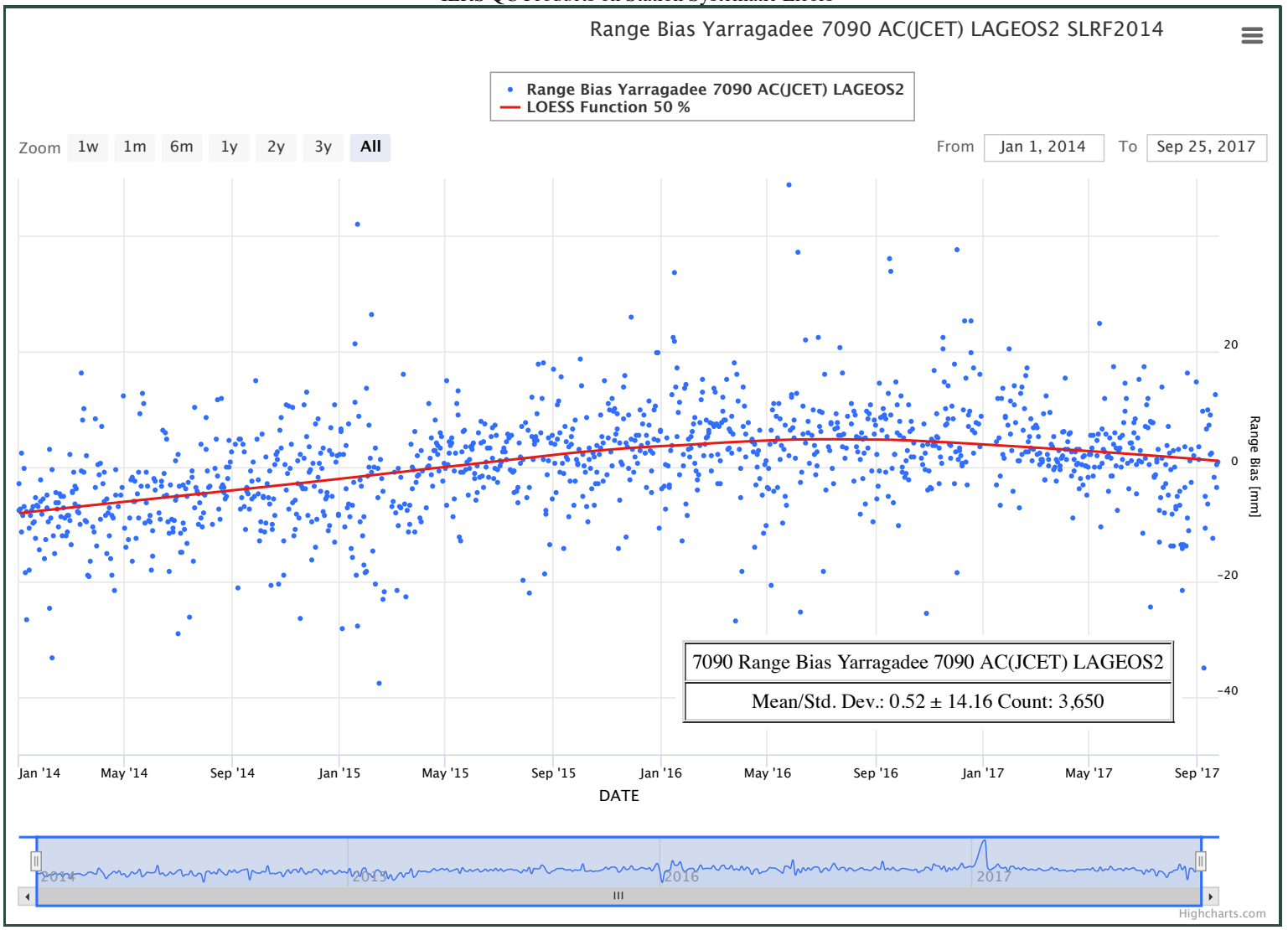
(8) QC Viewer Result: 7090 HITU

ILRS QC Products on Station Systematic Errors



(8) QC Viewer Result: 7090 JCET

ILRS QC Products on Station Systematic Errors



(9) Station History Change Log Query

Station History Change Logs Query Engine

Query: select distinct * from hst where station_cdp_no='7841' order by date, time Submit

http://geodesy.jcet.umbc.edu/sch_sci_query/

(9) SHC Log Query – Results: 1884

Query Result

[SELECT DISTINCT * FROM HST WHERE STATION_CDP_NO='1884' ORDER BY DATE]

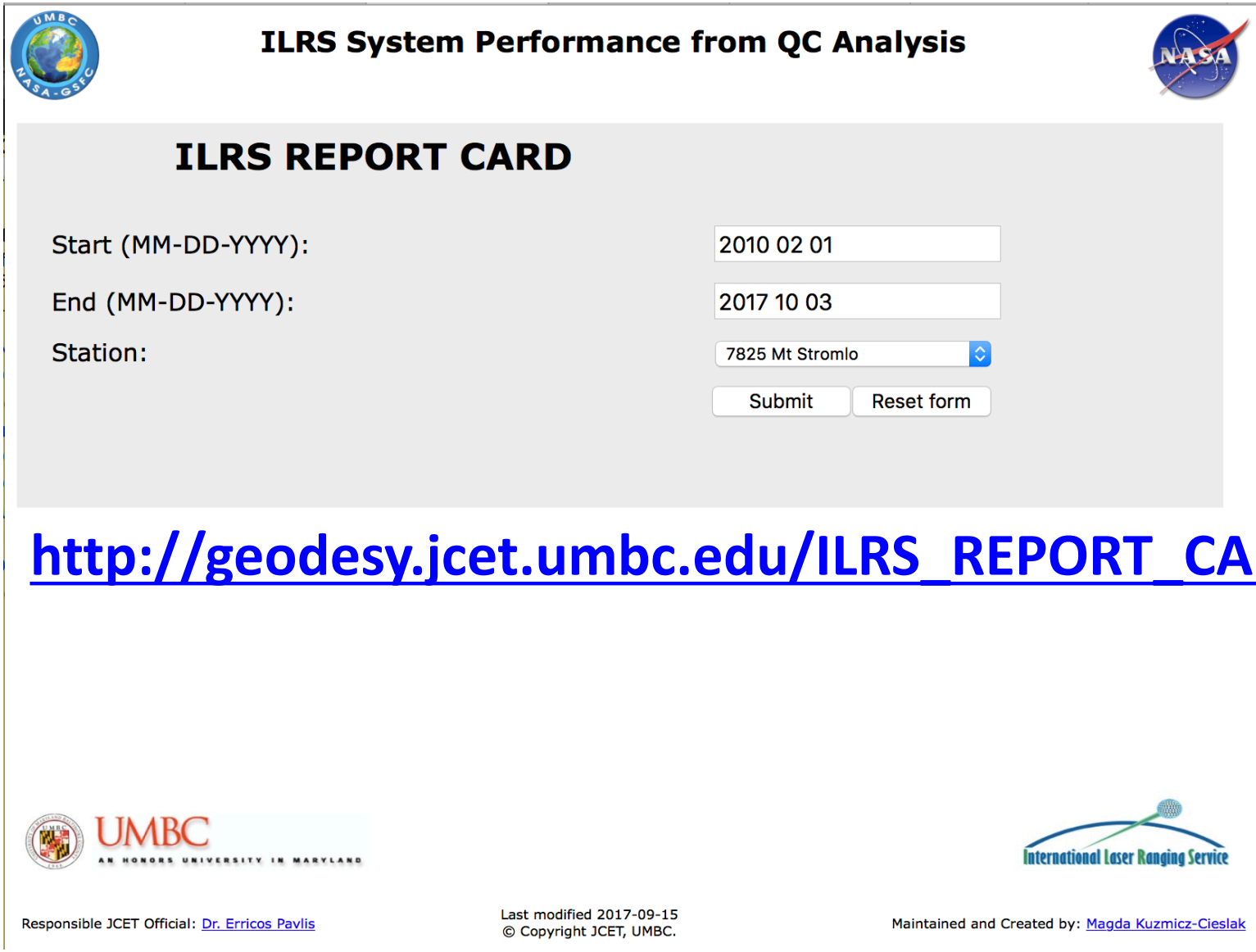
Get data file

DATE	TIME	STATION_CDP_NO	SOD_NO	SCH	SCI	HST	DATA_IMPCT_FLG	SUBSYSTEM	DESCRIPTION
2017-02-09	15	1884	4401	0	0	1	1	05.02	Telescope: new rotating mirror sync. control unit
2017-02-09	15	1884	4401	0	0	1	1	05.02	Telescope: installed new rotating mirror sync. control unit, old still primary
2017-02-15	13	1884	4401	0	0	1	1	05.02	Telescope: new rotating mirror sync. control unit operational
2017-03-27	9	1884	4401	0	0	1	1	99	Laser room: temperature control system repaired
2017-04-05	13.5	1884	4401	0	0	1	1	09.02	Time and frequency: secondary time and frequency standard SecureSync 1200-033 (05280) software update to 5.6.0
2017-04-08	11	1884	4401	0	0	1	1	09.02	Time and frequency: primary time and frequency standard SecureSync 1200-033 (05281) software update to version 5.60
2017-04-28	15	1884	4401	0	0	1	1	99	Auxiliary time and frequency standard SecureSync 1200-011 (05853) software update from version 5.60
2017-06-15	14.5	1884	4401	0	0	1	1	09.02	Time and frequency: secondary time and frequency standard SecureSync 1200-033 (05280) software update to 5.7.0
2017-06-30	9	1884	4401	0	0	1	1	09.02	Time and frequency: primary time and frequency standard SecureSync 1200-033 (05281) software update to version from 5.6.0 to 5.7.0
2017-07-26	12	1884	4401	0	0	1	1	99	Auxiliary time and frequency standard SecureSync 1200-011 (05853) software update from version 5.6.0 to 5.7.0
2017-07-27	14	1884	4401	0	0	1	1	09.02	Time and frequency: time and frequency unit swap: 1200-033 (05280) now primary
2017-09-04	15	1884	4401	0	0	1	1	04.02	Telescope optical channel commutation unit repaired. Rotating mirror gear position fixed.
2017-09-12	14	1884	4401	0	0	1	0	9.02	Time and frequency: secondary time and frequency standard SecureSync 1200-033 (05281) software update to version from 5.7.0 to 5.7.1

(10) Quarterly Report Card 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**	**10.0**	**95**	**10.0**	**20.0**	**10.0**	**95**	**10.0**	**20.0**	**10.0**	**95**	**10.0**	**20.0**	**10.0**	**95**	**10.0**	**20.0**	**10.0**	**95**
Yarragadee	7090	3.3	14.9	3.0	100.0	2.0	7.1	1.5	100.0	2.2	14.0	3.0	99.3	2.2	17.2	2.9	98.8	1.9	7.8	1.5	93.7
Changchun	7237	4.5	24.1	5.2	99.9	3.1	27.5	5.4	100.0	2.1	33.3	7.3	95.9	2.9	21.0	5.4	97.3	4.5	27.2	9.1	94.7
Mount_Stromlo_2	7825	3.0	17.3	2.9	100.0	2.3	9.7	1.9	100.0	1.8	13.2	3.7	99.7	2.8	15.2	3.4	97.5	1.7	10.4	2.1	95.8
Herstmonceux	7840	1.8	10.8	2.3	100.0	1.0	6.5	1.3	100.0	1.1	10.3	2.6	100.0	1.6	10.3	1.9	99.7	0.8	6.5	2.8	97.7
Zimmerwald_532	7810	2.7	11.1	3.0	100.0	1.7	7.5	1.5	100.0	1.9	10.8	3.1	99.8	2.9	11.9	1.7	97.5	1.7	7.6		94.8
Wettzell	8834	3.0	13.1	6.5	100.0	2.3	8.9	6.2	100.0	1.8	12.2	5.9	99.6	2.5	10.5	7.4	98.3	1.6	10.9	8.2	95.0
Graz	7839	2.0	9.1	3.5	100.0	1.5	6.2	2.3	100.0	0.9	11.1	4.0	99.3	1.8	8.5	3.5	97.1	0.6	8.8	2.5	96.1
Matera_MLRO	7941	2.3	13.9	3.9	99.7	1.2	8.8	3.3	100.0	1.3	14.0	4.6	98.9	1.5	13.6	3.8	98.8	1.1	14.2	5.0	96.4
Greenbelt	7105	3.0	12.5	6.4	99.7	1.6	7.8	3.9	100.0	1.7	12.0	4.7	99.0	2.5	15.9	4.0	98.9	1.7	10.2	6.1	90.7
Monument_Peak	7110	5.0	20.6	2.9	99.2	2.3	15.7	3.8	100.0	2.4	21.7	5.8	98.1	2.9	16.1	3.0	97.0	1.8	15.7	4.1	88.9
Wettzell_SOSW	7827	2.1	10.7	4.0	100.0	1.3	9.5	5.7	100.0	1.0	15.1	7.8	99.3	2.6	17.7	4.6	94.7				
Potsdam_3	7841	2.6	11.7	4.6	100.0	1.7	7.6	4.0	100.0	1.4	10.1	4.1	99.8	1.6	8.5	3.1	98.2	1.1	12.8	4.3	95.5
Shanghai_2	7821	3.0	16.1	4.8	100.0	1.6	10.8	5.5	100.0	1.6	15.5	7.1	99.6	2.9	15.7	7.0	100.0	1.3	15.4	5.8	97.6
Hartebeesthoek	7501	3.2	12.9	6.2	100.0	1.9	6.3	3.7	100.0	1.8	13.8	4.8	99.0	2.0	14.7	6.4	98.3	2.3	13.9	5.9	91.9
Haleakala	7119	5.3	26.4	8.9	99.8	2.8	9.2	3.5	100.0	2.7	11.6	3.1	97.2	3.4	18.0	8.1	98.4	2.9	21.9	13.4	91.7
Altay	1879	5.6	26.4	14.7	100.0	2.6	24.5	20.2	100.0	2.4	25.8	21.4	99.3	3.4	26.7	14.0	100.0				
Komsomolsk	1868	9.0	42.0	28.2	93.2	6.1	46.9	22.8	100.0					3.9	24.0	10.6	95.2				
Arequipa	7403	7.2	32.0	19.5	96.4	6.4	30.5	25.2	100.0	3.1	38.7	22.3	93.8	6.1	32.5	28.9	95.4				
Baikonur	1887	6.6	24.3	24.3	100.0	5.5	27.6	10.4	100.0	3.4	21.4	11.3	92.8	5.6	15.7	7.2	98.8				
Beijing	7249	7.9	15.8	14.5	95.0	11.7	15.1	10.9	100.0	4.0	22.1	16.9	88.0	6.4	21.1	14.8	95.5	3.0	24.5		84.4
Papeete	7124	4.4	16.5	9.6	100.0	2.7	8.8	5.0	100.0	3.2	12.7	7.1	98.1	3.9	19.3	8.7	99.2	1.6	12.3	5.4	93.6
Katzively	1893	13.5	22.1	13.7	96.9	13.3	22.3	10.9	100.0	2.6	15.1	10.1	74.4	11.0	18.3	10.1	90.0				
Brasilia	7407	4.8	30.7	10.7	100.0	3.7	18.5	5.8	100.0	2.1	36.5	13.8	93.8	5.5	23.2	13.1	94.7				
Simeiz	1873	23.6	43.2	24.9	92.9	24.3	46.3	31.4	100.0	3.8	42.2	13.4	53.1	25.0	43.4	31.3	90.7				
Arkhyz	1886	11.1	29.0	26.8	100.0	7.9	27.3	21.5	100.0	4.9	28.5	18.3	82.5	5.3	25.8	13.9	93.9				
Simosato	7838	5.8	22.1	6.4	99.8	4.0	19.1	7.0	100.0	3.5	17.1	17.4	96.8	4.9	10.0		99.7	3.2	14.3	4.5	92.6
Grasse_MEO	7845	3.8	11.6	7.1	100.0	2.7	18.6	7.7	100.0	2.2	17.4	5.7	98.7	2.9	18.3	12.8	97.1	1.8	12.2	4.7	94.8
Riga	1884	14.4	31.4	33.2	98.8	10.7	28.2	28.9	100.0												
Zelenchukskya	1889	7.0	18.4	15.5	100.0	6.3	18.6	16.0	100.0	4.5	19.4	26.8	90.6	6.4	16.9	10.5	93.0				
Irkutsk	1891	7.0	13.2	7.2	100.0	6.1	12.7	7.6	100.0	2.7	21.0		95.6	8.6	23.4		97.6				
Borowiec	7811	5.6	18.7	9.0	100.0	4.4	15.5	10.1	100.0												
Sejong	7394													1.8	8.2	30.6	98.4				

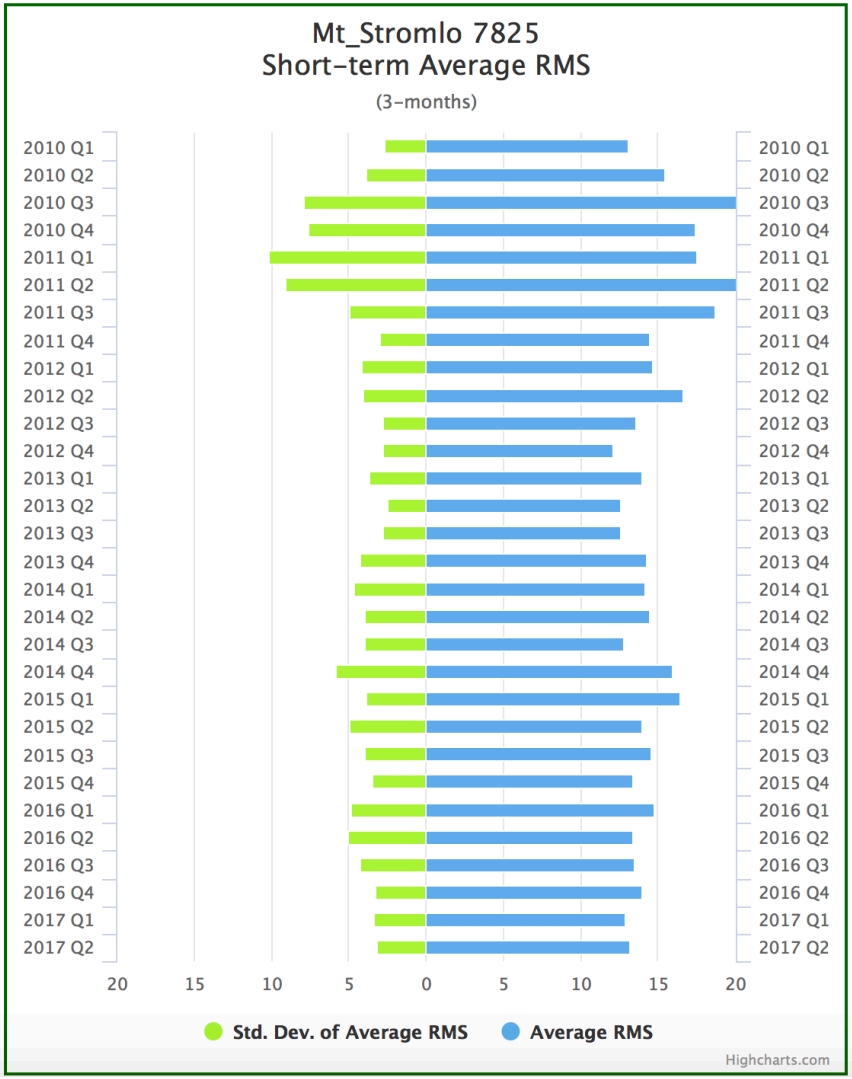
(10) Quarterly Report Cards Online

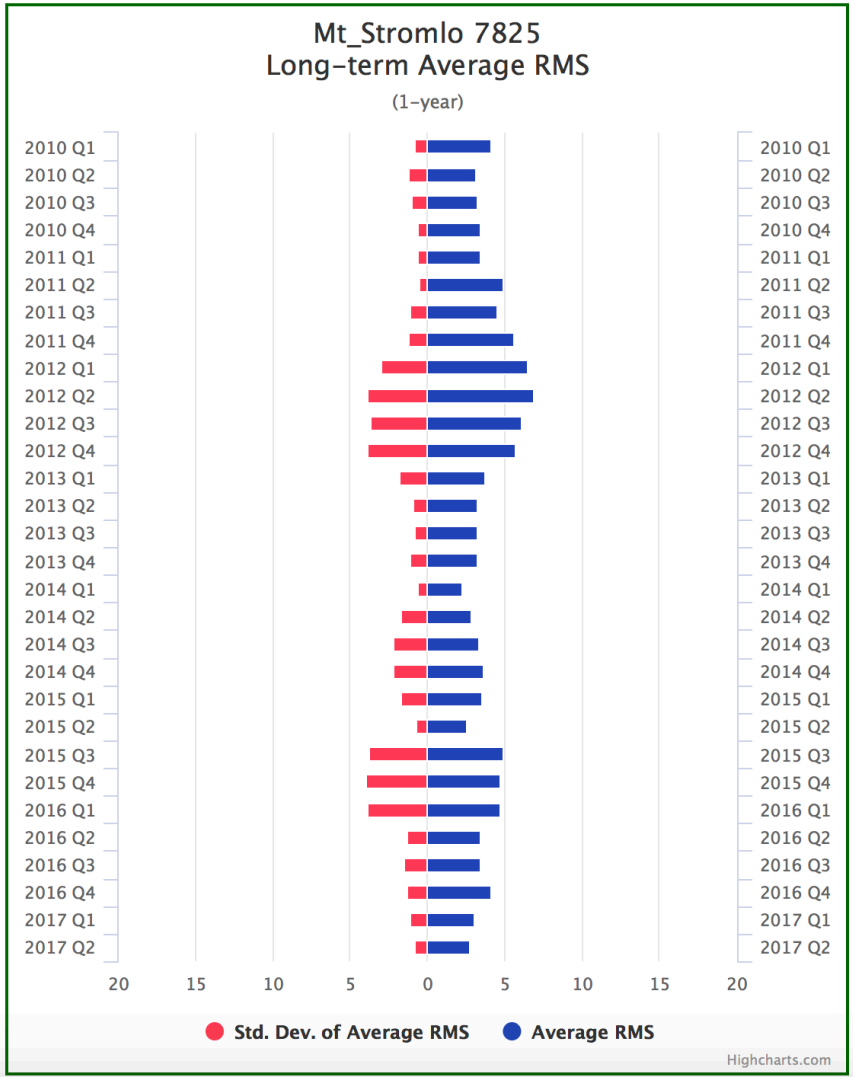


http://geodesy.jcet.umbc.edu/ILRS_REPORT_CARD/

(10) Quarterly Report Card: 7825

Mt_Stromlo 7825





Thank you for attending the Clinic!