

June 16, 2020

**ILRS QCB Meeting
June 11, 2020
Virtual Meeting**

Planned AGENDA

- Brief on ILRS contr. to ITRF 2020 Erricos (5 min)
- Study on what return pulse statistical information can reveal about ranging systematic errors Peter (20)
- Normal Point Studies
 - Comparison of NP generated by field stations with those generated by an open source NP program Randy, Matt, John Ries (20 min)
 - Normal Point Comparisons Matt/Stefan (20)
- Examination of systematic data issues revealed by Analysis Center generated data products Van (20 min)

Many changes were made to the agenda – see below

Participants

Erricos Pavlis, Frank Lemoine, Matt Wilkinson, Peter Dunn, David Sarrocco, Randy Ricklefs, Stefan Riepl, Toshi Otsubo, Van Husson, Jose Rodriguez, Mathis Blossfeld, Tom Varghese, Graham Appleby, Jason Laing.

Were Tom Oldham and Marshall Finch there? Did I miss anybody?

Chart Posting

The charts from the meeting are available at
https://ilrs.cddis.eosdis.nasa.gov/docs/2020/ILRSQCB_slides_20200611.pdf

Alternative Normal Point Strategy (20 min)

Erricos Pavlis

The Burmistrov paper was briefly reviewed. The paper argues that rather than starting normal points at fixed epochs propagated over a pass, it would be more efficient and data effective to generate normal points only in regions with sufficient data to be adequate for the users, without the constrain of starting the normal point at predefined epochs. A short data set using this strategy for a few Russian stations has been provided to Erricos for comparison with the operational data. Erricos will request a heathier set to test and evaluate.

The Path to Improved Data Integrity (30 min)

Peter Dunn/Matt Wilkinson

Peter reviewed the remaining charts from his May 14 presentation. As we recall, much of the improvement in range quality in single photon systems that would be provided by folding in the NP statistics (mean, peak, skew, kurtosis, etc.) in the analysis is already provided by the satellite C/M corrections provided by Jose. However, analyses by Toshi and others show dependencies of NP systematic offsets on FR rms, in particular with LARES, L1 and L2. This effect may be a useful tool to detect and study systematics. The systematics offset versus FR rms is not apparent in the multi-photon MCP data.

The systematic offset between L1 and L2 may be due to the positions of the IR cubes in the Earth facing sector of the two satellites. A diurnal effect seen at Yarragadee in range bias and kurtosis may be the result of slight changes in lunar aspect over the day.

Matt showed some double humped patterns from Herstmonceux on L2 which may result from two different cube rings on the satellites. Some abrupt changes seen in Graz data appear to correlate with documented systems changes.

A little more discussion on these charts will take place at the meeting on June 25.

Examination of systematic data issues revealed by Analysis Center generated data products (20 min)

Van Husson

- The appears to have been a sudden -30mm change in the Tahiti LAGEOS range bias, which correlates with a photo diode change in mid-April 2018. Tahiti Etalon range biases also appeared to have changed around that same time by a similar amount, but the Tahiti range bias changes on Lares, Stella/Starlette, and Ajisai were much less. The -30mm LAGEOS range bias appeared to have been corrected by late October 2019 after the station returned to operations after being down for 4.5+ months.
- Stations need to do a better job of keeping their change histories up-to-date and make updates when they notice any degradation in system performance or change in system delay, since these changes may induce systematic errors in their data.
- Based on our analysis findings, 7090 has instituted the following procedural changes:
 - 5-May-2020: Reset the event timer 3-4 times per day versus once to better maintain the event timer resolution.
 - 1-Jun-2020: Standard PMT Voltage is 3200 volts.
- Some of the 7090 biases are receive energy related. Better calibration of receive energies of the geodetic satellites is needed. We will work with the station and continue to monitor their progress on this issue.
- Questions that still remain:
 - Is the HITU 7090 +1 mm/year bias drift in the 4 sets of the geodetic satellites (LARES, Stella/Starlette, LAGEOS, Ajisai) real or in the analysis?

- What is the real range bias difference between 7090 LAGEOS, Lares and Etalon and how accurately can orbital analysis determine these offsets?
- When range bias changes correlate to changing in system performance (i.e. RMSs, calibration shifts, skew, kurtosis); an equipment change or a procedural change; then most likely there was a real change in the bias.

A special meeting will be held on June 25 at 9 am EDT covering the following”

- Interpretation of systematics through NP data statistics (10 min) Peter
- Processing data with the Wiener filter (20 min) Stefan
- Some relevant examples from examination of data (30 min) Van
- Discussion

The contributions from Randy and John Ries will be were postponed until the next QCB meeting on July 16 at 9 am EDT.

Let me know if you have any conflicts.

Mike