ILRS QCB Meeting
August 18, 2020
Virtual Meeting

Next Meeting September 24, 2020

Participants

Erricos Pavlis, Matt Wilkinson, Peter Dunn, Toshi Otsubo, Van Husson, Jose Rodriguez, Tom Varghese, Jason Laing, Carey Noll, Mike Pearlman, Tom Oldham. Frank Lemoine, Randy Ricklefs, John Ries. Did I miss anybody?

Chart Posting

The charts from the meeting are available at:

https://ilrs.gsfc.nasa.gov/docs/2020/QCB_slides_20200818.pdf

See the charts for more detail.

Herstmonceux Open-source Normal Point Program Testing (Randy)

The Herstmonceux normal point software was created as reference code for those testing or updating existing normal point software. Using a large data set, it is hoped to show that the Herstmonceux normal point software produces demonstrably acceptable results. The test(s) would be used to quantify the performance of the Hx software vs stations' software, and to highlight errors or issues with the Hx software. Ultimately the plan is to use the software to critique stations' software and procedures.

The data set used was January 2020 full rate and normal point data from LAGEOS-1 and LARES from multiple stations in the ILRS network. Computed NPTs were compared with those generated by the stations. Test on LAGEOS-1 (3846 NPTs) showed that almost 2/3 of the NPTs ranges agreed to 0.5 mm; about 3/4 agreed to better than 1 mm. About 13% were greater than 15 mm. Some of these were the result of significant differences in FR count/point selection, differences in epoch, and many were that result of bad NPTs. There were also unmatched NPTs create or destroyed in the process.

Tests on LARES (~4400 NPTs) showed that about 1/2 of the normal point ranges agreed to 0.5 mm; almost 2/3 agreed to better than 1 mm. About 13% were greater than 15 mm. The applies as above.

Several issues identified in the software will need to be addressed. Cases of misinterpretation of reporting parameters by the stations were also identified. Randy's analysis used a 1 return threshold, which may have produced some erroneous NPTs.

ACTION: Matt and Randy: Update the software and Python functions as required and make the new version available. Move to Python routines for statistics. Peak-Mean still needs work.

Analysis of SLR normal points from new normal pointing software (John)

John compared the normal points Randy generated with the Herstmonceux software to the station-generated normal points using the satellite orbits.

The vast majority of the NPT range differences were under 3 mm. The RMS for the differences for LAGEOS was 1 mm; the RMS for the differences for LARES was 1.2 mm (using 3 mm cutoff to avoid extreme outliers which were probably due to differences in the data selection). The NPT differences tended to be larger for the poorer stations.

The new NPTs were the same or more consistent than those provided by the stations; there was a slight improvement in fit RMS with the new NPTs for LAGEOS, but no change for LARES. There was some degradation for 1891, 1893 and 1888; there were severe problems with 1824, 7824.

In some NPTs the epoch moved due to differences in data screening, but no epoch differed by more than 0.1 μsec.

Test data set included additional NPTs not in original release. These appeared to be NPTs created with only a few returns, some as few as one, for stations that typically do not release such NPTs (7840, for example). These NPTs tended to perform less well overall, suggesting that not releasing them may be beneficial, at least for high-precision applications. If released, the assigned NPT RMS should be quite large, but at the moment, most if not all analysts do not look at or rely on it.

There was a lengthy discussion within the group as to whether there should be a minimum number of satellite returns required for a distributed normal point. At one time, as recorded on the ILRS web site, the ILRS set the standard of at least six returns for nighttime pass normal points and three returns for daytime pass normal points. The ILRS then backed down on that requirements for various reasons. Is now the time for re-establishing the requirement? There were many points made for and against. Ultimately, John volunteered to rerun his tests with various minimum return levels to learn the extent to which these "small" normal points were corrupting the analysis.

ACTION: John will rerun some of these tests with a 3 and a 6 FR data point threshold.

Next Meeting: September 24, 2020, 09:00 a.m. EDT, 13:00 UTC.

Agenda:

- Update from Randy and John
- Report from Van on some of the NASA station, Review on some of the Russians stations