December 1st, 2023.

ILRS QCB Meeting September 27, 2023 (version 1)
Virtual Meeting (9 AM – 11:00 AM EST – 13:00 UTC)
Next Meeting:
March 11th, 2024
9:00 am – 11:00 am EDT (13:00-15:00 UTC)

Participants:

Erricos Pavlis, Mathis Blossfeld, Van Husson, Julie Horvath, Frank Lemoine, Matthew Wilkinson, Mike Pearlman, Peter Dunn, Randy Ricklefs, Austin Garrety, David Sarrocco, Toshi Otsubo, Graham Appleby, Andreja Susnik, Stefan Riepl, Claudia Carabajal.

The charts from the meeting will be available at (when posted):
https://ilrs.gsfc.nasa.gov/science/qcb/qcbActivities/index.html

Agenda:

Presentations by Van:

- 1824 GLSL Golosiiv Analysis
- ITRF2014 vs ITRF2020 Site Velocities
- 7941 MATM Analysis (Update)

Is there any need to review the conclusions and recommended actions?

Mike:

- Quarantine stations procedures, need for future planning.

Claudia

- Updates on preparations for the 2023 Virtual International Workshop on Laser Ranging, October 16-20.

Mike and Erricos:

ILRS Analysis

With the retirement of Erricos at the end of November, NASA plans to continue the UMBC work. Frank Lemoine, Scott Luthcke, and perhaps Evan Hoffman will work with Magda and Keith, to better document the processes and bring them closer to the project activities. NASA is searching for a replacement for Erricos, who is working on a report detailing his labors over the past few years. Erricos has been invited to remain connected so that his corporate memory will not be abruptly lost.

Mathis will soon announce the schedule for its next ASC this fall; stay tuned. The summaries of ASC meetings and presentations will be posted on the ILRS webpage.

Stanford Counters.

In an effort (or hope) to improve the quality of some past data, Graham continues to look at Stanford Counter issues, doing comparisons with event timers. There are presently Stanfords at Sussex, and at several stations. Andreja is looking into range dependent errors on the Systems at Herstmonceaux, San Fernando, and Zimmerwald. We believe that the Standfords have nearly all been replaced. For stations that are still using Stanford counters, corrections need to be applied. Do stations in the WPLTN (Kunming, Wuhan, Catsiveli) have Stanfords?

Where studies show that data needs to be changed, this can be done within solutions (dynamically), to ~1 cm discrepancy – most by applying a constant. There is some noise, systematic noise which remained after modeling was done and the constant removed. The current process is equivalent to that used earlier, so for those who used the process earlier, no change is required.

They have a collection of Stanfords calibrated at Hertzmonceaux. They could be made available if needed. There is a spreadsheet with the data (needs to be added to the notes).

The current process is equivalent to that used earlier, so for those who used the process earlier, no change is required.

Graham and Andreja will continue looking into the past to determine the time spans of interest. Correction will be made to the Data Handling File (DHF).

Corrections can be done at the NP level. Reprocessing can be done before the next ITRF.
Only those showing significant non-linearity need to make a correction. All kHz stations have moved to event timer. Graham prefers that we do not change the data. Erricos sees the need to document this whole process in a paper for the users. Matt commented that the Data Ranging Resolution is sub-milliseconds at least.

Erricos pointed out that error bounds need to be provided in the results and that there should be interaction with the work on the SSEM, and the need to separate, and state what people have to do for ITRF2020. Correction has to be applied before the SSEM process, the same with the barometer data corrections.

Station Quarantine Process:

The station quarantine release processing was already discussed. Golosiiv station has significant biases, but still passed quarantine as long as bias looks stable. Perhaps the NESC can help with determining the source of the bias. This is a special station; they are a young team and very determined.

See the recent write up describing the quarantine process.

Station Performance

Mike showed the Station Performance charts, and suggested that we reward best performers (3500 passes); 14-15 stations are performing at this level or above. Unfortunately, many of the poor performers have been in that situation for a long time. We give the impresion that we have a 40 stations network, but only 14 are contributing to the reference frame.

Frank has suggested that we find out from the stations the reasons for their lack of performance and if something can be done.

ILRS has not had no specialized workshop since 2018. An SLR school, ran in 2019 in Stuttgart, was well attended, and mentioned as a great way to engage the stations and discuss issues, and provide training. Such a school could be run during the Kunming Workshop.

We agreed to design a questionnaire to the stations to find out what is limiting their performance and how they might be helped.

Action: Mike will work with Matt on a 'Station Questionnaire', and it will circulate it to others for inputs.

Erricos will decide if he wants to stay connected at all with the ILRS. In the meantime we will leave him on the listserv exploders.

Presentations by Van:

1824 GLSL Golosiiv Analysis
Golosiiv data productivity has increased significantly the past few months, but there have been some data quality issues starting on August 29, 2023 when they accidently removed their neutral density filter during calibrations. This change correlates with a change in system delay and range bias. Between August 29 and September 9, there are two populations in their range bias separated by ~1 meter. Their range bias returned to more nominal levels on September 10. On September 13, some of their passes were intermittently biased by ~1 meter but stabilized again on September 22. The cause of these intermittent 1-meter range biases is unknown.

The 1824 GLSL ITRF2014 coordinates currently being used to assess their data quality is a major source of error. There is a 23 to 25 cm station height difference between 1824 GLSL ITRF2014 and ITRF2020 station coordinates for calendar year 2023. When the analysis centers switch to ITRF2020 coordinates, there will be a more accurate assessment of 1824 GLSL biases (range and epoch).

Golosiiv is just another example of a station that is not keeping their station history log current.

ITRF2014 and ITRF2020 Station Up, North, & East Velocity Comparisons
The site velocities, especially the station height velocities, for several SLR sites appear more realistic based on ITRF2020 SLR site velocities relative to ITRF2014. A velocity error of 1 mm/year in any one component (Up, North or East) since LAGEOS-2 launch will grow to 31 mm, thirty-one years later (i.e. by October 2023).

7941 MATM Data Analysis
7941 MATM single shot RMSs (satellite and calibration) have been steadily increasing since the beginning of 2022 caused by instability in the laser. A new laser has been ordered and delivery is anticipated. The increase in satellite RMSs have led to mm level changes in their geodetic range biases. The station has tried to mitigate the increases in LAGEOS RMS by discarding any LAGEOS CRDs, if the session RMS exceeded a certain limit. It is also not clear if the automated peak receive energy measurement and/or its correction is properly working.

Plots from the ILRS website. (I am not sure why this is here)
RMS and scatter increasing.
LAGEOS RMS for 1 month.
Slide 3, monthly averages since 2003. Slide 4 Red, change PMT + CFD.
Blue, data above 10 mm in RMS not submitted. Not sure how many passes flunked.
Slide 6 from Erricos website, Slide 7 single shot RMS - Red - time walk curves; Yellow: Cummulative; Max energy 209 (no units) relative measurement
Slide 9- Orbit NP plot.
Editing energies did no improve the scatter.

David Sarrocco's comment on the Matera System
From Matera, in recent weeks (current times) there is the upgrade of the Laser System. The realistic time in which the upgrade can starts is the end of November 2023. After this change we can see the impact of the instability of the Laser, and then check if there are other hardware issues (PMT/CFD and so on). It's not easy to isolate the receive peak energy time-walk corrections and the others. So, we want to start looking step by step at the impact after the laser is changed,. Because of this, I think that we will not have news before the end of November 2023 (date in which we hope to have the new laser operating). It will replacethe current one.

Toshi asked if Van can look at the return rate. The answer was that the return is pretty good, they have a large telescope.

Table 1. History Log Voids by Station (2023.09.26)

Station Location	CDP #	Time Gap(s)*				Last entry
Kiev	1824	000120-080302	080402-110515			141410
Komsomolsk	1868	NO DATA				
Simeiz	1873	NO DATA				
Mendeleevo	1874	NO DATA				
Altay	1879	NO DATA				
Riga	1884					230919
Arkhyz	1886	NO DATA				
Baikonur	1887	NO DATA				
Svetloe	1888	NO DATA				
Zelenchukskaya	1889	NO DATA				
Badary	1890	NO DATA				
Irkutsk	1891	NO DATA				
Katzively	1893	NO DATA				
Yarragadee	7090					230913
Greenbelt	7105					230426
Monument_Peak	7110					230630
Haleakala	7119					230809
Tahiti	7124	020825-080414	130321-191022			230520
Changchun	7237	950101-970802	020714-051002	180410-210106		211215
Beijing	7249	881101-940301	940301-981116	981116-211013		230425
Tsukuba	7306					230404
Sejong	7394	NO DATA				
Wuhan	7396	NO DATA				
Arequipa	7403	920718-951023	951023-981130	981130-010523		200629
San Juan, Argentina	7406	NO DATA				
Brasilia	7407	NO DATA				
Hartebeesthoek_HARL	7501	020409-081105				230711
Hartebeesthoek_HRTL	7503	NO DATA				
Izana	7701					230406
Zimmerwald_532	7810	030905-060203	080715-100901			230713
Borowiec	7811	030329-071227	080205-131218			211005
Kunming	7819					221212
Shanghai_2	7821	140222-170315	170720-190811			210922
San_Fernando	7824	900703-930222	971216-010124	090302-110601	180801-210518	220830
Mount_Stromlo_2	7825					210901
Wettzell_SOSW	7827	140501-160511	160511-190528	200424-230607		230607
Simosato	7838	900701-950810	950810-991007	991019-040701	080401-181212	211209
Graz	7839	150504-190311				230630
Herstmonceux	7840					230427
Potsdam_3	7841	040906-081026	081026-110501	170303-200303		211229
Grasse_MEO	7845	010601-200818				230215
Matera_MLRO	7941	140902-171204	171206-210629			230209
Wettzell	8834	980720-001012	001012-090324	090324-131021	170407-190604	210115

* Assuming at least 2 year data gap

Status 2022.10.19

From Peter Dunn: Erricos is not alone in his worry about Arequipa. Van has actually fully rationalised the SSEM RB behavior seen in the ITRF2020 analysis at that station, after 2001.
Results in a presentation to be shown when a slot is available at a QCB meeting. It allows us to improve the choice of RB intervals in the solution. There is a remaining anomaly which complicates the analysis of some potentially valuable data collected before the earthquake.
It is shown in the attachment and prompts us to ask what happened in early 1998 to correct a large bias drift and return the station to bias-free operation. Available documentation has so far failed to clarify this issue.

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