Minutes of the 19th Int. Laser Workshop ILRS AWG Meeting **Sunday, October 26, 2014**

Maryland Inn, Crown and Crab Room, *Annapolis, MD, USA, 9:00 – 14:00*

Sad News:

– Prof. Carl Christian Tscherning passed away early morning on October 24th in Copenhagen.

Other News:

– Application for a new AC: Univ. of Cape Town, SA *(Ramesh Govind)*

Report from the AC and CC

ASI:

- The ILRSA v60 combined time series 1983-2013 has been delivered.
- The AC and CC solutions have been verified in terms of: looseness, AC Bias application and editing, AC Scale factor, SSC residuals, EOP residuals, translations & scale. During the combination phase, some ACs were asked to submit again their time series mainly due to erroneous bias application. A loosening was applied to the DGFI solutions before making the combination and it was not used before March 1991 because the weighted root mean square (wrms) of the coordinates was roughly 100 mm. Most of the ACs solutions are internally consistent, at 4-5 mm level after 2000.0 and the same level is reached in the 3D wrms of the coordinate residuals w.r.t. ITRF2008. The translations and scale w.r.t. ITRF2008 are similar to those computed with the previous ILRS contribution for ITRF2008; a small jump is found in the Y translation component and in the scale around the year 2010.

JCET:

- The ILRSB v60 combined time series 1983-2013 has been delivered.
- Overview of the check performed on the AC solutions before making the combination for ITRF2013.
- The JCET monitoring website is available with new features and more user friendly: number of stations, systematic error model from the DH file, looseness. As soon as the website is complete, it will be moved to the main page.

GRGS:

- The orbital information for Lageos and Etalon coming out from the re-analysis for ITRF2013 has been investigated. Looking at the weekly solution variance factors, there are some cases in which the Etalon data are making the solution worse. A comparison was performed between the v60 time series and a solution obtained using the IERS

convention mean pole and EIGENS2-extended gravity model. There are very small differences in terms of translations and scale.

NSGF:

- Test made estimating the weekly bias for all the stations together with coordinates. The scale has a difference w.r.t. the standard solution, 0.5-1 ppb smaller

IFE/LLR: Comparison of Apollo 15 coordinates from LLR and from LRO images: 22 meters difference.

ITRF2013 RE-ANALYSIS STATUS:

- Participating AC and CC and data analysis periods:

Analysis / Combination Center	Time Span of Data Analysis
ASI AC & CC	1983 – 2013
BKG	1993 – 2013
DGFI	1983 – 2013
ESA	1983 – 2013
GFZ	1983 – 2013
GRGS	1983 – 2013
JCET AC & CC	1983 – 2013
NSGF	1983 – 2013

ITRF2013 or ITRF2014 ?

- At the end of November ITRS/IGN will decide if we will extend the analysis to include 2014 and go for an ITRF2014 that will be valid for a longer period than ITRF2013 would.
  The ILRS ACs are ready to support a quick re-analysis of the 2014 weeks over the next two months, so that we can deliver a combination to ITRS in early 2015 (by February at the latest!).
- Discussions with CSR indicate that we can have the required input gravity modeling in place and available to the ACs soon enough, so this is not a problem. The input will be ready by the end of November.
- All the ACs agreed to extend their analysis (ESA is not attending the AWG meeting and will be contacted for confirmation) as soon as the required models are available. It is possible that we should only have to do the analysis of the last month or last few

weeks of 2014 in early January, and the CCs would have the previous' weeks combined by then already, leaving only these last month for analysis and combination in early January 2015.

Evaluation schedule for ITRF2013 (or ITRF2014):

- Three (3) combination centers will be involved in the ITRF generation IGN, JPL, DGFI. The final solution will come from the IERS/ITRS Center, that is, IGN. The IGN solution will be most probably available by the end of May 2015. ITRF2013 will be a SINEX file with the Solution EPOCHS block included and a discontinuity file.
- ITRF2013 will have the non-tidal loading applied and a non-seismic deformation model for stations affected by earthquakes. A NT table with the corrections will be available and a relaxation model will be given to compute the coordinates in the post-seismic period. SSC/SSV will not be affected by NT for time series longer than 3 years. The post-seismic will be standardized in the future in the SINEX format but, at the moment being, it will be a simple table.
- The geocenter motion will be delivered together with ITRF, amplitude and phase for the 3 Cartesian components. In the next future, ILRS could provide the update of the extension as discrete series. IGN could provide 2 models: one before applying the NT loading and the other after applying the NT. The model will be well documented.
- EOP aligned with all of them? IERS will make an EOP series aligned with the new ITRF. Not clear if it will be done for all the 3 combined solutions.
- As with previous ITRF models, the ILRS AC/AAC will be involved in the evaluation of the new model to ensure that there is no unexpected behavior or degraded performance in analyzing SLR/LLR data. The IGN solution will have priority from ILRS in this validation. The discontinuities in the ILRS time series will be checked again in the next weeks and sent to IGN in order to reach an agreement on the final ITRF.
- The ACs willing to participate are: ASI, BKG, DGFI, GFZ (waiting for Koenig confirmation), GRGS, JCET, NSGF. The ACs will be asked to submit information on their foreseen test-plan and timeline, considering the ITRF delivery as the validation process start-time.

ILRS report on GNSS tracking campaign

During August and September 2014, the ILRS stations were asked to track intensively the GNSS constellation. Results were shown in terms of number of passes and number of satellites tracked. There are 5-6 stations that got a large amount of data. Unfortunately, there were practically no daylight tracking data to speak of. ILRS should better define its requirements for tracking the GNSS satellites.

AWG new products, revised analysis procedures and modeling standards:

- All the AC are ready to convert the current operational process standards to one aligned with the mode of analysis used for the ITRF2013 re-analysis as soon the gravity coefficient series is ready. ECP will contact CSR and will deliver to the ACs routinely the forecast for the degree-2 coefficients. Mean pole: the available table given by Gambis is good enough also for the 2014 re-analysis. Gambis is committed to make a new series at the beginning of each year. Gambis (or Petit, Bizouard) will be

contacted to understand if he is still willing. A change of the IERS conventions should be discussed.

- Revise current AWG rules on the **regular estimation of systematic errors** for all sites (new product from same SINEX). The activity could start as soon as we have completed the ITRF2013/ITRF2014 submission, February-March 2015.
- **Estimation of low-degree** SH of the gravity field (decide a priori gravity & tides model). NSGF is very close and we will wait for them before planning the Pilot Project.
- **Inclusion of LARES** as a 5th satellite in the group of analyzed data. All the ACs are ready and the activity will start after completing the PP on bias and gravity.
- The **NT Atm. Loading & Gravity implementation** will continue as an internal PP. The model could be eventually included in the operational solutions. The time series for ITRF are always coming out from a re-analysis and will follow the Product Center standards (i.e. to exclude NTAL modeling). To be done within 2015.
- Orbital Product: to be done soon but planning is postponed.

Next meeting:

Next AWG meeting, almost certainly **DURING** the EGU 2015 week, possibly just half a day.

AWG List of attendees, AWG @ Annapolis, Fall 2014, Oct. 26

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