Minutes of the Fall 2019 (44th) ILRS ASC Meeting

Tuesday, October 1, 2019, Observatoire de Paris, Paris, France, 9:00 – 17:00

Operational products: status reports and future plans

All ACs & CCs with brief reports on key issues

ASI:
- Standard products are running smoothly both as single AC submission and CC submission. Some remarks on the combination products:
  - The daily JCET solutions still show a much lower 3D WRMS of the coordinate residuals with respect to the other ACs and to the JCET weekly time series. Similar issue in the scale to ITRF2014 because it is close to zero and it is smaller also in the weekly solutions. Higher values of the along track residuals rms for LAGEOS-2. (**AI**)
  - DGFI had an intermittent submission period, above all for the weekly solution, between October 2018 and March 2019, now the situation is nominal.
  - There are large signatures (up to 15 mm) in the TX and TY geocenter motion but all the ACs show the same behavior. As regards LOD, all the ACs have a scatter between ± 100 µs except **GFZ** showing a larger scatter and the problem is still under investigation. (**AI**)
- Systematic error estimates
  - ASI time series v230 submitted with updated Wettzell data
  - Four ACs submitted their time series. First check shows a benefit of the new satellite CoM corrections.

BKG:
- PP_SSEM: Time series v230 submitted with:
  - updated Wettzell data
  - HF-EOP model implemented in Bernese (NOT used in SSEM PP products yet)
  - Revised ASC procedure: secular pole implemented, latest CoM model
- LARES orbit computation is underway

DGFI:
- Performance of the v170/v70 solutions in terms of number of observations. There are cases in which stations are submitting old data (e.g. Sejong submitted June/July 2019 data). Bloßfeld will check with Schwatke how many stations are submitting data late **(AI)**.
- HF EOP model validation: 12 models implemented in DOGS-OC SW. Test on orbit determination shows that some models give an improvement in the estimated orbit even if the impact on the rms is rather

small. Test on the estimation of LOD and polar motion: Desai and Gipson seem to perform slightly better than the other models.
- Operational products have now a stable behavior
- SSEM PP time series will be submitted very soon (**AI**)

ESA:
- AC status:
  - o Wettzell data issue: data update **To Be Done**
  - o SSEM PP v230 should be submitted next week (**AI**)
  - o HF EOP done, secular pole and CoM model adopted in the analysis

GFZ:
- Nominal weekly and daily products.
- SSEM PP: v230 ready (**without HF-EOP - AI**) , to be submitted soon (**AI**).
- LARES analysis for spherical harmonics. Six satellite solution available (L1,L2, AJ, STE, STA, LR) with 5x5 filed estimated, not tested for L1, L2, E1, E2, LR.

IAA:
- Overview of the LLR data available. 3 stations giving new data: OCA (both green in 2009-2019 and infrared in 2015-2019), Matera (2003-2019) and Wettzell (2018-2019). The one-way rms is close to 1.5 cm for OCA and Wettzell, 3 cm for Matera (**TBC**).
- Model evaluation can go down to 5 mm: daily adjustment of LOD/EOP, better lunar theory will help to improve, daily site offsets
- DUT0 accuracy is around 50 µs, may LLR can contribute to the EOP determination?

IGN
- ITRF2020 model update requested from all TCs. ILRS is requested to include the range biases (RB) in the SINEX file (**AI**). One possibility could be the reporting of RB as estimated constrained parameters (included in the variance/covariance matrix) in order to give the possibility to re-estimate the RB in the combination. The ASC considers this possibility too dangerous because the re-estimation at the ITRF combination level could absorb different effects and deliver something different from site RB. The covariance is in any case incomplete, lacking the entire orbital section, thus the manipulation of only the biases will unavoidably cause distortions in the solution.
- Comparison of new SLR scale w.r.t. VLBI, DORIS and the IGS including Galileo data. The new ILRS approach almost zeroes the offset with VLBI

NSGF:
- SSEM PP v230 time series uploaded, new data from Wettzell and Mount Stromlo, no HF-EOP (**AI**).
- CoM modeling.
  - o Some refinement but no more major changes expected. Model for new (NIR) 8834 will be available soon (**AI**).
  - o Default values to be adopted in case the correction is not available. **Pavlis** will send the default CoM corrections (**AI**).
  - o The recent model is labelled 190904.
  - - Proposed SINEX corrections block

- Horizontal gradients: 1 year L1,L2,LR with/without horizontal gradients, with/without RB. No big changes in the residual mean absolute deviation.

JCET:
- SSEM PP v230 time series uploaded
- JOGSILR: 22 papers, work completed. Still a few papers are under review, the journal will be published in October or in November, at latest.
- Etalon campaign February-May 2019: consistent increase of the top producer 5 stations. The improvement in Px, Py and LOD was 37%, 18%, 15 % respectively when comparing with the 2018 estimates. The European network got 56% of the total amount of data.
- JCET Portal has the new v230 time series from the SSEM PP.
- Horizontal gradient modeling proposed by Sosnica. Test made with Geodyn and comparison of the 2 series (with and without) of estimated biases. The biases are affected at the 1 mm level and 1 µm in rms. The model is thus not providing the expected improvement and it is not considered useful for the next ITRF2020. The effect on the EOPs has not been checked (**AI**).
- ILRS 2016-2018 report status (C. Noll): in particular, expected contributions from ACs and CCs **(AI for all ACs)**.

Operational Products

- New CRD format: JCET, ASI and DGFI will contribute to test it. Some data are available at EDC, not at CDDIS.
- The new CoM must not be used for the operational products. We will probably starts its use from the beginning of 2020.
- Discussion on common modeling among the ACs for CoM, DH file, HF-EOP, gravity field. Proposal for a table summarizing the models to be used for the different ILRS products. Bloßfeld, Pavlis and Rodriguez will work on the documentation (settings, models, etc.) for the operational products and PP products **(AI)**.
- Pavlis and Luceri will update the ILRS products web pages **(AI)**.
- Pavlis will update the resource files for the analysis in the online ILRS web page **(AI)**.

Planning for the development of the next ITRF

- Pilot Project: Inclusion of LARES as a 5th satellite in our operational product development and estimation of low-degree SH of the gravity field solving for a 6x6 gravity field. All ACs are requested to process 2017 with 5 satellites data set. Bias estimation as in the operational series only. These SINEX series should be submitted by the **end of October 2019 (AI)**. The SH parameters should be included in the SINEX file (**version 3xx)**, using the official SINEX format convention.
- The ITRF2020 time series will have a SINEX block for the a priori corrections. It will contain 3 sections in the COMMENT block: range biases, time biases and CoM corrections. The start and stop dates for each correction will be taken by the reference data handling file, considering only the lines used for the specific arc solution. The blocks will be named as:
    - MODEL/RB
    - MODEL/COM
    - MODEL/TB

Sample in Appendix I (under discussion). **Final version** and block format will be distributed shortly (**AI**).

SSEM PP

- The operational phase of the SSEM PP will start after a dry run, probably around March 2020 in order to have the first results for the EGU. The weekly solution, v230 style, will have a latency to be decided.
- The RB table will be updated whenever a clear mean change is visible in the estimated combined RB time series.

<u>Next meeting</u>

At the EGU in Vienna, **Saturday May 2nd, 2020** (**AI**)

APPENDIX

I.   Example of new SINEX blocks (under discussion!)

Pre-applied range biases:

```
*          1         2         3         4         5         6         7         8
*23456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
*--------------------------------------------------------------------------
+MODEL/RB
*SITE PT_ SOLN T START_DATE__ END_DATE____ M RANGE_BIAS STD_DEV
 1873 L1   501 L 18:288:00000 18:295:00000 R   -0.0193   1.000
 1879 L2   501 L 18:288:00000 18:295:00000 R    0.0193   1.000
-MODEL/RB
```

Pre-applied timing biases:

```
*          1         2         3         4         5         6         7         8
*234567890123456789012345678901234567890123456789012345678901234567890123456789012345
*----------------------------------------------------------------------------------
+MODEL/TB
*SITE PT_ UNIT T START_DATE__ END_DATE____ M __E-VALUE___ STD_DEV _E-RATE__ _CMNTS_
 1824 --- us   A 12:084:68460 12:085:00000 T    -24.400    5.000   0.0000 -------
 1873 --- us   A 09:059:00000 09:110:00000 T    -21.750   50.000  -0.2600 c.drift
-MODEL/TB
```

Applied target signature correction:

```
*          1         2         3         4         5         6         7         8
*23456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
*--------------------------------------------------------------------------
+MODEL/COM
*SITE PT_ SOLN T START_DATE__ END_DATE____ M    COM_CORR
 1873 L1   501 L 18:288:00000 18:295:00000 C     0.1234
 1879 L2   501 L 18:288:00000 18:295:00000 C     0.1234
-MODEL/COM
```

II.   SUMMARY of ACTION ITEMS:

AI No.	Responsible Entity	Action Item Description
1	**JCET**	Reconcile DAILY/ WEEKLY-product scale, check on LAGEOS-2 modeling
2	**DGFI, ESA, GFZ**	Deliver your v230 series ASAP!
3	**GFZ**	Check your modeling to correct increased LOD scatter in your solutions
4	**DGFI**	EDC/Schwatke will report on recent unannounced data replacements
5	**GFZ & NSGF**	Implement HF EOP model ASAP!!!
6	**ECP & CL**	Prepare NEW Data Handling file for reanalysis by **end of 2019**
7	**ECP & CL**	Finalize/distribute example of the 3 new SINEX Blocks by **October 31.**
8	**ECP**	Provide gravity and tides model SH coefficients to be used for the reanalysis by all ACs by **November 30, 2019** (UAW2019 decision)
9	**ECP**	The *a priori* constraints on the gravity coefficients to be distributed to the ACs by **October 31, 2019**
10	**ECP**	Distribute DEFAULT CoM values for all CoM model satellites
11	**ECP**	Check JCET solutions for the effect of Horiz. Trop. Gradients on EOP
12	**MB/ECP/JR**	Compile documentation of all ASC series, operational & PP **ASAP !!!**
13	**J. Rodriguez**	Extension of the new CoM tables to include NIR data from Wettzell (8834) **ASAP !!!**
14	**ALL ACs**	Add new SINEX Blocks with the RB, TB and CoM corrections only for the stations included in each weekly SINEX file by the **end of 2019**.
15	**ALL ACs**	Deliver complete reanalysis series (**v230**) 1993-now using SLRF2014, the new CoM model and allowing for all-systematics adjustment including a combined bias for the two Etalons, by **October 31, 2019**.
16	**ALL ACs**	Deliver SINEXs (**v300**) of 2017 reanalyzed with LARES included and estimation of a 5x5 plus C/S(6,1) set of SH by **November 30, 2019**.
17	**Both CCs**	The combination and the NEW RB section of the new Data Handling file will be available to the ACs for the operational phase, in **early 2020**.
18	**IAA**	Check on Matera's LLR performance since recent system changes.
19	**ALL ACs**	Next meeting: **May 2, 2020** prior to the EGU at TU Wien.
20	**ECP**	Book a room at TUW for the next meeting on Saturday May 2, 2020

II. ASC List of Attendees, 44th Meeting, Observatoire de Paris, Paris, France
Tuesday, October 1, 2019,   09:00 – 17:00

CHECK✔	Last name	First name	Institution	e-mail
✔	Basoni	Antonio	e-GEOS, Italy	antonio.basoni@e-geos.it
✔	Bloßfeld	Mathis	Deutsches Geodätisches Forschungsinstitut, Germany	mathis.blossfeld@tum.de
✔	Deleflie	Florent	GRGS/ IMCCE / Paris Observatory, FR	Florent.Deleflie@obspm.fr
✔	Gross	Richard	JPL/NASA, USA	richard.s.gross@jpl.nasa.gov
✔	König	Daniel	Bundesamt für Kartografie und Geodäsie, Germany	Daniel.Koenig@bkg.bund.de
✔	Luceri	Cinzia	e-GEOS, Italy	cinzia.luceri@e-geos.it
✔	Pavlis	Erricos	Joint Center for Earth Systems Technology, Univ. of Maryland, Baltimore County, USA	epavlis@umbc.edu
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✔	Ries	John	The University of Texas at Austin, USA	ries@csr.utexas.edu
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16	**TOTAL**			