Combination at the Observation Level
IERS Working Group

Minutes of the COL Working Group Meeting

9-10 December 2010 – DGFI, Munich, Germany

Agenda of the meeting

December 9th

13:45 welcome
14:00 introduction, reminder of COL objectives, *H. Drewes, R. Biancale*
14:15 activities in the COL analysis centres / contribution on the COL test period (10-30 August 2008):

1. *AIUB/BKG, D. Thaller*
2. *DGFI, R. Heinkelmann*
3. *ESOC, D. Svehla*
4. *GFZ*
5. *GRGS, J.-Y. Richard*
6. *other*

15:30 activities in the COL combination centres

1. *a priori models used, toward a set of common standards?, S. Loyer/L. Soudarin*
2. *compatibility of SINEX files, data and parameter homogeneity, M. Seitz, J.-Y. Richard*
3. *comparison strategy and results (polar motion, UT1, nutation, stations…), M. Seitz, J.-Y. Richard*

17:30 *adjourn*

December 10th

09:00 discussion on roadmap (tasks and sequence)
09:30 proposal on test reiteration:

1. *standards*
2. *data sets*
3. *parameter sets*
4. *SINEX evolutions*

10:30 discussion on combination

1. *strategy and methods*
2. *objectives to be reached*
3. *planning of work*

11:30 activity report
12:00 summarizing next actions and schedule
12:30 *end of meeting*

Chairs
Manuela Seitz , Richard Biancale

List of participants

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Minutes

Introduction
Reminder of the main goals of COL.
Jump of precision with respect to ITRF2008 both for position (goal 2-3 mm) and rates (0.1 mm/y) of stations → important for mean sea level rise monitoring (acceleration ?)
Production of « NRT » station solutions (monthly for instance) in order to manage geophysical events like earthquakes.

Activity report from the analysis centers
D. Thaller: SLR and GNSS processing at AIUB with Bernese
H. Müller: SLR processing of Lageos-1/2, Etalon-1/2 at DGFI with DOGS 5.0
Robert Heinkelmann: VLBI processing at DGFI with OCCAM 6.1.
D. Svehla: instantaneous reference frame realization by combination of space geodetic techniques onboard Jason-2 at ESOC with Napeos 3.5. Jason-2 considered as moving station offers a fast changing geometry which allows to de-correlate parameters.
C. Sciaretta: ASI/e-GEOS is willing to join the analysis centers for SLR with Geodyn and maybe VLBI
H. Spicakova: TUW will process VLBI with the new written software VieVs.

Activity report from the combination centers

J.-Y. Richard: report on GRGS combination centre (ERP and station coordinates)
S. Loyer: reviewing the model and parameter differences between groups
M. Seitz: exhaustive combination report on station coordinates
J.-Y. Richard quotes the interest of Mykhailo Lytvyn from Kiev Observatory to participate to combination process. During a stay at Paris Observatory he conducted to various analyses leading to similar results obtained using the GRGS Dynamo software.

Discussion on SINEX format

SINEX file must be complete (including the full STATISTIC information)
M. Gerstl:
- separation between observations NEQ system and constraints system→ already done by most groups, to be verified for ESOC.
- indicate the total number of parameters (including reduced parameters) → already done by most groups → mandatory.
- make the SINEX format « XML-compatible » → implies too large a community to change SINEX format ; but a conversion tool from SINEX to XML format can be imagined. To be developed by volunteers, on a « best effort » basis.

Discussion on models

- Gravity field: GRGS will provide the gravity field model computed from a GRACE-GOCE time variable model centered over the 3-week test period. This model will include averaged atmosphere and ocean current gravity variations.
- Ocean tides: FES2004 is consensus. Loading displacement for a few collocated sites (e.g. Greenbelt) should be check between groups. List of proper triple co-location sites during CONT08:
  - GPS-VLBI-SLR: Hartebeesthoek (30302), Concepcion (41719)
  - GPS-SLR-DORIS: Washington (40451), Mount Stromlo (50119), Tahiti (92201)
  - GPS-VLBI-DORIS: Kokee Park (40424), NyAlesund (10317)

- Elevation cut-off angles are different according to centers, although they are generally 10 degrees. No consensus.
- Different weighting are no problem for individual techniques (because they can be re-weighted) except for the combined techniques where the ratio cannot be changed.
- Tropospheric delay: GPT+GMF should be adopted among all groups except for SLR (Mendes-Pavlis). Horizontal gradients shall be estimated. Zenithal tropo delay and gradients should be included in the SINEX files (for co-location sites only).
- To simplify comparisons it is agreed that no atmospheric loading will be used.
- Station coordinates: ITRF2008.
- EOP: EOPC04_08 consistent with ITRF2008 (available beginning from January 2011).
- GPS antenna phase centre (station and satellite): igs08*.atx (as soon as provided by IGS)
Recommended models should be put on the forum.

Discussion on parameters

- The high density of observations obtained during the CONT08 campaign allows to specifically study the sub-diurnal EOP variations. For this it is necessary to derive hourly or 2-hour estimates.

This should be done by the various centers in a second step after those first results obtained for daily EOP estimations be consistent one to another.
- Pole/UT1: either piecewise linear (PWL) at 0h or offset+drift (OD) at 12 h, at the choice of the groups; the OD approach can be easily converted in PWL for combination. The interpolation between reference points is kept linear.
- For groups who can do multi-technique processing on Jason or GRACE (LEO and GNSS processed together), satellite phase center coordinates in the satellite reference frame should appear in the NEQ as additional parameters.
– Implementation of X/Y nutation parameters (with partial derivatives) is now recommended
M. Gerstl will provide a short paper on interpolation methods. There is in particular a need for adopting a reference procedure for the interpolation of the a priori EOPC04 for the data epoch. Paris Observatory will conduct some tests and propose a method of interpolation.

Next tasks
Processing with updated and homogenized standards and parameters will be reiterated over the same 3-weeks period (CONT08) for the moment.
Provide a unique data set for the benchmark, at least for DORIS, VLBI and SLR. → considered as difficult by most groups (because of outlier edition, etc). Number of collocated sites almost satisfactory.
New set of data: LEO satellites, in particular Jason-2 with multi-technique (SLR, DORIS, GPS) or GRACE-A/B (SLR, GPS). To be provided by some groups on a volunteer basis.

Roadmap
The following 5 points of the roadmap should be fulfilled before the next meeting::
1) review the approach of the various groups
and their capability to process two or more techniques.
2) elaborating benchmarks
to intercompare results between groups from the same data set.
3) insuring SINEX compatibility
between techniques and with the international technique services and IERS.
4) establishing common processing standards
for all techniques in order to guarantee homogeneity and consistency.
5) optimizing and unifying parameterization

Schedule deadlines
- end of January for the a priori models and information to be put on the COL forum (http://grgs.obspm.fr/forum/)
- May for SINEX delivery through the ftp server (ftp://hpiers.obspm.fr/iers/eop/grgs/)
We foresee to present the COL activities on poster at some events such as EGU and IUGG Assemblies. Abstracts are due for mid-January 2011

Next meeting
September/October 2011. D. Gambis has offered to host the meeting in Paris Observatory.
ESOC sent a message as well proposing to host the next meeting in Darmstadt.

PS: the presentation stuff will be made available in the forum.