EARTH ROTATION PARAMETERS DETERMINED OVER CONT08 FROM THE COMBINATION OF SPACE GEODETIC TECHNIQUES

J.Y. RICHARD , D. GAMBIS , C. BIZOUARD
Observatoire de Paris, SYRTE UMR8630, GRGS
61 av. de l'Observatoire, 75014 Paris
e-mail: jean-yves.richard@obspm.fr

A IERS Working Group on Combination at the Observation Level (COL-WG) was set up in the course of 2009 [http://www.iers.org/IERS/EN/Organization/WorkingGroups/]. Its main objective is to enhance techniques at the observation level. The period relative to the continuous VLBI campaign CONT08 extending from 10 to 30th August 2008 was selected to inter compare multi-technique combinations. We present the first analyzes.

1. PROJECT

We produced EOP solutions with a time resolution of 6h for pole coordinates and universal time and 12h for nutation offset parameters. The file exchange format is SINEX delivering normal equations (NEQ) per week. VLBI NEQ were obtained by the Bordeaux Observatory, SLR NEQ by the Côte d'Azur Observatory, GPS NEQ and DORIS NEQ by CNES-CLS and combination is processed at Paris Observatory.

2. ANALYSIS

We first analyze pole coordinates with respect to the a-priori C04 series in which the ocean tidal model is included. These parameters are estimated at 6h intervals by individual techniques and combined. For the polar motion estimation nutation offsets and space stations coordinates were held fixed to their a-priori (Figure 1)
We secondly determine celestial pole offsets with respect to the IAU 1980 precession nutation model. Pole and space stations coordinates were held fixed to their a-priori values for the nutation estimation (Figure 2). The a-priori EOP series is C04, interpolated at 6h intervals for pole series and at 12h intervals for nutation offsets series, the a-priori space station coordinates are those of the ITRF2005 and the a-priori quasar coordinates are issued from ICRF2.

3. RESULTS and CONCLUSIONS

When Terrestrial (TRF) and Celestial (CRF) reference frames are held fixed, pole coordinates are unbiased for all techniques. The combination of the four techniques (Comb) using the variance component analysis for weighting techniques exhibits the smallest mean and RMS values. When the TRF is simultaneously estimated with polar motion (Comb+TRF), we obtain a bias of a few hundred μas revealing a disagreement between the combined and terrestrial reference frame [table 1].
Considering celestial pole offsets estimated by VLBI, the continuity constraints have no effect. When combined with GPS and DORIS (Comb), and simultaneously estimated with TRF, the smallest mean and RMS values are observed. Nutation parameters estimated with TRF and CRF (Comb+TRF+CRF), exhibit a bias of 400 μas due to the disagreement of the estimated CRF and the a-priori ICRF2 [table 2].

Technique	**X-Pole** mean	**X-Pole** WRMS	**Y-Pole** mean	**Y-Pole** WRMS
GPS	-10.3	160	-60.3	117
VLBI	-17.2	189	-91.7	174
DORIS	31.5	1485	262	1098
SLR	-25.7	855	-193	800
Comb	-10	165	-66.8	106
Comb+TRF	298	185	-794	211

Table 1: Weighted mean and RMS values of daily pole corrections versus C04 series in μas

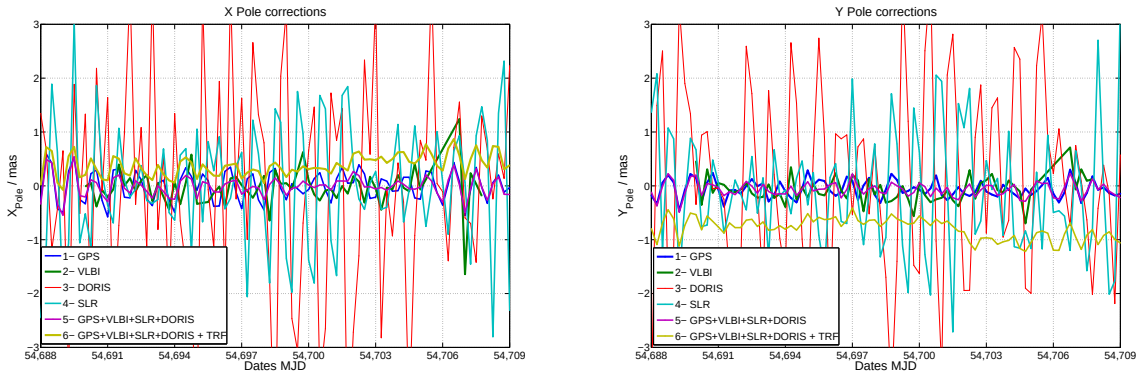

Figure 1: X and Y pole corrections at 6h interval. *1)GPS with TRF fixed, UT removed, 2)VLBI with TRF fixed, quasars removed, tropospheric zenithal bias substituted, 3)DORIS with TRF fixed, 4)SLR with TRF fixed, 5)Weighted Combination GPS+VLBI+SLR+DORIS with TRF fixed, 6)Weighted Combination GPS+VLBI+SLR+DORIS + TRF estimated, with continuity constraints of 3cm for polar motion, minimal constraints and co-located ties for space stations coordinates*

.

Technique	**d**ψ mean	**d**ψ WRMS	**d**ϵ mean	**d**ϵ WRMS
VLBI	-26.2	183	77.9	132
VLBI const.	-6.5	190	91	133
VLBI+CRF	-81.7	192	-688	229
Comb+TRF	-1.2	261	41.4	256
Comb+TRF+CRF	-388	313	322	279

Table 2: Weighted mean and RMS values of daily celestial pole offset versus C04 series in μas

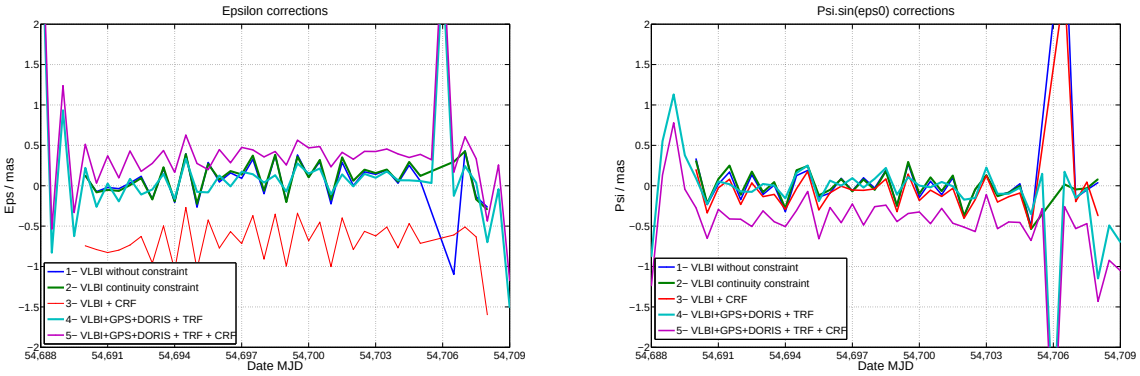

Figure 2: dϵ and dψ corrections at 12h intervals. *1)VLBI with TRF fixed, 2)VLBI with TRF fixed with continuity constraints of 3cm for nutation offsets, 3)VLBI + CRF quasars estimated, nutation and quasars unconstrained, 4)Weighted combination VLBI+GPS+DORIS + TRF estimated, continuity constraints on nutation, 5)Weighted combination VLBI+GPS+DORIS + TRF + CRF estimated, continuity constraints on nutation offsets, minimal constraints, local ties, stability constraints on stations coordinates, stability constraints on quasars coordinates*