

3.6.1.2 Institut Géographique National (IGN)

The IGN ITRS Combination and Research Centre concentrates its activity on software enhancement, new combination strategy development and regular analysis of Global TRF solutions as well as time series solutions of TRF and EOP. The experience gained in time series analysis leads to the conclusion that the upcoming ITRF solution should combine TRF and EOPs, based on times series of TRF and EOP of the individual techniques. It is preferable to use weekly solutions in order to better monitor station non linear motions. The EOP parameters resulted from this combination would be used then to recalibrate the current IERS C04 series, so that ITRF and IERS EOP consistency will be ensured. Therefore preparation of the ITRF2004 was commenced in 2004 and a call for participation was issued.

Data analysis and software enhancement

With interaction of IERS Analysis Centres (AC), individual solutions from the different techniques are frequently evaluated and tested, in order to improve the individual analyses as well as the ITRF combination. Thus both the individual ACs as well as the ITRS Combination Centre regularly test new analysis strategies. This cooperation between the IERS ACs and the ITRF CC is vital for quality control and improvement of IERS products. To achieve this goal, the software package Combination and Analysis of Terrestrial Reference Frames (CATREF), developed by IGN, is regularly updated and enhanced in order to perform proper analysis of the different solutions performed by the IERS ACs. In particular modelling of the Earth Orientation Parameters (EOP) is included in the CATREF software, to be able to combine concisely and coherently station positions/velocities and EOPs.

Analysis of time series of station positions and Earth Rotation Parameters

We performed time series analysis using CATREF software, using the following data:

- o VLBI: 24h-session SINEX files over 1990–2004, provided by Goddard Space Flight Center (GSFC) VLBI Group, using the terrestrial reference frame of gsfd001
- o SLR: weekly solutions provided by Italian Space Agency over the period 1993–2004
- o GPS: Official IGS weekly combined solutions over the period 1999–2004
- o DORIS: weekly solution provided by Institut Geographique National/Jet Propulsion Laboratory over the period 1993–2004

A multi-technique combination was performed using the above described solutions over the period 1990–2004. In order to avoid the

impact of dubious local ties in the combination, we added 77 precise local tie vectors (as internally determined by our own analysis) located in 58 collocated sites, using only one point per technique in each site. We noticed that the post fit local tie residuals are generally 2–3 mm larger when EOPs are included in the combination.

As results of this combination test, Figure 1 shows the polar motion post-fit residuals over the 4 techniques.

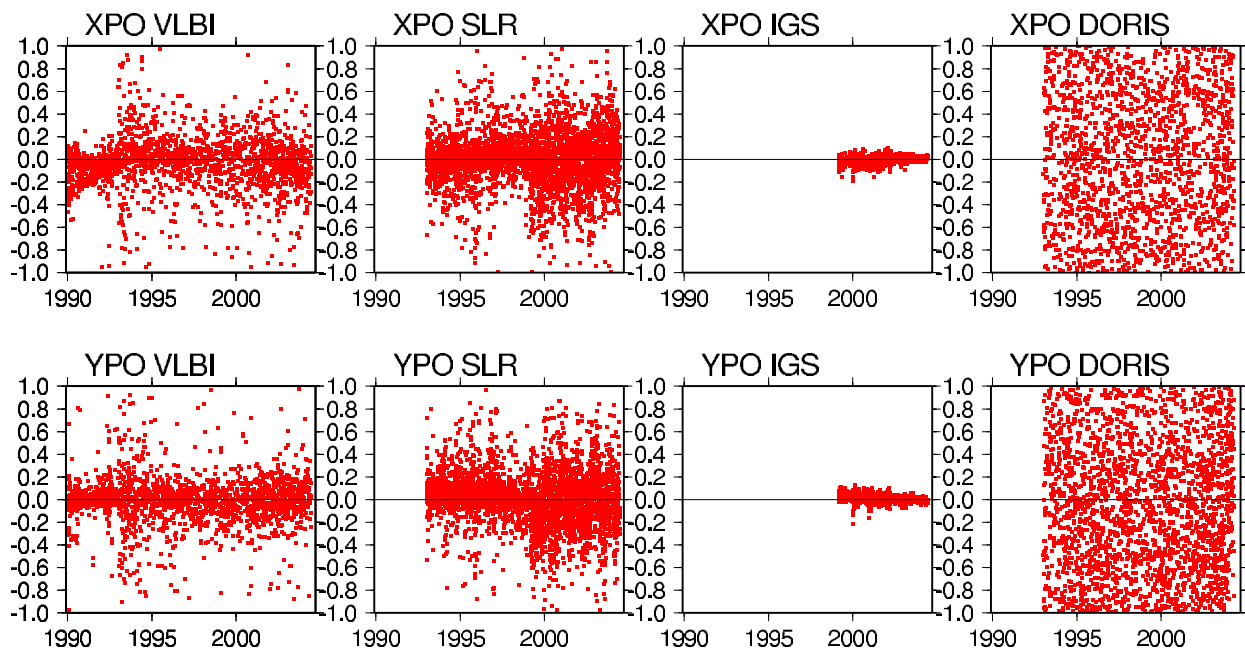


Fig. 1: Post fit residual of Polar motion per technique (mas)

The EOP IGS results appear to dominate the other technique results. This is mainly due to the fact that the IGS solution is already a combination of 7 analysis centres, whereas the others are provided from one analysis centre per technique. In addition, the IGS EOP estimates are based on continuous observations from more than 300 sites homogeneously distributed.

Publications

Altamimi, Z., C. Boucher and P. Willis, 2004, Terrestrial Reference Frame Requirements within GGOS Perspective, *J. Geodynamics*, accepted for publication.

Altamimi, Z., C. Boucher and D. Gambis, 2005, Long-term Stability of the Terrestrial Reference Frame, *Adv. Space Res.*, in press.

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