

3.6.1.2 Institut Géographique National (IGN)

The IGN ITRS Combination Centre and the IGN Combination Research Centre concentrate their activities on software enhancement, new combination strategy development and regular analysis of Global TRF solutions as well as time series (weekly/monthly) 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 (weekly or monthly) 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 EOPs 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.

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 EOPs

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

- VLBI: 24h-session SINEX files over 1990-2003, provided by Goddard Space Flight Center (GSFC) VLBI Group, using the terrestrial reference frame of gsfd001
- SLR: weekly solutions provided by Italian Space Agency over the period 1993-2003
- GPS: Weekly solutions from the IGS Analysis Centers:
 - o EMR: Natural Resources Canada: 1996–2003
 - o GFZ: GeoForschungsZentrum: 1996–2003
 - o JPL: Jet Propulsion Laboratory: 1996–2003
- DORIS : weekly solution provided by Institut Geographique National/Jet Propulsion Laboratory over the period 1993–2003

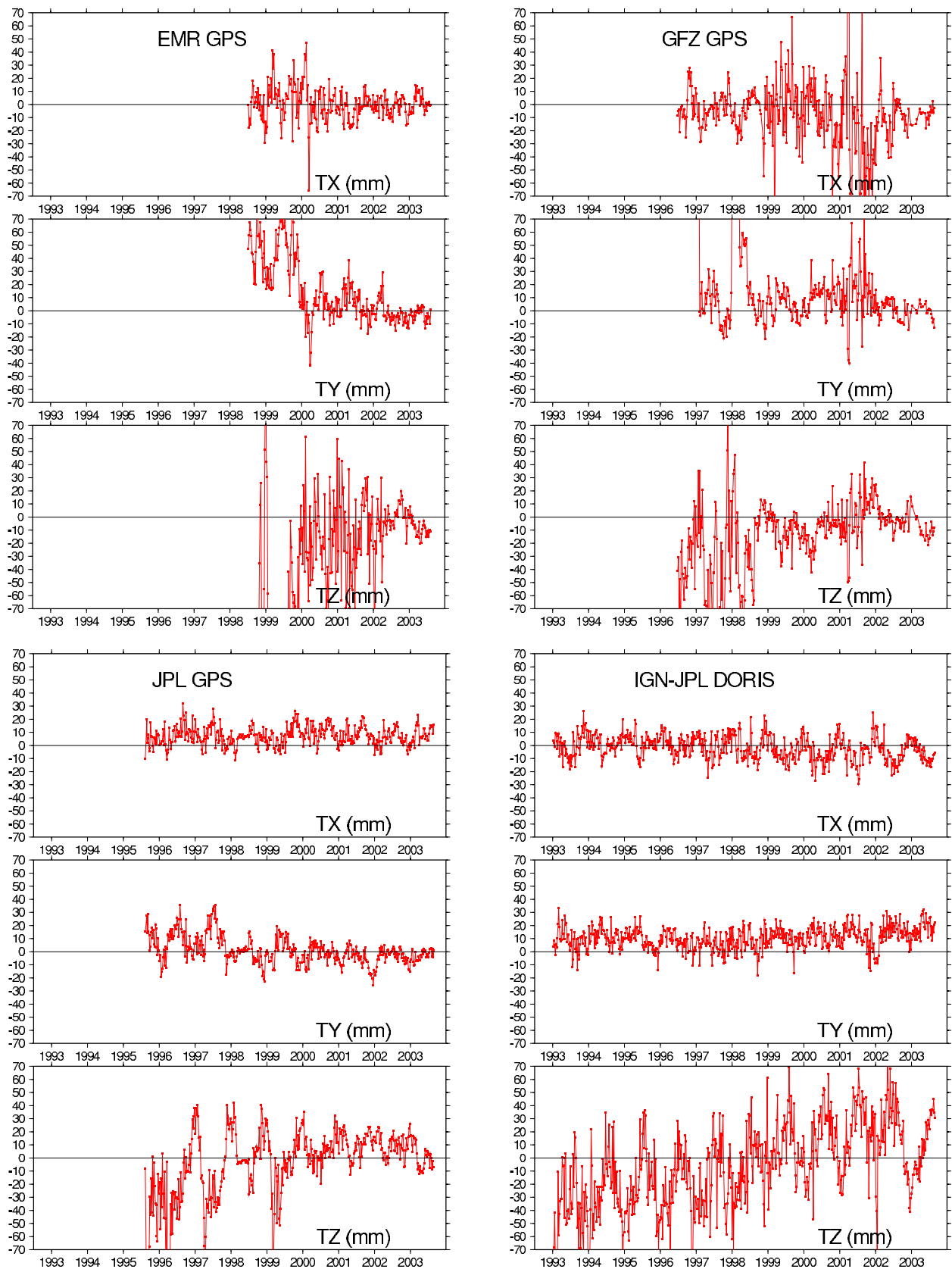


Fig. 1: Geocentre variations of GPS EMR, GFZ, JPL and the IGS combined solutions

As results from this analysis, Figure 1 illustrates the geocentre variations for 3 IGS Analysis Centers (EMR, GFZ, JPL) and the official IGS combined estimates. Figure 2 shows the geocentre results as obtained from the analysis of DORIS (IGN-JPL) and SLR (ASI) weekly solutions.

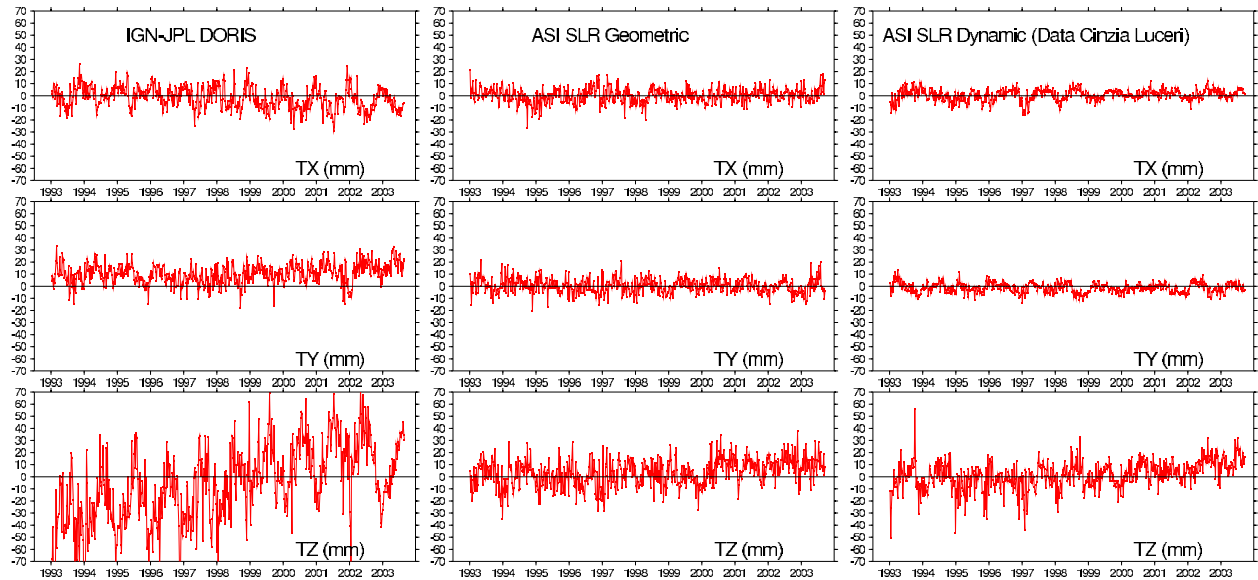


Fig. 2: Geocentre variations of DORIS (IGN-JPL) and SLR (ASI) weekly solutions

A multi-technique combination was also performed using the above described solutions over the period 1999-2003. 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.

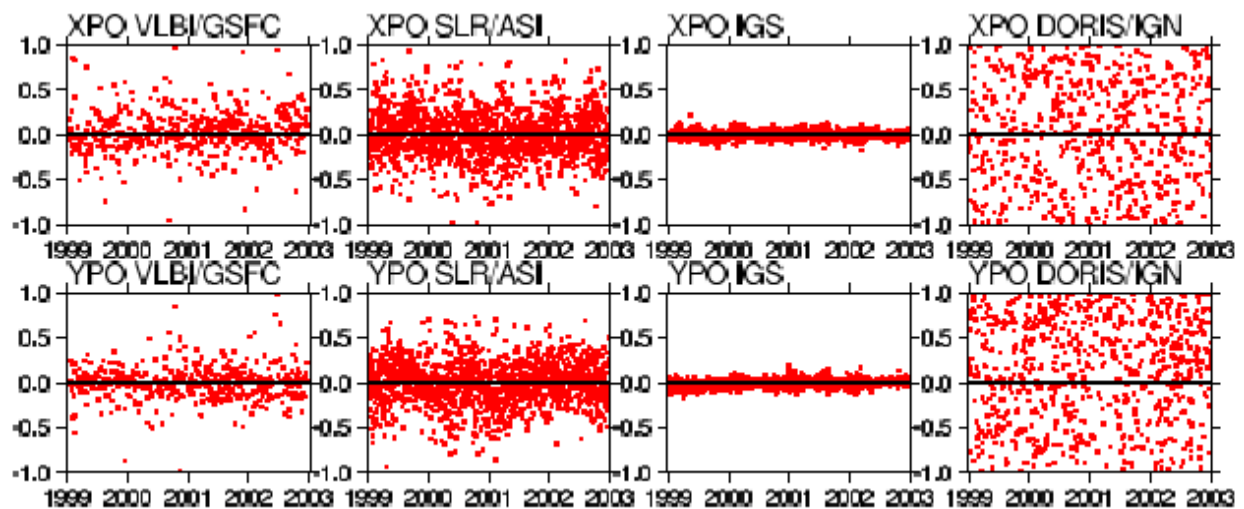


Fig. 3: Post fit residual of Polar motion per technique (mas)

As results of this combination test, Figure 3 shows the polar motion post-fit residuals over the 4 techniques.

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 200 sites homogenously distributed.

Publications

Altamimi, Z., P. Sillard and C. Boucher, The Impact of a No-Net-Rotation Condition on ITRF2000, GRL, 30(2), 1064, doi:10.1029/2002GL016279, 2003.

Altamimi, Z., A. Moore, A. Nothnagel, V. Husson and H. Fagard, ITRF and Collocation Sites, in: IERS Workshop on site co-locations, Matera, Italy, 2003. (IERS Technical Note) Frankfurt am Main: BKG, 2004, in preparation.

Altamimi, Z., C. Boucher and P. Willis, Terrestrial Reference Frame Requirements within IGGOS Perspective, submitted to J. Geodynamics, 2003.

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