

3.6.2 Institut National de l'Information Géographique et Forestière (IGN)

This report summarizes the activities of the ITRS Combination Centre at IGN during the year 2018.

Research and development activities

The members of the IGN CC, often in cooperation with other scientists, conduct research and developments activities relating to the ITRF in particular and reference frames in general. R&D activities include ITRF accuracy evaluation, mean sea level, loading effects, combination strategies, and maintenance and update of CATREF software. Scientific results of specific data analysis and combination are published in peer-reviewed journals, as listed in the references' section, but also presented at international scientific meetings.

Investigation of the scale discrepancy between SLR and VLBI

The scale of ITRF2014 was defined in such a way that it has zero scale and zero scale rate with respect to the arithmetic average of the implicit scales of SLR and VLBI solutions as obtained by the stacking of their respective time series. The resulting scale and scale rate differences between the two solutions (SLR and VLBI) are $1.37 (\pm 0.10)$ ppb at epoch 2010.0 and $0.02 (\pm 0.02)$ ppb/yr. The level of the scale agreement between SLR and VLBI confirms the ITRF2008 finding and is an indication of the persistent scale offset between the two technique solutions. These results suggest that there is still an urgent need for investigation on the causes of the scale discrepancy, e.g., range biases in case of SLR [Appleby et al., 2016] and possible effects due to VLBI antenna gravity deformations [Sarti et al. 2009, 2010]. The ILRS has initiated a pilot project on systematic errors including the range biases which will be estimated in the ILRS solution to ITRF2020. A preliminary SLR test solution was made available to the ITRS center by Cinzia Luceri from the Italian Space Agency (ASI) where estimated range biases were taken into account. Analyzing the time series of this SLR test solution showed a clear scale offset of about 1 ppb with respect to the ILRS solution which was used in the ITRF2014 as illustrated by Figure 1. We expect that this scale offset will greatly minimize the scale discrepancy between SLR and VLBI in the coming ITRF2020 solution.

Contribution to the Hotine Marussi Symposium 2018

The Head of the ITRS Center convened a session during the Hotine Marussi Symposium 2018 entitled "Theory of modern geodetic reference frames and Earth's rotation". A presentation on behalf of the ITRF team at IGN was made at the session dealing with a "Review of Reference Frame Representations for a Deformable Earth". A written paper was also submitted to the IAG series of this symposium.

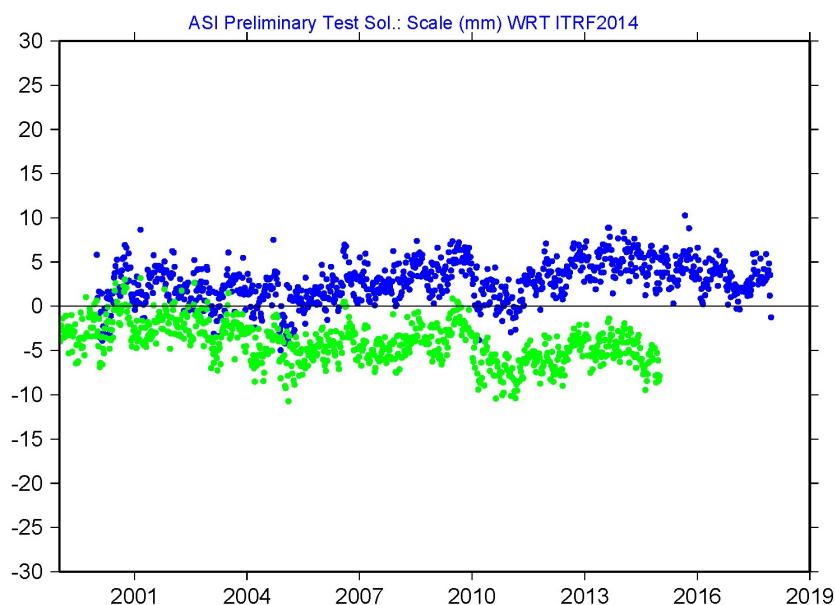


Fig. 1: Scale discrepancy between ASI preliminary solution (blue) where range biases are estimated and ILRS solution (green) used in the ITRF2014 computation

Publications

- Altamimi, Z., P. Rebischung, X. Collilieux, L. Métivier and K. Chanard (2018) Review of Reference Frame Representations for a Deformable Earth, Submitted to International Association of Geodesy Symposia.
- Bruni, S., P. Rebischung, S. Zerbini, Z. Altamimi, M. Errico, E. Santi (2018) Assessment of the possible contribution of space ties on-board GNSS satellites to the Terrestrial Reference Frame, *Journal of Geodesy*, doi:10.1007/s00190-017-1069-z
- Chanard, K., F. Fleitout, E. Calais, P. Rebischung, J.-P. Avouac (2018). Toward a global horizontal and vertical load deformation model derived from GRACE and GNSS site position time series. *Journal of Geophysical Research*, doi.org/10.1002/2017JB015245
- Collilieux, X., Z. Altamimi, P. Rebischung, L. Métivier (2018) Coordinate kinematic models in the International Terrestrial Reference Frame releases. Special issue for Professor Emeritus Athanasios Dermanis, Quod Erat Demonstrandum – In quest of the ultimate geodetic insight, School of Rural and Surveying Engineering, AUTH

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