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 2012. These research activities are mainly related to the ITRF2008 results.

ITRF2008 Plate Motion Model

For various geophysical and geodetic users' applications, we estimated a plate motion model derived from and consistent with ITRF2008, for 14 major tectonic plates, and published in Journal of Geophysical Research (Altamimi et al., 2012). The analysis we adopted to estimate the ITRF2008 Plate Motion Model (ITRF2008-PMM) consisted in the simultaneous estimation of angular velocities of the 14 plates, together with a global translation rate parameter representing an Origin Rate Bias (ORB) of the selected velocity field of 206 sites, far from plate boundaries and deformation zones. The results of this study indicated that we were able to determine an ITRF2008-PMM with and RMS of 0.3 mm/yr. In addition to the precise estimation of the plate angular velocities, we also evaluated the ORB and compared our results to the most used geophysical models, namely NNR-NUVEL-1A and NNR-MORVEL56 elaborated by Donald Argus from JPL, in 1991 and 2011, respectively. The components of the evaluated ORB are (in mm/yr): 0.41 ± 0.27, 0.22 ± 0.32, 0.41 ± 0.30 over the three axes (XYZ). In addition, we observed a large angular residual velocity of the order of 4 mm/yr of the Australian plate between ITRF2008-PMM and NNR-MORVEL56, as illustrated by Figure 1. This bias is not observed when comparing ITRF2008-PMM to NNR-NUVEL-1A, suggesting that it is originated from the new model NNR-MORVEL56.

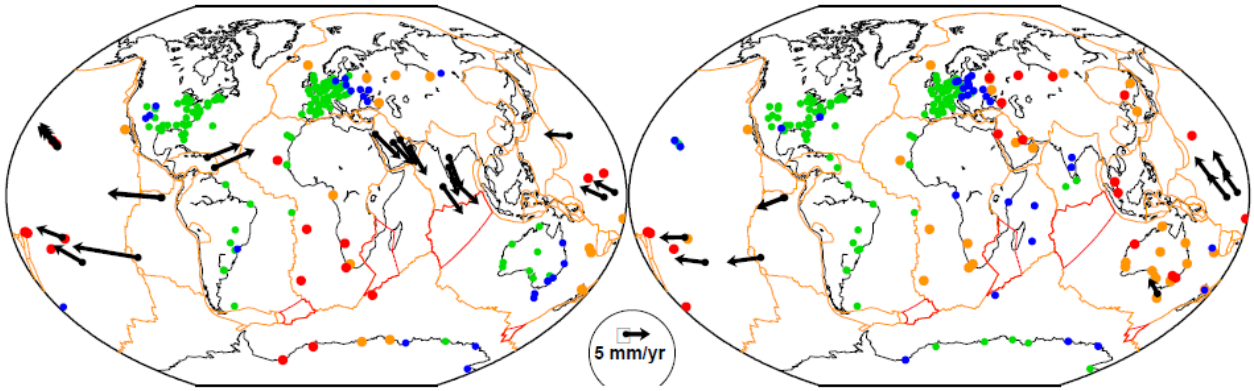

Fig. 1: Velocity differences after rotational transformation between ITRF2008 and NNR-NUVEL-1A (left) and NNR-MORVEL56 (right). In mm/yr: green: less than 2; blue: between 2 and 3; orange between 3 and 4; red between 4 and 5; black larger than 5.

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.

Publications

Altamimi, Z., L. Métivier and X. Collilieux (2012), ITRF2008 plate motion model, J. Geophys. Res., 117, B07402, doi:10.1029/2011JB008930.

Altamimi, Z., X. Collilieux and L. Métivier (2012), Analysis and Results of ITRF2008, IERS Technical Note 37, Verlag des Bundesamts für Kartographie und Geodäsie, Frankfurt am Main, 2012.

Chen, Q., T. van Dam, N. Sneeuw, X. Collilieux and M. Weigelt (2012) Singular spectrum analysis for modeling seasonal signals from GPS time series, Journal of Geodynamics, in review

Métivier, L., X. Collilieux, and Z. Altamimi (2012), ITRF2008 contribution to glacial isostatic adjustment and recent ice melting assessment, Geophys. Res. Lett., 39(L01309), doi:10.1029/2011GL049942.

Santamaría, Á., M. Gravelle, X. Collilieux, M. Guichard, B. Martín Míguez, P. Tiphaneau and G. Wöppelmann (2012) Mitigating the effects of vertical land motion in tide gauge records using a state-of-the-art GPS velocity field, Global and Planetary Change, 98–99, p. 6–7, doi:10.1016/j.gloplacha.2012.07.007

van Dam, T., X. Collilieux, J. Wuite, Z. Altamimi and J. Ray (2012) Nontidal ocean loading effects in GPS height time series, Journal of Geodesy, DOI 10.1007/s00190-012-0564-5

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