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RESIF-RENAG : The French GPS component of a European infrastructure

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RENAG is a collaborative effort from 20 Academic Earth Sciences Department and Institutes of France. RENAG currently operates nearly 50 Continuous GPS stations and through agreement with IGN-France and commercial compagnies, archive and routinely process about 200 sites covering France with a higher density of sites in the western Alps. RENAG recently joined RESIF (http://www.resif.fr), the cpntribution of France to EPOS. RENAG aims at (1) quantifying the slow tectonic deformation in France (2) monitoring the deformation induced by the spatial and temporal variations in continental water loading (3) providing sea level changes along the French coast with respect to a global reference frame stable in time through collocated tide-gauges and CGPS stations (4) monitoring the integrated content of water vapour in the atmosphere. We detail here the main results obtained on crustal deformation. France is an area of moderate seismicity where the associated crustal deformation has yet to be precisely quantified and understood in the frame of the regional deformation. We show that the current accuracy of velocity estimates for the sites operating since 1998 is about 0.3 mm/yr and 0.5 mm/yr on the vertical component (at the 95% confidence level). Long time-correlated noise in the time series still prevents to reach the 0.1 mm/yr accuracy. At the level of 0.3 mm/yr, no deformation is detected on the horizontal components with a WRMS of horizontal velocities with respect to the Stable Europe Reference Frame of 0.15 mm/yr. However, vertical velocities in the western Alps reach 1.5 mm/yr, and show a pattern of increase correlated with the averaged topography. Because vertical velocities magnitudes are higher than horizontal ones, the observed vertical deformation is difficult to be explained by crustal deformation induced either by current extension associated with gravitationnal spreading or driven by boundary conditions induced by the counter-clokwise rotation of the Adriatic, as proposed previously. We therefore speculate that the current observed vertical deformation reflects an on-going adjustment having a deeper origin. These results suggests that monitoring surface deformation in slow deforming areas and better understand crustal-mantle deformation within the Mediterranean plate boundary could be added as objectives of any European plate infrastructure.