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Mapping of active deformation regions in Europe using the EPN network

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The EPN (EUREF Permanent Network) network consists currently of about 180 GPS stations distributed all over Europe and with some few stations also located in the surrounding regions ($e.g.$, North Africa, Middle East). Such network provides a unique and dense set of data to derive the present-day velocity field in this region because it has been computed in a consistent way since 1996 (with the first solution comprising 29 stations). Currently, each weekly solution is computed by combining individual solutions provided by 16 different Local Analysis Centres (each station is processed by 3 to 5 centres). This ensures the reliability and robustness of the final weekly solution due to the overlap between the different sub-networks that facilitates and improves the detection of outliers.

From those weekly solutions, we have estimated the velocity field using only the stations with a data span larger than 3 years (at the moment, approximately 140 stations). In order to map the stations in a unique and consistent reference frame, ITRF2000, the different reference frame constraints imposed during the years (different realizations of the ITRS and different sets of reference stations) were first removed.

For every individual station, a power-spectrum analysis has been performed in order to estimate the coefficients of the white + power law model that better describes the noise observed for that station. We adapted our methodology, based on the analysis of daily solutions, in order to estimate those coefficients from weekly solutions. Using the derived noise model, each individual component of the velocity was computed by applying a 4-parameter model in order to also consider the influence of seasonal variations.

Angular velocities, computed with this improved noise model, were used to delimitate

the different tectonic blocks covered by the EPN network. For this, an iterative process was followed in order to select set of stations that could define different stable tectonic blocks in Europe. Angular velocities were derived for each set of stations and tested if they were significantly different. Our final map of the present-day deformations taking place in the European region is confronted against the known major geophysical and geological features in this region and compared with previous results produced using other geodetic and geophysical solutions.