Geophysical Research Abstracts
Vol. 20, EGU2018-865-1, 2018
EGU General Assembly 2018

Is present-day deformation and seismicity in the Pyrenees an example of super-slow plate boundary? Constraints from a new analysis of GNSS data.

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Global Navigation Satellite System (GNSS) is a powerful tool to decipher the present-day deformation along plate boundaries, but is usually overlooked in slow deformation regions because of resolution limit. Can we push the limits by evidencing significant low deformation in intraplate domains with GNSS measurement? To answer this question we analyze ∼1200 GNSS continuous sites across Western Eurasia. Using the derived parameters from the time-series analyses (seasonal signal, noise, and offsets), we generate a large set of synthetic data. By testing the variation ranges of each of the parameters, we are able to quantify their impacts on the determination of the long-term velocity. We show that, for this synthetic dataset, 61% (resp. 75%) of the calculated velocities are within 0.1 (resp. 0.2) mm/yr of the true value.
The analysis of the actual GNSS data shows groups of sites with spatially coherent velocities at the order of 0.15 mm/yr in western France and northern Iberia. However, the rigid rotation of Iberia relative to Western Eurasia does not explain the strain patterns computed for the Pyrenees, raising the question of the origin of the deformation and seismic hazard in this active earthquake region. Other processes, such as erosion, are needed to explain the seismicity and the few tenth of millimeter per year observed in the Pyrenees, which may or may not be a present-day plate boundary.