Geophysical Research Abstracts
Vol. 16, EGU2014-2718, 2014
EGU General Assembly 2014

Strain Rate Tensor in the Euro-mediterranean Domain from GPS data

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In this work, we compute the strain rate tensor (SRT) in several areas of the Euro-mediterranean domain using the so-called STIB method (Strain Tensor from Inversion of Baselines), which uses the length variations of the baselines between each pair of the geodetic stations to provide a map of the deformation over the whole area covered by the network, reducing the impact of erroneous data and noise.

We use the GPS data compilation of Nocquet (2012) and compute the SRT in the following Mediterranean regions, from West to East: Iberia-Nubia, Italy, Balkans, Greece, Anatolia and Dead Sea. In addition to the major tectonic features (extension in the Apennine Mountains, Corinthian Gulf opening, North Anatolian Fault and so on) our results highlight new evidence of deformation in these different zones.

In Iberia-Nubia, along with the compression in the Moroccan Rif and Atlas, extension appears clearly in the western part of the Alboran Sea in spite of a lack of GPS data in oceanic areas. Moreover, small extensions inside the Iberian Peninsula could nuance the common statement about the rigidity of this area. In Italy, our results emphasise the strong extension in the Apennines and on the Calabrian cost. The compression in the subduction zone north of Sicily and the extension colocated with the Etna volcano are equally well recovered. In the Balkans, a diffuse extension appears in the Pannonian Basin, west of the Carpathians and the northward convergence of the Adria-Apulia microplates with its associated shortening in the Dinarides is another feature of the Balkanic SRT map. Greece shows three well-known tectonic patterns: the North Anatolian Fault (NAF) ending, the Corinthian Gulf opening and the Hellenic subduction zone. Compression is retrieved along the Cephalonian Fault but we still lack data south of the Aegean Sea to reveal the shortening related to the subduction of the African plate. In Anatolia, apart from the NAF, important deformations are located between the Marmara Sea and the Mediterranean costs; from a geomorphological point of view, they result into large active grabens such as the Gediz and Buyuk Menderes grabens. At last, the Dead Sea fault system shows a South–North transition from compression to extension with more complex patterns close to the Karliova triple junction.