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Strain field on the Sicily-Calabria (Southern Italy) from seismic and geodetic data

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The kinematics and geodynamics of the Sicily-Calabria subduction system is still matter of debate, mainly due to ambiguities in constraining the motion of Sicily and the Ionian Sea in the framework of the slowly NW-ward Nubia-Eurasia plate convergence. The rapid increase of continuous GPS stations in the study area, together with new integration of GPS surveys performed from early '90, is going to add new fundamental constraints to the comprehension of this complex region, both in terms of plate kinematics and elastic strain accumulation across active faults, responsible for some of the largest earthquakes of the Mediterranean.
In this work we calculate the strain-rate field for the southern part of Italy, by combining seismic and geodetic (GPS) data. For the seismic strain processing, we used earthquake focal solutions from the CMT catalogue, for earthquakes with M>5, from the RCMT catalogue, for earthquakes with 4.5<M<5.5, and from EMMA catalogue, for all recorded earthquakes occurred from 1997 to 2009. We considered only those events occurred in the seismogenic layer comprised between 0 and 30 km depth. The geodetic strain field has been obtained by analyzing continuous GPS (CGPS) stations operating in the Mediterranean area and periodically measured GPS (EGPS) stations belonging to denser network lying on the Iblean plateau (Bonforte et al., 2002) and across the Messina Straits (Serpelloni et al., 2010). We used GPS station velocities obtained by means of GAMIT/GLOBK package.
Taking into account the network geometry and the estimated velocity at each site, we calculated the horizontal strain-rate field, applying the method of Haines and Holt (1993). CGPS networks provide precise regional constraints on plate kinematics, the analyzed local periodic networks add fundamental information to constrain the rates of strain loading across major fault systems. Seismic data determine the direction in which the current tectonic stress acts and the actual brittle deformation style of the area.
Data inversion for both datasets provided the seismic and geodetic strain fields over Italy, evidencing the areas affected by a mainly extensional regime and those where the compressive strain induced by the continental collision is still active. At large scale, results show active N-S oriented compressive strain regime on the northern Sicily, while the southern Appennines and eastern Sicily are clearly affected by an extensional strain regime.

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