

Seismotectonics of Northeastern Sicily and Southern Calabria (Italy): New constraints on the tectonic structures featuring in a crucial sector for the Central Mediterranean geodynamics

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The purpose of this study is to gain a better understanding on the tectonic structures featuring in a crucial sector of central Mediterranean area, including the Aeolian Islands, southern Calabria and northeastern Sicily, where the convergence between Eurasian and African plates has given rise to a complicated collisional/subduction complex. A high quality dataset of about 3000 earthquakes has been exploited for local earthquake tomography and focal mechanisms computation. Results depict undiscovered details of a network of faults which enables the contemporary existence of adjacent compressional and extensional domains. In particular, tomographic images, seismic events distribution and focal mechanisms pinpoint the geometry and activity of a lithospheric-scale tear faults system which, with a NW-SE trend through Sicily and the Tyrrhenian and Ionian Seas, represents the southern edge of the Ionian subduction trench zone. At crustal depth, this tearing is well highlighted by a rotation of the maximum horizontal stress, moving across the area from west toward east. In addition, the shallow normal fault regime, characterising the northeastern Sicily mainland, south of the NW-SE lineament, changes in the deeper part of the crust. Indeed, a NE-SW earthquake distribution, NW gently dipping, and inverse fault solutions indicate a still active contractional deformation in the eastern Sicily, caused by the Africa–Eurasia convergence and well framed with the current compressive regime along the southern Tyrrhenian zone and at the front of the Sicilian Chain-Foreland.