

# Seismotectonics in the North-Western Sicily Continental Margin: implications for Geohazard assessment

<sup>(1,2)</sup> Attilio Sulli, Elisabetta Zizzo <sup>1</sup> & Maurizio Gasparo Morticelli<sup>1</sup>

<sup>1</sup> *Dipartimento di Scienze della Terra e del Mare, Università di Palermo, Via Archirafi 22, 90123  
Palermo*

<sup>2</sup> *INGV, Sezione Centro Nazionale Terremoti, Via di Vigna Murata 605, 00143 Roma*

**Keywords:** seismotectonics, seismicity, active tectonics, Geohazard.

Active processes in the Northern Sicily Continental Margin (NSCM) have been analysed to produce a seismotectonic map, in order to obtain a useful tool for the assessment of the seismic hazard of the sea-land region.

The seismotectonic map is composed of overlapping layers that represent the distribution of different features, such as lithostratigraphy, tectonic elements, seismicity, heat flow, gravimetry, magnetometry, Moho depth, horizontal and vertical movements, submarine landslides, fluid emissions, outlining the mutual relationship and the active structures.

The NSCM is suitable to test this approach because it's located in a transitional area between the Sicilian-Maghrebian chain to the south and the Tyrrhenian back-arc basin to the north. Along this transect the Moho depth ranges from about 10 km, in the Marsili bathyal plain, to about 40 km, towards the northern Sicily coast. The Bouguer anomalies change from 180 mGal in the Tyrrhenian region to negative anomalies in central Sicily (-100 mGal), while positive magnetic anomalies characterize the volcanic edifices, both submerged and buried. The heat flow values are high in the Tyrrhenian Sea (200 mW/m<sup>2</sup>), decreasing (30-40 mW/m<sup>2</sup>) towards the stable sector of the foreland area (Iblean plateau in SE Sicily).

At a regional scale, in the NSCM we distinguished different seismogenetic volumes, both shallow and deep. The deep seismicity, relative to the Ionian subduction, is prevailing in the eastern margin, but the shallow events are the result of the brittle deformation of the Maghrebian chain. In the western sector, shallow hypocentres occur along an E-W belt, with focal mechanisms coherent with a NW-SE compression. To the East seismicity is linked to NW-SE trending extensional to right-lateral transcurrent fault systems.

During the last 125 ky tectonic activity is evidenced by vertical movements, decreasing from E to W; moreover, while the continental sectors are raised, offshore areas are subsiding, suggesting the occurrence of vertical differential movements. The GPS values document the active deformation with differential movements of individual blocks northward-directed, in agreement with the shallow seismicity, as well as the convergence between Sicily and Sardinia, with values of about 2-6 mm/y.

The first step of this research produced the detailed seismotectonic map between the Castellammare and Palermo gulfs, including both the emerged and marine areas. In this sector we defined two seismogenetic volumes, produced by a NW-SE oriented compressional stress field, and defining an intraplate shallow seismogenetic zone. Though these results are only preliminary, we are developing a scientific product that can provide useful information in terms

of seismic hazard in a complex region that includes both continental and marine sectors. Therefore, it could represent an important tool for monitoring the potentially seismogenic structures and assessing geohazards in marine and coastal environments.