ACTIVE TECTONICS ALONG THE AEOLIAN-TINDARI-LETOJANNI FAULT SYSTEM: AN UPDATED VIEW FROM A MULTIDISCIPLINARY PERSPECTIVE

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The current tectonic setting of the southern Tyrrhenian plate boundary is related to the poly-phased episodes of oceanic subduction, slab retreat, and continental collision occurred since Neogene in response to the Eurasia-Nubia convergence (*e.g.* Faccenna *et al.*, 2001 and references therein). Geodetic data highlight the presence of distinct deformation belts separating the Tyrrhenian Sea, and the Sicily and Calabria blocks, which interfere in NE Sicily (Palano *et al.*, 2012).

A recent (Middle Pleistocene) re-organization of the Africa/Eurasia plate boundary was postulated based to the analyses of marine geophysical data in the Ionian Sea (Polonia *et al.*, 2016) where two sets of oppositely dipping fault systems, the Ionian Fault (IF) and Alfeo-Etna Fault (AEF) systems, impinges along the coast of NE Sicily (Polonia *et al.*, 2017). Such lithospheric faults accommodate slab tearing processes and connect the deformation zone along the northern margin of Sicily with the Calabria subduction along dextral shear corridors including the Etna volcano and the Messina Straits region.

In such a tectonic maze, the so called "Aeolian-Tindari-Letojanni" Fault System (ATLFS), a complex lithospheric discontinuity consisting of a broad NNW-SSE- to NW-SE-trending deformation zone from the Aeolian Islands down to the Ionian coast of Sicily, has been interpreted as the current shallow expression of a sub-vertical lithospheric-scale tear-fault, bordering the southern edge of the Tyrrhenian subduction zone at depth (Palano *et al.*, 2017 and references therein).

A number of geological and geophysical evidence allowed to define main tectonic features on the southern Tyrrhenian offshore (Gulf of Patti) and coastal areas (*i.e.* across the Peloritani

chain), where the ATLF joins with the Sisifo-Alicudi shear zone, a WNW-ESE oriented dextral strike-slip shear zone passing through Alicudi and Filicudi characterized by the occurrence of low-to-moderate magnitude earthquakes (Palano *et al*., 2012 and references therein). In its south-eastern termination (*i.e*. toward Mt. Etna and the Ionian coast) no clear tectonic expression can be recognized (Billi *et al*., 2006; De Guidi *et al*., 2013; Palano *et al*., 2015). Despite the complexity of the onshore tectonic pattern, the activity of major fault systems agrees well with offshore data. The IF and AEF may thus represent the Ionian counterparts of the dextral transtensive deformations described in NE Sicily and in the southern Tyrrhenian Sea.

This study focuses on the off-shore segment of ATLFS in the southern Tyrrhenian and surrounding areas. We adopted a multidisciplinary approach based on seismic reflection and submarine morpho-structural data integrated with seismic, geodetic and geological observations collected in the last two decades. In particular, we investigated a broad deformation zone that include the ATLFS to provide an improved picture of active tectonics offshore northern Sicily.

References

Billi A., Barberi G., Faccenna C., Neri G., Pepe F. and Sulli A.; 2006: *Tectonics and seismicity of the Tindari Fault System, southern Italy: Crustal deformations at the transition between ongoing contractional and extensional domains located above the edge of a subducting slab*. Tectonics, **25**(2).

De Guidi G., Lanzafame G., Palano M., Puglisi G., Scaltrito A. and Scarfì L.; 2013: *Multidisciplinary study of the Tindari Fault (Sicily, Italy) separating ongoing contractional and extensional compartments along the active Africa-Eurasia convergent boundary*. Tectonophysics, **588**, 1-17.

Faccenna C., Becker T. W., Lucente F. P., Jolivet L. and Rossetti F.; 2001: *History of subduction and back arc extension in the Central Mediterranean*. Geophys. J. Int., **145**(3), 809-820.

Palano M., Ferranti L., Monaco C., Mattia M., Aloisi M., Bruno V., Cannavò F. and Siligato, G.; 2012: *GPS velocity and strain fields in Sicily and southern Calabria, Italy: updated geodetic constraints on tectonic block interaction in the central Mediterranean*. J. Geophys. Res.: Solid Earth, **117**(B7).

Palano M., Piromallo C., and Chiarabba C.; 2017: *Surface imprint of toroidal flow at retreating slab edges: The first geodetic evidence in the Calabrian subduction system*. Geophys. Res. Lett., **44**(2), 845-853.

Palano M., Schiavone D., Loddo M., Neri M., Presti D., Quarto R., Totaro C. and Neri, G.; 2015: *Active upper crust deformation pattern along the southern edge of the Tyrrhenian subduction zone (NE Sicily): Insights from a multidisciplinary approach*. Tectonophysics, 657, 205-218.

Polonia A., Torelli L., Artoni A., Carlini M., Faccenna C., Ferranti L., Gasperini L., Govers R., Klaeschen D., Monaco C., Nijholt N., Orecchio B. and Wortel R.; 2016: *The Ionian and Alfeo–Etna fault zones: New segments of an evolving plate boundary in the central Mediterranean Sea?*. Tectonophysics, **675**, 69-90.

Polonia A., Torelli L., Gasperini L., Cocchi L., Muccini F., Bonatti E., Hensen C., Schmidt M., Romano S., Artoni A. and Carlini, M. (2017). *Lower plate serpentinite diapirism in the Calabrian Arc subduction complex*. Nature communications, **8**(1), 2172.