



Neotectonic map of the Nubia-Eurasia plate boundary from Algeria to Calabria

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In the framework of the MAREMOTI Project (Mareograph and field tsunami observations, modeling and vulnerability studies for Northeast Atlantic and Western Mediterranean, funded by the French Agence Nationale de la Recherche), a new map of active and potentially tsunamigenic faults has been drawn over a broad region running from the North African margin in Algeria to the Pelagian Sea and Sicily area. Geologically, the map covers the transition from the Western Mediterranean to the Eastern Mediterranean, from back-arc inversion off Algeria to incipient subduction off Sicily and ultra-slow subduction off Calabria. The map uses up-to-date published structural studies, including offshore faults recognized from marine surveys and simplified seismotectonic maps on-land. A corrected and comprehensive catalogue of earthquake focal mechanisms was built from INGV (Istituto Nazionale di Geofisica e Vulcanologia) and SSS (Swiss Seismological Services) collections of events between 1977 and 2010. Similarly, we compiled an exhaustive catalogue of epicenters, dating back to 1908, out of the many collections available from Engdahl, ESMC (European Mediterranean Seismological Centre), ISC (International Seismological Center), USGS (United States Geological Survey), as well as the known historical earthquakes back to 461 BC. The map also shows the latest GPS geodetic solution, as well as a continuous velocity field and strain-rate field modeled from GPS and CMT using Holt and Haines techniques.

This new map sheds original light on this complex portion of the Nubia-Eurasia boundary. It first shows that the Nubia-Eurasia boundary is highly segmented, probably because Neogene structures are systematically re-used to accommodate the overall convergence. These include the Miocene structures of the southern margin of the Algero-Provençal Basin, at the boundary between the oceanic and continental crusts, as well as the Pliocene margin of the south Tyrrhenian Basin offshore Sicily. Faults that formed the Pelagian grabens in upper-Pliocene to Recent times, as well as similar grabens in Tunisia, are also re-activated in transtension. This segmentation is responsible for the moderate size of the earthquakes, although they may be quite destructive and generate tsunamis. We further document a seismicity gap in the Sardinia Channel that may be partly instrumental, but may also point to a lateral variability of the width of the boundary from rather localized in Algeria, distributed in Tunisia and over the Pelagian shelf, and localized again off Sicily. The lack of permanent GPS stations over the African portion of the boundary is however a clear limitation to our understanding of the accommodation of the slow Nubia-Eurasia convergence there.