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Extensional tectonics during the Tyrrhenian back-arc basin formation synthetized in a new morpho-tectonic map

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A new tectonic map is presented focused upon the extensional style accompanying the formation of the Tyrrhenian back-arc basin. Our basin-wide analysis synthetizes the interpretation of vintage multichannel and single channel seismic profiles integrated with modern seismic images and P-wave velocity models, and with a new morpho-tectonic map of the Tyrrhenian (Palmiotto & Loreto, 2019). Four distinct evolutionary opening stages have been constrained: 1) the initial Langhian(?)/Serravallian opening phase actives offshore central/southern Sardinia and offshore western Calabria; 2) the Tortonian/Messinian phase dominated by extension offshore North Sardinia-Corsica, and by oceanic accretion in the Cornaglia and Campania Terraces; 3) the Pliocene phase, dominated by mantle exhumation which was active mainly in the central Tyrrhenian and led to the full opening of Vavilov Basin; and 4) the Quaternary phase characterized by the opening of the Marsili back-arc basin. Listric and planar normal faults and their conjugates bound a series of horst and graben, half-graben and triangular basins. Distribution of extensional faults, active since Middle Miocene, throughout the basin allowed us to define a faults arrangement in the northern / central Tyrrhenian mainly related to in a pure shear which evolved a simple shear opening of continental margins. At depth, faults accommodate over a Ductile-Brittle Transitional zone cut by a low-angle detachment fault possibly responsible for mantle exhumation in the Vavilov and Magnaghi abyssal plains. In the southern Tyrrhenian, normal, inverse and transcurrent faults appear to be related to a large shear zone located along the continental margin of the northern Sicily. Extensional style variationthroughout the back-arc basin combined with wide-angle seismic velocity models, from Prada et al. (2014; 2015), allow to explore the relationship between shallow deformation, represented by faults distribution throughout the basin, and crustal-scale processes, subduction of Ionian slab and exhumation.

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