The transition between the Marsili oceanic crust and the W Calabria rifted margin: rifting and drifting in the upper plate of the Ionian subduction zone

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The western Calabria continental margin forms the transition between the Late Pliocene to Recent Marsili spreading center and continental Calabria. Integrating high-penetration and -resolution upper crustal seismic images with seafloor morphology, ODP well data and geological/geophysical constraints we provide a detailed reconstruction of the architecture of the distal portion of the W Calabria rifted margin and of the adjacent Marsili "oceanic" domain (Fig. 1) and develop a scheme for the Pliocene to present rifting and drifting of the upper plate of the Ionian subduction zone. Our seismic data document the presence of stretched and thinned continental crust, less than 10 Km thick into the eastern sector of the Marsili abyssal plain previously considered as floored by a three-layer oceanic crust.

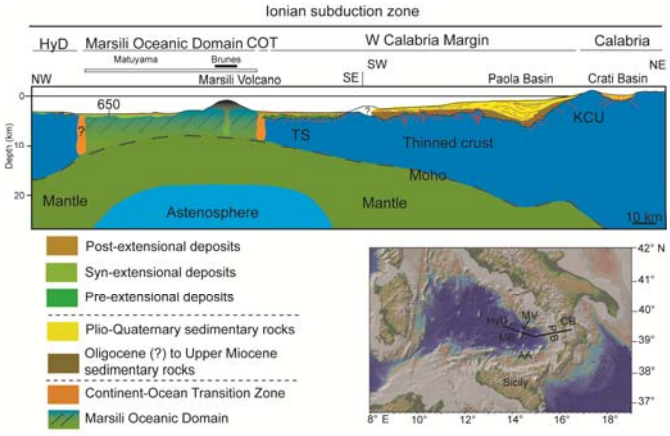

Fig. 1 – Lithospheric cross-section from the hybrid domain between the Marsili and Vavilov basins, across the Marsili Oceanic Domain, the W Calabria continental margin to the Crati Basin (Calabria mainland). HyD, hybrid domain between the Marsili and Vavilov basins; MB, Marsili basin; MV, Marsili Volcano; AA, Aeolian Arc, PB, Paola Basin, CB, Crati Basin; KCU, Kabilian - Calabrian units; TS, thinned and stretched Calabrian continental crust; COT, Continent-Ocean Transition Zone. No vertical exaggeration.

Thinning of the crust is associated with a numbers of 2-4 km wide tilted blocks composed of an acoustic basement and pre- and syn-rift sediments.

Stretching factors between 1.1 and 1.42 (ca. 40% extension) has been obtained assuming a domino-like style of deformation. With few exceptions, the infill completely smoothes out pre-existing topography and explain the flat sea floor in the area surrounding the Marsili volcano. Extensional tectonics began in the Late (?) Pliocene – Early (?) Pleistocene times and ended at ca. 0.5 Ma resulting in the formation of ca. 70 km of "oceanic" domain with an average spreading rate between ca. 5.1 and 5.9 cm/yr. The appearance of vesicular basalts in the Marsili basin was not associated with the end of extension. The post-extensional sedimentary package has fairly constant thicknesses of ca. 350 along the entire Marsili abyssal plain. The Marsili volcano grows close to the western termination of the stretched and thinned W Calabria continental crust, in an asymmetric position with respect to the < 2 Ma Marsili Basin itself.

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