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Subcommission Open Session: SCD-0 Crust and Upper Mantle Structure

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Crustal structure of southern Tyrrhenian sea

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We derive crustal structure of southern Italy from Deep Seismic Refraction and Wide-Angle-Reflection data included in the REWARD database. REWARD aims to assemble and store in a common format Deep Seismic Refraction analogue land data collected before 1994 and high-resolution Refraction and Wide-Angle Reflection (R/WAR) digital waveforms generated by air-gun shooting and acquired on-shore Italy. At present the Calabrian Arc subset of the database is available.

In the Calabrian Arc most of the global plate tectonic processes are observed. Oceanic subduction is associated to mantle seismicity down to 400 km depth, restricted to a compact slab having well-defined edges. Slab rollback and detachment arc, intraplate volcanism, sea-floor spreading, continental rifting, arc-continent collision are all coexisting within a few hundred km.

In order to evaluate competing tectonic models debating whether the Calabrian Arc subduction is dying, slowing down or continuing, we need a detailed knowledge, possibly 3D, of the crustal and upper mantle structure of the region. The 3D structure will also determine if the crustal structure follows the smooth sweep of the topography along the Apennine-Calabria-Maghrebides belt, or there are lateral tears bounding a well-defined platelet.

The available seismic profiles provide a 3D image of the Moho, characterized by short wave-length undulations beneath the Southern Tyrrhenian Sea. Major upheavals, from 24 km depth, beneath the Sicily and Calabrian margins, are located beneath the Marsili basin (10 km) and the southern Aeolian volcanic area (18 km) and affects all the crustal boundaries. Another sharp crustal thinning is observed beneath the gulf of Patti at the south-eastern edge of the Tyrrhenian Sea. We suggest that the graben-like structure, occurring along the Salina-Lipari-Vulcano islands (Aeolian Arc) and oriented at high angles to the trench, can be followed down to Moho depths.

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