



## Shear-velocity structure and dynamics beneath the Central Mediterranean inferred from seismic surface waves

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The evolution of the Sicily Channel Rift Zone (SCRZ), located south of the Central Mediterranean, is thought to accommodate the regional tectonic stresses of the Calabrian subduction system. It is unclear whether the rifting of the SCRZ is passive from far-field extensional stresses or active from mantle upwelling beneath. To map the structure and dynamics of the region, we measure Rayleigh- and Love-wave phase velocities from ambient seismic noise and invert for an isotropic 3-D shear-velocity and radial anisotropic model. Variations of crustal S-velocities coincide with topographic and tectonic features: slow under high elevation, fast beneath deep sea. The Tyrrhenian Sea has a <10 km thin crust, followed by the SCRZ (≈20 km). The thickest crust is beneath the Apennine-Maghrebian mountains (≈50 km). Areas experiencing extension and intraplate volcanism have positive crustal radial anisotropy ( $V_{SH} > V_{SV}$ ); areas experiencing compression and subduction-related volcanism have negative anisotropy ( $V_{SH} < V_{SV}$ ). The crustal anisotropy across the Channel shows the extent of the SW-NE extension. Beneath the Tyrrhenian Sea, we find very low sub-Moho S-velocities. In contrast, the SCRZ has a thin mantle lithosphere underlain by a low-velocity zone. The lithosphere-asthenosphere boundary rises from 40-60 km depth beneath Sicily and Tunisia to ≈33 km beneath the SCRZ. Upper mantle, negative radial anisotropy beneath the SCRZ suggests vertical mantle flow. We hypothesize a more active mantle upwelling beneath the rift than previously thought from an interplay between poloidal and toroidal fluxes related to the Calabrian slab, which in turn produces uplift at the surface and induces volcanism.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 843696.

