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Rayleigh wave dispersion and anisotropy in the Tyrrhenian Sea

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The central Mediterranean subduction zone evolved in a complex dynamic evolution with a westward retreating trench. The openings of several basins, such as the Tyrrhenian Basin are coupled to the slab evolution. However, the details of the process are still unclear. Further complexities of the subduction dynamics are caused by a series of slab windows in the Calabrian arc, as indicated by body wave tomography and complex pattern of magmatism.

Mantle anisotropy measurements provide a direct tool to investigate mantle dynamics and to measure strain in the mantle. However, shear wave splitting measurements for Italy show complex pattern and their restricted depth resolution hinders detailed interpretation for 3D structures. Moreover, measurements are restricted to onshore. The transition from the prevailing E-W fast orientations on Sardinia to the complex pattern on mainland Italy is therefore still unknown.

Here, we apply a surface wave dispersion tomography with the aim to identify depth dependent azimuthal anisotropy in the Tyrrhenian Sea between the islands of Corsica and Sardinia, mainland Italy and Tunisia. We use data from various temporary and permanent seismic stations surrounding the Tyrrhenian Sea to measure interstation fundamental mode Rayleigh wave phase velocities. The measurements are then used to obtain a shear wave model and azimuthal anisotropic phase velocity maps. These results can then complement teleseismic shear wave splitting measurements to provide a more sophisticated image of the 3D anisotropic structure of the Tyrrhenian Sea. This will help to improve our understanding of the dynamic evolution of the central Mediterranean subduction zone and the Calabrian arc.