Geophysical Research Abstracts
Vol. 14, EGU2012-2517, 2012
EGU General Assembly 2012

Anomalous upper mantle structure around the Tyrrhenian Sea imaged from Rayleigh wave tomography

S.M. Greve and H. Paulssen
Dept. of Earth Sciences, Utrecht University, The Netherlands (s.m.greve@uu.nl)

We present detailed 3D shear velocity structure for the Tyrrhenian Sea and surrounding onshore areas down to about 160 km depth. The high resolution and accurate constraints of the anomalies are achieved through the use of interstation Rayleigh wave dispersion curves in a small regional setting with good station coverage.

The most noticeable imaged structure is a pronounced ring-shaped low velocity region at about 80 km depth surrounding the higher velocity centre of the Tyrrhenian Sea. Its depth extend is constrained to a maximum of 40 km and it is independent of the chosen inversion parameters or the background model.

Underneath southwestern Italy the lateral extend of the low velocity region is well correlated with the location of recent subduction volcanism. Two different types of subduction become apparent in the observed velocity structure.
In the Adriatic region around western Apennines the velocity anomaly is located below the volcanic chain as expected for a standard subduction with undisturbed mantle corner flow. In the area underneath Sicily and Calabria the velocity anomaly is offset to the north of the volcanic chain. We relate this to the different slab geometry in this area. The Ionian slab is still attached but discontinued by a vertical tear towards the west. In this setting mantle flow around the edge could divert the corner flow and cause the observed offset of the velocity.

To the north of the study area, the imaged low velocity anomaly extends under the island of Corsica. As no recent subduction volcanism is active in this area, other processes must cause the anomaly. We propose that the front of the Adriatic slab resting on the 660-km transition zone causes convective instabilities and upward mantle flow (Faccenna et al., 2010). This, in turn, then helps to trigger a melting process in the shallower mantle underneath Corsica/Sardinia. Upward push from mantle upwellings can result in observable dynamic topography. Thus, the good correlation of the residual topography (Boschi et al., 2010) with the low velocity area in the Northern Tyrrhenian Sea area provides further evidence for our proposed model.