Geophysical Research Abstracts
Vol. 13, EGU2011-7023, 2011
EGU General Assembly 2011

Seismic structure and anisotropy of the upper mantle beneath the Aegean and Anatolia: images of a very complex subduction system

Gwenaelle Salaun (1), Anne Paul (1), Helle Pedersen (1), Fabien Hubans (1), Hayrullah Karabulut (2), Ahu Komec Mutlu (2), and the Simbaad Team

(1) ISTerre, Université Joseph Fourier and CNRS, Grenoble, France (anne.paul@obs.ujf-grenoble.fr), (2) KOERI, Bogazici University, Istanbul, Turkey, (3) Department of Geophysics, Aristotle University of Thessaloniki, Thessaloniki, Greece

The Aegean-Anatolia region is a key area to investigate the relations between surface expressions of a long-lived and still active deformation zone (orogenic belts, a plateau, deep basins, seismicity, fast displacements,. . .) and the dynamics of the underlying mantle. But geodynamic modeling requires high-resolution constraints on the mantle structure, particularly in collision zones where subduction plays a large part in the dynamics. To better constrain the geometry at depth of the Hellenic – Cyprus subduction and image the structure of the upper mantle beneath Western and Central Anatolia, we analyzed records of more than 150 broadband permanent and temporary seismic stations compiled in the database of the SIMBAAD project. The result is an unprecedented high-resolution 3-D S-wave velocity structure of the crust and upper mantle to 300 km depth in the area [35-42°N; 20-35°E]. The Moho depth model obtained from ambient noise tomography in the 7-40s period range is used to constrain the inversion of dispersion measurements between 40 and 200s for upper mantle velocity. The Hellenic slab has an irregular geometry, with folds and tears, far from the amphitheater shape expected from the Benioff zone. Toward the East, it is separated from the much weaker and smaller-size high-velocity anomaly interpreted as the trace of the Cyprus slab by a 160-km wide vertical tear delineated by a low-velocity anomaly. The location of this anomaly coincides with a sudden change in the orientation of the fast polarization direction of the split SKS phases. Fast split SKS have a fairly homogeneous N35 polarization in western and central Anatolia, except in the area of the slab tear in southwest Anatolia where the polarization turns to N145. We believe that this rotation documents a change in mantle flow associated with the edge of the Hellenic slab in-between Rhodos Island and the Bay of Antalya. Our new mantle model supplies a precise framework for future modeling of small scale mantle flow that would help establishing the contribution of mantle circulation to surface tectonics.