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Fabrics of the lithospheric mantle beneath the Northern Apennines – first results on P-wave anisotropy from RETREAT experiment (Italy)

Helena Munzarova, Jaroslava Plomerova, and Ludek Vecsey
Institute of Geophysics, Czech Academy of Sciences, 141 31 Prague, Czech Republic (helena@ig.cas.cz)

We analyze travel time deviations of teleseismic P waves, particularly their variations with back-azimuth and incidence angle recorded during the RETREAT (REtreating-TRench, Extension and Accretion Tectonics) passive seismic experiment (2003-2006, Margheriti et al., Annals of Geophys. 2006) as a part of the multidisciplinary international project aiming at developing a self-consistent dynamic model of syn-convergent extension in the Northern Apennines. Stations with similar distribution of relative early and delayed arrivals form groups, separated by a curved trace of the Adriatic and Tyrrhenian plate collision. Early arrivals from the eastern azimuth are mapped at stations located in the Tyrrhenian plate, while in the Adriatic plate the eastern arrivals are delayed as compared with those from the west. The high-velocity heterogeneity of the subducting slab in this region can partly contribute to the observed phenomenon, but the residual pattern mostly reflects anisotropy in the upper mantle, as was also shown in shear-wave splitting (Salimbeni et al., Tectonophysics 2008). Stations with similar variations of the splitting in dependence on event back-azimuth delimit the lithospheric mantle domains with characteristic anisotropic structure. Variations of the splitting time delays and fast polarization exclude a 2-D sub-lithosphere corner flow associated with the Apennines subduction as the main source of the inferred anisotropy (Plomerova et al., EPSL 2006). Two independent methods and data sets (P- and S-wave anisotropy parameters) delimit upper mantle domains with similar boundaries. The domain-like character of the lithosphere reflects complexity of the mantle structure. We associate the main part of the anisotropic signal with a fossil fabric of the Adriatic and Tyrrhenian lithospheric mantle domains, which we model by anisotropy with inclined symmetry axes oriented generally in 3D.