

Upper mantle anisotropic structure of the Eastern Alps

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Preferred alignment in upper mantle structure develops in response to past/present-day tectonic deformation. Such an alignment causes direction-dependent differences in seismic wave velocities, so called seismic anisotropy. The effect of anisotropy due to upper mantle fabrics can be easily seen in seismological observations. In this work, we evaluate upper mantle anisotropy beneath the Eastern Alps by analyzing shear wave splitting. Using data collected at 33 permanent broadband stations and applying the minimum energy technique, we measure fast polarization azimuths and delay times from recorded teleseismic core shear waves (SKS). Our measurements show two different patterns of fast polarization in the western and eastern part of the study region with a 45° change between them. The change indicates a striking lateral change of anisotropy. We also observe a backazimuthal dependence of measurements at single stations, and we test for effects of a vertical change of anisotropy. Such a vertical change of anisotropy may be described by the presence of more than one layer of anisotropy in the lithospheric-asthenospheric upper mantle. We accordingly model two anisotropic layers at individual stations. Results for the easternmost stations may suggest the presence of two sources of anisotropy. Such multilayer anisotropy might be interpreted as the effects of frozen aligned fabric in the lithospheric mantle as well as flow-induced aligned materials in the asthenosphere. If this is the case, the results might suggest that the strains in these two layers are not stretched in the same orientation.