Geophysical Research Abstracts, Vol. 7, 04713, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04713

Upper mantle structure beneath the Alpine orogen from analysis of P-wave first arrivals from natural earthquakes

B. Nita (1), E. Perchuæ (1), H. Thybo (2), P. Maguire (3), P. Denton (3)

(1) Institute of Geophysics, Warsaw, Poland, (2) Institute of Copenhagen, Denmark, (3) University of Leicester, UK (blankan@igf.edu.pl),

The crustal structure beneath the Alpine orogen has been extensively illuminated by controlled and natural source seismology but the structure of the lithosphere/asthenosphere system is still not well resolved. We interpret natural earthquakes data with epicenters in Europe and in north Africa (Algeria) in order to model 1-D velocity distributions of the Alpine upper mantle down to 600 km for different azimuths. Earthquakes have been indentified from regions situated around the Alpine orogen at appropriate epicentral distances for the seismic ray to penetrate the upper mantle structures of interest beneath the studied area. The resultant models are discussed in relation to the current models resulting from other methods, among which the most recent is teleseismic P-wave residual tomography. We have also analysed the azimuthal distribution of P-wave residuals (as reported in the ISC bulletins). Our analyses result from information derived from ISC bulletins and seismic waveforms registered at chosen European stations. It is clear that there is a substantial P-wave delay of the order of a few seconds at the Alpine azimuths compared to the Variscan ones. The maximum delay between the two regions resulting from transmission through the crust is 1s. Therefore the observed differences in residuals of up to 3s must result from the upper mantle. The models obtained for different azimuths suggest that the well-established ‘400-km’ discontinuity is significantly shallower beneath the Alps than normal. It produces strong refraction clearly distinguishable on the relevant travel time curves. This discontinuity is not noticeable in the upper mantle beneath the adjacent Variscan area at such a shallow depth.