Geophysical Research Abstracts, Vol. 8, 08927, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08927

Radially anisotropic three-dimensional upper mantle structure of the European region from inversion of surface waves

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We present a model of the shear wave velocity structure of the upper mantle beneath the broad European and Mediterranean region, obtained by inversion of surface wave seismograms. We measure group velocity of the fundamental mode of Love and Rayleigh waves from seismograms recorded at regional distance. Group velocity maps for periods ranging from 35 to 150s are then obtained by linear inversion. We make use of a priori information in the form of a smooth global model we previously derived by inverting a phase velocity dataset (Ekstrom et al. 1997) on a global grid, where our regional grid is embedded. This greatly improves the coverage near the borders of our region. Group velocity maps model wave propagation very efficiently and accurately, and can be translated to correction surfaces for specific stations, that can in turn be used for routine processing. In each pixel — approximately 120 km in size — the set of group velocities are then used to find the best-fitting vertical shear velocity profile by nonlinear inversion. In this step, we make use of a priori knowledge from PREM and CRUST2.0. We present results in terms of Voigt average velocity variations, and radial anisotropy, and compare them with other results from the literature. The resulting model confirms the larger-scale deep geological features known for the region, and add detail due to the inclusion of measurements on shorter paths. Crustal structure from the global 2x2 degree compilation CRUST2.0 shows some limitations when working at this resolution, and we feel the need for a more detailed model.