Geophysical Research Abstracts
Vol. 13, EGU2011-7682, 2011
EGU General Assembly 2011

Teleseismic Shear-Wave Analysis in Southern Norway

Britta Wawerzinek, Corinna Roy, and Joachim Ritter
Karlsruhe Institute of Technology, Geophysical Institute, Karlsruhe, Germany (britta.wawerzinek@kit.edu)

The ESF TOPO-EUROPE collaborative research project "TopoScandiaDeep – the Scandinavian Mountains: Deep Processes" (www.geo.uio.no/toposcandiadeep) aims at developing a geophysical model of the lithosphere-asthenosphere system which explains the mechanisms that cause the present high topography of the Scandinavian Mountains. The MAGNUS experiment was conducted to derive structural information about the deep processes in the upper mantle underneath Southern Norway. 31 temporary broadband stations of the Karlsruhe Broadband Array (KABBA) and 10 permanent broadband stations (NORSAR, KONO, HFC2, BER) recorded continuously from September 2006 until June 2008.

Our group at KIT analyses the teleseismic shear wavefield to determine the shear wave structure underneath Southern Norway. We perform a S receiver function analysis to resolve upper mantle discontinuities. The resulting S receiver functions of more than 140 teleseismic events are stacked in dependence of their conversion points at depth (CCP stacking). These CCP stacked S receiver functions include conversion signals from the crust-mantle boundary (Moho) and lithosphere-asthenosphere boundary (LAB) and are used to map both discontinuities. To constrain the mantle anisotropy we process a teleseismic shear-wave splitting analysis with the core phases SKS and SKKS. The average fast direction is NW-SE in the southern part of the MAGNUS network and NE-SW in the central and northern part of the MAGNUS network. It seems that the average fast direction bends around the Southern Scandinavian Mountains. At present the anisotropic pattern is interpreted as signature of geodynamic asthenospheric processes. In order to determine the 3D shear-wave velocity structure in the upper mantle underneath Southern Norway we determine teleseismic travel time residuals. These residuals contain travel time contrasts up to 2.5 s across the MAGNUS network. The residual pattern shows a clear travel time delay underneath the central part of Southern Norway in contrast to earlier arrivals (negative residuals) in the area around and east of Oslo Graben. Since travel time effects caused by the well-known crustal structure are already removed, the travel time delay must be produced in the upper mantle underneath Southern Norway. This travel time contrast reflects possibly a thin lithosphere underneath Southern Norway and/or a thermal perturbation.