



Teleseismic S Receiver Function Analysis in Southern Norway

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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. In order to resolve upper mantle discontinuities a S receiver function analysis is performed.

The principles of receiver functions are in brief: Teleseismic waves reflect, refract or convert to another wave type, e.g. S-to-P-wave conversion, at discontinuities where the medium properties change, e.g. seismic velocity or density. The S receiver function method uses the travel time difference between the direct S wave and the S-to-P converted wave to estimate the depth of a conversion boundary. The amplitude ratio of these waves is almost proportional to the change in the elastic parameters.

The processing sequence has these main steps: According to their polarisations the direct S wave and the S-to-P converted wave are separated to different components by using observed backazimuth and incidence angles. The source signal is removed by deconvolution which is performed both in the frequency domain as spectral division and in the time domain as Wiener filter. Since the expected conversion signal of the lithosphere-asthenosphere-boundary is very small the signal-to-noise ratio of the resulting S receiver functions has to be improved. Therefore the individual S receiver functions are corrected for move out and stacked in dependence of their conversion points at depth (CCP stacking).

For this S receiver function study we analysed 143 teleseismic events ($5.3 \leq mb \leq 7.9$) which occurred in the distance interval of 55° - 85° for S waves and 85° - 125° for SKS waves. The CCP stacked S receiver functions show conversion signals from the crust-mantle boundary (Moho) and lithosphere-asthenosphere boundary (LAB) and are used to map both discontinuities. In the next step, a forward modelling is performed to estimate the depth and velocity contrast at these discontinuities.