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Teleseismic S-receiver functions from the MAGNUS array, Southern Norway: First results

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The MAGNUS experiment consisted of 31 temporary stations of the KArlsruhe BroadBand Array, which recorded continuously from September 2006 to June 2008, and 10 permanent stations (NORSAR(7), KONO, BER and HFC2) in and around the Scandinavian Mountains. MAGNUS is now part of the ESF TOPO-EUROPE project TopoScandiaDeep (www.geo.uio.no/toposcandiadeep) which aims at testing alternative causes for the possible recent lithospheric uplift in the region. To resolve possible upper mantle velocity anomalies underlying the enigmatic highlands of Southern Norway an S-receiver function analysis of the MAGNUS dataset is performed. The MAGNUS array recorded 66 strong teleseismic events (Mw$\geq$6.5) in the distance interval of 55-125° useful for computation of S-receiver functions.

The principles of receiver functions in brief are: Teleseismic waves reflect, refract or convert to another wave type, e.g. S-to-P-wave conversion, at discontinuities where the medium properties, e.g. seismic velocity or density, change significantly. 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 and elastic contrast of a conversion boundary. The amplitude ratio of these waves is almost proportional to the change in the elastic parameters.

Our processing sequence has these main steps: The direct S-wave and the S-to-P converted wave are separated to different components according to their polarisations by using observed backazimuth and incidence angle. The source signal is removed by deconvolution. The deconvolution is performed both in the frequency domain as spectral division and in the time domain as Wiener filter. We tune both deconvolution methods and determine stabilisation parameters with realistic synthetic data.

In the second step, we analyse events of the MAGNUS dataset. For the S-receiver functions we study events with epicentral distance of 55-85° for S-waves and >85° for SKS-waves. The resulting S-receiver functions are corrected for move out and stacked to improve the signal-to-noise ratio. First results of this tuned processing sequence applied to the full MAGNUS array will be presented.

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