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3D-shear wave velocity anomalies underneath Fennoscandia deduced from global travel time tomography

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The international research project ScanArray with the German contribution LITHOS-CAPP operated 98 broad band seismic stations in Norway, Sweden and Finland. Recordings from these stations and additionally from permanent stations and broadband sensors of previous studies in different areas of Fennoscandinavia are used to compute a 3D-absolute shear wave velocity model for the Earth's mantle in this region.
The used method integrates regional and global tomography: absolute travel times of shear waves, which were recorded at our regional network, are inverted together with travel times of a global dataset provided by the EHB-catalog. In this way we determine a coarse global tomographic model with high resolution in the study region. Raytracing is performed for the entire mantle from source to receiver and model parametrization in the upper mantle under Fennoscandia is conducted with small-sized blocks. Together with the high ray coverage this procedure provides a high resolution, especially in the deep upper mantle.
All in all, travel time measurements from approximately 300 stations, that have been deployed in Fennoscandia in the past 20 years and that are evenly distributed in the survey area have been analyzed. Due to the long duration of observation, an excellent azimuthal coverage with ca. 250 earthquakes (Mw larger than 5.5) in distances of 20°-90° is achieved.
The resulting velocity model provides information about possible active and past mantle processes which contributed to the present-day topography as well as tectonic evolution and division of Fennoscandia. The presented results focus on middle and northern Fennoscandia, where only few studies exist up to the present day. The most prominent features are slow velocity anomalies beneath the Scandinavian mountains down to around 100 km, while fast velocities dominate the areas east of them. Especially the lithospheric structure beneath an area south of the Lofoten is characterized by a significant shear wave velocity reduction.