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Upper mantle of Fennoscandia from P and S receiver functions of the POLENET/LAPNET array

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We inverted jointly P and S receiver function (PRFs and SRFs, respectively) and teleseismic P and S travel-time residuals for 25 stations of LAPNET in Fennoscandia. The travel-time residuals are inferred from travel times of P410s and P660s phases in the PRFs. This technique provides robust estimates of the S velocity (Vs) and constraints on the P velocity (Vp) and Vp/Vs ratio in a depth range from the Earth's surface to ∼300 km. A high Vs (∼4.7 km/s) and a low Vp/Vs ratio (∼1.7) in our models in a depth range from the Moho to 150 km are common properties of a depleted upper mantle. In a depth interval from 250 km to 300 km we obtain unexpectedly high Vp (∼9.0 km/s) and Vs (∼4.9 km/s). These anomalous velocities can be explained either by azimuthal anisotropy in the pyrolitic mantle or by a high fraction of basalt (eclogite). We argue that the anisotropy as a reason for high velocities is unlikely, whereas high fraction of eclogite is a viable possibility. We also discuss indications of very high velocities in the same depth range in some other regions. Eclogite in the upper mantle of Fennoscandia and, perhaps, some other regions may have important implications for geodynamics.