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Crustal and upper mantle structure of Siberia from teleseismic receiver functions

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This study presents seismic images of the crustal and lithospheric structure in Siberia based on the available broadband seismic data using teleseismic receiver functions (RFs). We invert P- and S-RFs jointly. The inversion technique is carried out by approach described by Vinnik et al. (2004). With this method, we determine seismic P- and S-velocities that are comparable to the results of teleseismic body wave and surface wave tomography techniques.

The RF model shows variations in the crustal thickness between 35 and 55 km. Intracrustal structures are identified, in particular using the high-frequency P-RF component as it has about an order of magnitude better resolution than S-RF.

We find no indication for significant crustal anisotropy in the cratonic areas of Siberia. The preliminary crustal thickness results from the Hk stacking and from the inversion approach agree with a previous study of mainly controlled source results by Cherepanova et al. (2013). Here we also determine the Vp/Vs ratio. Our analysis maps deep features in the upper mantle as the mid-lithospheric discontinuity and the thickness of the transition zone, whereas the lithosphere-asthenosphere boundary is not resolved.

The current results of RF analysis of the crustal and mantle structure will help to build a model for tectonic and geodynamic evolution of different provinces of Siberia. We compare our results to the recent detailed models of crustal structure in the area and with seismic models for similar geodynamic settings worldwide.