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Crustal Structure of the central Baltic Shield highlighted by Seismic Tomography and Anisotropy Studies

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The complex 3D crustal structure of the central Baltic Shield was formed during several Precambrian events. The crust is composed of varying size and shapes of blocks and layers composed of accreting terranes and intervening basins. These structures can be visualized by the seismic travel time tomography and by the directional component of azimuthal anisotropy.
The data set consists of first arrivals of P- and S-waves recorded during controlled source refraction and reflection experiments and during passive SVEKALAPKO seismic tomography project. In addition, P- and S-wave arrivals measured from chemical explosions registered at permanent stations are included. A large number of first P-wave arrivals (19180) and S-wave crustal arrivals (15146) are used in the tomography inversion. The inversion produces P- and S-wave velocity models with highest lateral resolution of 50 km to the depth of 40 km in 800 [U+F0B4] 800 km2 wide area.
The distribution of the P - and S-wave velocities and the velocity ratio, Vp/Vs, has notable, local variations throughout crust depicting a complex mosaic of alternating minima and maxima. The anomalies reveal several distinct blocks and belts, which can be associated with the main geological terranes. For example, the Archean-Proterozoic boundary zone is characterized by a distinct upper crustal low velocity zone. The upper crust of the schist belts is associated with velocity minima (Vp <6.1 km/s, Vs <3.6 km/s and Vp/Vs <1.70). The rapakivi batholiths and the granitoid complexes associate with velocity maxima (Vp/Vs >1.74-1.76) in the middle crust.
In the isotropic tomographic velocity models of the crust anisotropic component is embedded in the residual component. An azimuthal anisotropy is verified when fast P-wave velocity direction is accompanied by orthogonal slow velocity direction. The resulting anisotropy directions coincide with transport directions drawn from structural observations. In summary, the images obtained from seismic tomography and anisotropy give us a versatile, complex view of the crustal structure. Consequently, we can use our results to trace back the crust forming processes, the accretion of old micro-continents and island arcs stabilized by extensional processes in the central Shield.