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VELOCITY IMAGES OF LOWER LITHOSPHERE AND UPPER MANTLE IN EUROPEAN ARCTIC

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Passive seismological experiment LAPNET provided data for structural studies of the upper mantle beneath the northern part of Fennoscandia. We analyze body waves of earthquakes from teleseismic distances and retrieve both anisotropic and isotropic velocity images of the upper mantle. We present domain-like fabrics of the Precambrian continental lithosphere of northern Europe and map boundaries as well as thickness of the domains. Similarly to other regions of various tectonics and ages, the Archean mantle lithosphere is formed by domains with differently oriented fabrics reflecting fossil anisotropic structures (Babuška & Plomerová, 2006). The domains in the Archean part of the Fennoscandian Shield are sharply bounded (Plomerová et al., Solid Earth 2011). While the Proterozoic-Archean contact (P-A) in the south-central Finland appears as a broad transition (Vecsey et al., 2007), the P-A contact in the north seems to be more distinct. Boundary between the domains with distinct mantle lithosphere fabrics can be associated with the Baltic-Bothnia Megashear Zone (BBZ).

Isotropic velocities in the Archean mantle lithosphere retrieved by standard tomography appear to be lower than those in the Proterozoic part of the Fennoscandian Shield. Boundary between the two regions follows the surface trace of the BBZ. The westward shift of the boundary between regions with positive and negative velocity perturbations at depths around 125 km can indicate its inclination similarly to wedge like structure of the Proterozoic-Archean transition in the south-central Finland (Plomerová et al., 2006). Higher velocities around 170 km can be related to the lithosphere thickening towards the south-central Finland and along the P-A lithosphere contact beneath the middle part of the LAPNET array (Plomerová & Babuška, 2010).

Combined analysis of 3D anisotropic structures retrieved by joint inversion of body-wave anisotropy parameters, based on P- and shear-wave anisotropic parameters, along with velocity perturbations imaged by standard isotropic regional tomography, advance our knowledge of the upper mantle structure, the lithosphere formation and its development with potential implications for 'intraplate' seismicity or deposits of raw materials. We concentrate on the lithospheric mantle structure and the upper mantle processes, which govern most of dynamic crustal features.

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