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Inter-wedging of the Proterozoic and Archean mantle lithospheres in the south-central Fennoscandia

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Joint inversion of anisotropic parameters of body-waves proved the mantle lithosphere of the south-eastern Fennoscandia is formed by several domains with different anisotropic structure. Fabric of the mantle lithosphere of two Proterozoic domains can be approximated prevailingly by hexagonal symmetry with the north-westerly dipping low-velocity symmetry axis b. Fabric of Archean domains can be approximated by orthorhombic symmetry with the high-velocity axis a dipping to NE. There is a trade-off between the strength of anisotropy and thickness of the anisotropic domains required to explain the observed anisotropic parameters. Nevertheless, stable solutions were achieved for the SW Proterozoic domain and the Archean domains, providing 100-150 km and 160-210 km thicknesses, respectively. Lateral variations of body-wave seismic anisotropy allow us to detect the Archean-Proterozoic boundary in the upper mantle, though isotropic teleseismic P- (Sandoval et al., 2003) or surface-wave tomography (Bruneton et al., 2004) do not noticeably differ in the Proterozoic and Archean mantle beneath the SVEKALAPKO array. The broad transition zone appears as isotropic for P waves (Plomerova et al., 2005). But inversion of shear-wave splittings results in a model down to a 250 km depth with anisotropy close to that found for the Archean domains, which is in accord with the lithosphere thickening towards the core of the craton. In general, variations of body-wave anisotropic parameters indicate a very complicated structure, which cannot be approximated by a single layer with horizontal symmetry axis or a simple contact of two mantle lithosphere blocks. We propose three potential anisotropic models of the mantle lithosphere around the Proterozoic-Archean contact, formed by inter-wedging of both Precambrian units. The

proposed model of the south-central Fennoscandian Shield is supported by recent findings from surface wave anisotropy (Pedersen et al., 2006), mantle xenoliths (Peltonen et al., 2006) and magnetotellurics (BEAR project).