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Shear-wave splitting as a diagnostics of varying upper mantle structure beneath SVEKALAPKO array (Fennoscandian Shield)

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To study anisotropic structure of the upper mantle, we need to evaluate reliably teleseismic shear-wave splitting parameters. There are three basic methods, which can be used: correlation method, eigenvalue method and minimizing transverse energy method, the last one in case of core shear waves. Seismic noise present in a useful signal can spoil especially results from the correlation method. In case of temporary array data, we can hardly work only with very high signal-to-noise ratio data. In such a case, the other two methods provide more reliable results. Namely, the minimizing of transverse energy, leading to linearization of particle motion, which serves as an independent cross-check, provides stable solutions. Moreover, compared with the eigenvalue method, the transverse energy method is less sensitive to the cycle-skipping effect. Regardless of a method used, we show a necessity of pre-processing of analysed signals. We apply a wavelet spectra analysis to determine the time-frequency content of a signal, as well as a filtering and a careful setting of the shear-wave time window for the splitting analysis. Reliability of each evaluated set of anisotropic parameters, i.e., an orientation of the polarized fast shear wave and a time delay of the slow shear wave, is estimated by the bootstrap method. The main target of a deep seismic tomography experiment of the SVEKALAPKO project (SVEcofennian-KArelian-LAPland-KOla) was to investigate the lithosphere structure in the central part of Fennoscandia, and especially the Archean-Proterozoic contact in the upper mantle. We present results of the shear-wave splitting analysis of the array data with about 50 km station spacing, which allows us to map lateral variations of apparent mantle anisotropy. The lateral variations of the shear-wave splitting parameters, as well as their dependence on the direction of propagation within the upper mantle, reflect a general 3D orientation of

anisotropic structures in the mantle lithosphere. For some directions of wave propagation, a sudden change of splitting parameters can be related to the Archean-Proterozoic upper mantle boundary, while for other directions the boundary appears as a broader transitional zone. We present a 3D self-consistent anisotropic model of the Precambrian lithosphere domains of the Fennoscandian Shield in south-central Finland.