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Variability of lithospheric structure in the Baltic Shield

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We present the shear velocity structure down to 250km depth beneath the dense LAPNET array in northern Finland, located at the northern end of the Baltic Shield. We analysed phase velocity dispersion of fundamental mode Rayleigh waves, using data from 46 seismic broadband stations and almost 200 magnitude >6 events. The inversion of the dispersion curve shows a well resolved low velocity zone starting at approximately 150km depth, while the shear velocities above are typical for cratonic lithosphere. The comparison to other parts of the Baltic Shield show strong variability of the lithospheric structure. Immediately south of LAPNET, in an area dominated by paleaproterozoic rocks at surface, the lithosphere is fast to a depth of 225-250km, while cratonic lithosphere seems to be absent beneath southern Norway, in spite of Proterozoic age tectonic ages. The low velocity zone beneath northern Finland indicates that the lithosphere in this area is either modified at depth, for example through metasomatism, or that it is thinner than the more internal part of the Baltic shield. We suggest that the modification of the cratonic lithosphere beneath northern Finland is not related to continental breakup at the opening of the Atlantic Ocean, as the continental shelf continues north, beneath the Barents Sea. We rather favour the hypothesis that subduction and/or collision could potentially modify (by fluid injection) or remove (by erosion/dripping) otherwise stable cratonic lithosphere.