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Crust-mantle boundary in the central Fennoscandian Shield: constraints from wide-angle P- and S-wave velocity models and from new results of reflection profiling in Finland

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We present an analysis of a crust-mantle boundary in the central Fennoscandian shield based on comparison of new combined P- and S-wave velocity models of previous SVEKA and FENNIA wide-angle reflection and refraction profiles to results of FIRE- a new seismic reflection experiment in Finland (FIRE Working Group, 2006). In the Precambrian Fennoscandian shield the recordings of S-waves in wide-angle data demonstrate clear reflections from the Moho boundary (SmS) due to generally high Vp/Vs ratio in rocks representing lower crustal lithologies, although this boundary cannot be easily detected by interpretation of P-waves. Thus combined analysis of P- and S-wave reflections can be used to obtain the position of the lithological crust-mantle boundary. Comparison of new P- and S-wave velocity models to the line drawing sections of the FIRE1 and FIRE2 profiles showed non-uniformity of the crust-mantle boundary beneath the central part of the Shield. The depth to this boundary varies in a wide range (50-65 km). The high velocity lower crust (HVLC) with Vp$>$7 km/s detected from combined P- and S-wave velocity model corresponds to a prominent zone of high reflectivity at a depth of 30-50 km depth in FIRE sections, while the Moho coincide with the bottom of this zone. From the models of Vp/Vs ratio distribution we can distinguish two main types of crust-mantle boundary. The first type is observed in the transition zone between Archean and Proterozoic domains, where the peridotitic upper mantle is overlain by high-velocity lower crust with high content of mafic garnet granulites. The second one corresponds to the Proterozoic domain, where the mafic high-velocity lower crust is underlied by eclogitic layer in the upper mantle.