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Moho depth and crustal structure of the Siberian Craton and the West Siberian Basin: An appraisal of existing seismic data

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We present a digital model of the crustal structure of the Archean-Proterozoic Siberian craton and the Paleozoic-Mesozoic West Siberian basin, based on seismic profiles published since 1960 in international and Russian journals, books, theses and reports. Data quality was assessed and quantitatively assigned to each profile based on acquisition and interpretation method and completeness of the model. The database represents major improvement in coverage and resolution with a nominal sample interval of 50 km before interpolation onto a uniform grid. It includes depth to Moho, thickness and average P-wave velocity of five crustal layers (sediments, and upper, middle, lower, and lowermost crust) and Pn velocity. Results are presented in maps and cross-sections, which demonstrate strong crustal heterogeneity. Crustal structure shows weak correlation with tectono-thermal age and strong correlation with tectonic setting. Sedimentary thickness varies from 0-3 km in stable craton to 10-20 km in extended regions. Typical Moho depths are 44-46 km in stable Archean crust, 40-42 km in Proterozoic craton and Neoproterozoic/Paleozoic orogens, 35-38 km in extended cratonic crust, and 38-40 km in the West Siberian basin. Average crustal velocity is $\sim$6.2-6.4 km/s, ranging from <5.8 km/s in deep sedimentary basins to $\sim$6.6 km/s around the up-to 54 km thick Anabar shield crust. The cratonic crust generally consists of three layers and has no high-velocity lowermost crust (Vp$\sim$7.4 km/s), which is observed only in magmatic areas. Upper mantle Pn velocities are generally $\sim$8.2 km/s in the craton and West Siberian Basin, lower in Baikalian and Caledonian areas, higher in the Tunguska and Viluy basins, and abnormally high (8.6-8.9 km/s) around kimberlite fields. We provide an extensive summary of the tectonic and geodynamic evolution of the region and discuss the origin of crustal heterogeneity and processes of crustal evolution in Precambrian cratons and major Phanerozoic basins and rift zones.