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Crustal structure of Europe, Greenland, and North Atlantics: Synthesis and analysis

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We use a new regional crustal database to compare regional and global crustal models for the area 70W-62E, 30N-85N; this region encompasses all of Europe from Svalbard in the north to the Mediterranean in the south and the Ural mountains in the east, as well as Iceland, Greenland, and the North Atlantic region including the Baffin Bay and the Labrador sea. Our new crustal database is compilation "from scratch" of all available seismic data for the region, acquired and interpreted from the late 1960-ies until present. The new database is based on ca. 200 seismic surveys reported in ca. 400 publications and includes the results of seismic reflection, refraction and receiver functions studies, but excludes unreliable constraints, such as based on seismic interpolations, gravity modelling, or tectonic similarities. The new regional crustal model comprises detailed and reliable information on the seismic structure of the crust for most of the tectonic structures of the region and allows for examination of spatial correlations with tectonic and geological structures. We show that several widely accepted hypotheses about crustal structure of the continents are not supported by regional seismic data. In particular, the Archean crust of the East European craton, which is 40-45 km thick (locally >50 km) and has a thick (10-25 km thick) high-velocity lower crust, is similar to the Proterozoic crust both in thickness and in structure. Regional seismic data also disagree with the global averages for structure of the continental crust of different tectonic types: there is not a single tectonic structure in the region that matches global averages neither in the crustal thickness nor in the average crustal Vp velocity. As a result, the regional crustal model averaged on 2x2 deg or 5x5 deg grid is also in striking contrast with global crustal models CRUST2.0 and CRUST5.1. Significant differences between regional and global models in the crustal velocities and thickness of individual crustal layers as well as in the depth to Moho question representativeness of global crustal models for many tectonic settings. It is clear that an improved crustal model based on a high-quality compilation of seismic data is needed; a recently announced CRUST1.0 model can be an important step forward in this direction (although unavailable in digital form at the time of abstract submission for comparison with the regional model).