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A crustal thickness model of the Arctic Region

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The recent remarkable increase in the amount of new data collection and compilations for the Arctic region calls for a re-evaluation of our knowledge about the crustal structure and the tectonic evolution of the Arctic basins. We derive the crustal thickness of the High Arctic region by taking into account an updated bathymetric grid (Jakobsson et al., 2012), newly published gravity anomaly grids and a modified TeMAr sedimentary thickness gridded data. This inversion includes a lithosphere thermal gravity anomaly correction (Alvey et al., 2008, Minakov et al., 2012) a vertical density variation for the sedimentary layer; and variable crustal density for different parts of the studied region based on calculated Bouguer gravity anomalies.

The new crustal thickness grid fits well with data from selected seismic profiles for most parts of the High Arctic region. Exceptions are observed under the Alpha-Mendeleev Large Igneous Province, under the Lomonosov Ridge and the Chukchi Borderland continental blocks. The crustal thickness from gravity inversion is a few kilometers less than on seismic profiles under the Mendeleev and Alpha ridges. We suggest that this is most likely due to underplating as observed on seismic models. A discrepancy of a few kilometers greater than on seismic models is also observed between the seismic data and our computed crustal thickness of continental blocks. A lighter mantle density under these blocks results in a better fit. We infer that this could be explained, by depleted continental mantle under these continental blocks.

The results are compared with recent models of the Arctic lithosphere and the upper mantle and they will be subsequently incorporated into an improved tectonic model of the Arctic Ocean. We aim to include these results into the world crustal thickness model (CRUST 1.0).