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Validation of the 3D Moho depth models by active seismic 2D models for the High Arctic.

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Gravity inversion (3D) has been used to build a new Moho depth grid of the High Arctic region (Lebedeva-Ivanova et al., in review). The 10x10 km cell-size grid was analyzed against the Moho depth models derived from active crustal scale seismic experiments within the region. 37 seismic models of ca.18000 km length were digitized at 10 km interval. This broad seismic model data set (SMDS) provides an independent way to quality control our model. Some publically available global and regional Moho depth models were also compared with the SMDS.
Our analysis shows the Moho depth seismic models uncertainties of ca.2 km. The new 3D Moho depth model shows a mean of misfit with SMDS of 0.4 km for the whole study area. One standard deviation (SD) illustrates that ca.68% of the results fit with seismic Moho within 3.8 km; ca.30% of our results have misfit within 2 km. Most of the mismatches with the seismic models are attributed to the presence of underplating material or Moho depth rapid changes at the continental margins due to usage of low-pass filter of 35 km for 3D inversion.
The global models of the crustal structure with resolution of 0.5-1.0 geographic degrees are broadly used as input data for many seismological studies. CRUST1.0 Moho depth grid (Laske et al., 2013) is created mostly using models from various kind of seismic data. This model shows a mismatch with SMDS with SD of 5.5 km and the mean of 1.8 km. CRUST1.0 poorly describes many Arctic regional features, like the deep Arctic ridges, probably due to lack of models in CRUST1.0 for the High Arctic.
The GEMMA global Moho depth model (Reguzzoni et al., 2015) was created using GOCE satellite gravity measurements. It has greater mismatch with SMDS (SD of 7.7 km) than CRUST1.0, however it better describes the Moho variations for main Arctic morphological features with significant underestimates (mean of -5.8 km).
Barents50 Moho depth model (Ritzmann et al., 2007) for the Barents-Kara shelves was created using seismic models. The greatest underestimates of the Moho depth of ca.10 km are observed at the Kara Sea, due to lack of available seismic models at that time. It has mismatch distribution of 5 km SD and mean of -2.5km for the shelves.
Glebovsky et al. (2013) Moho depth model was derived using 3D gravity inversion for the deep Arctic Ocean, and some inversion parameters were calibrated by seismic models. Error distribution for the model has SD of 2.5 km with mean of 0.003 km. The model well captures all deep water features, but limited by this area.
The comparison of gravity derived and SMDS Moho depths shows that the global crustal models are out of focus in the High Arctic region. The regional models reliably constrain the Moho architecture, but do not cover broad regions. The new 3D Moho depth model is comparable with seismically derived Moho depths and can be used in the future to replace the Arctic region in global models.