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The latest 3D density model of the Barents Sea crust

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The 3D gravity inversion was realized in order to reveal the density features of the Earth's crust the Barents Sea. The original 3D density model of the region includes both lateral and depth density`s changes.
The main steps of the modelling are:

- The calculation of the anomalies of the gravity field in Bouguer reduction with the three-dimensional gravitational effect correction of the seabed.

- Gravity field correction for the three-dimensional influence of the Moho boundary (according to the GEMMA model). The excess density at the Moho picked by minimizing the standard (root-mean-square) deviation of the gravity effect from GEMMA Moho boundary and Bouguer anomalies. So, the regional density jump at the Moho border is 0.4 g / cm^3.

- Based on regional geological and geophysical data about the deep structure of the Barents Sea, it was developed generalized dependence of density changes by depth in the sedimentary cover and the consolidated part of the earth's crust.

- Compilation of 3D original model of the base of the sedimentary cover on predictive algorithms of neural networks. The neural network was trained on several reference areas located in different parts Barents area using a number of potential fields transformations and the bottom of the sedimentary cover from model SedThick 2.0.

- Using the resulted dependence of the crust density change by depth and a new model of the sedimentary cover bottom, the gravitational field corrected for the impact of the sedimentary cover with variable density.

- The finally stripped gravity field is used to create density model above and below the base of the sedimentary cover. Frequency filtering on Poisson wavelets [Kuznetsov et al., 2020] had been used for the final separation of the gravitational field into its components.

- The inverse task was solved using specialized volumetric regularization [Chepigo, 2020].

As a result, the crust of the Barents Sea density inhomogeneities were localized by depth and laterally in 3D model, which became the basis for further structural-tectonic mapping.

References

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