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A new 3D regional density model for the Barents Sea Region

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We present a 3D density model of the Barents Sea Region, which provides new insights into the regional lithospheric setting and evolution of the regional sedimentary basins. The tectonic setting and lithospheric structure of the Barents Sea area is a still not completely understood due to the lack of integrated geophysical studies.

Our 3D density model is based on seismic information adjusted to the gravity field and geoid undulations. Seismic information is available from the seismic velocity models BARENTS50, with a resolution of 50 x 50km. In a first step, we analyse the relation of the wavelength content in the potential fields and possible source location or density contrast. We focus on the upper mantle density variation using geoid undulations and on the basement geometry by the gravity field anomaly. Analysis of magnetic data additionally helps to study the upper basement structure.

We present a forward model using the software package IGMAS that allows us to adjust the model parameters in order to get the best fit between the modelled and observed anomalies simultaneously for the gravity field, geoid and magnetic anomalies. We also discuss the accuracy, uncertainties and limitations of our model in respect to the available database.

The 3D model defines the basin geometry and the crustal structure of the Barents Sea Region on a regional scale. The density distribution gives new insights into the link between basement properties and basin architecture. The different basin geometries

between the Eastern and Western Barents Sea are clearly expressed by different lithospheric structures and especially the mega-scale basins in the Eastern Barents Sea are an outstanding feature, as they correlate with an apparent high-density-velocity structure in the upper mantle and visible in filtered geoid undulations. The link between the upper mantle structures and the Eastern Barents Sea Basin is certainly a key to unveil the formation of the mega-basins with up to 20 km of sedimentary succession.