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Earth's Crust and Upper Mantle Density Models of North-East Russia on the Basis of Offshore Wide-angle Seismics

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In recent years, numerous DSS studies (four intersecting lines of total length of ~3000 km) accompanied by MRS observations have been carried out to investigate the deep structure of the transition area from the Eurasian continent to deep-water part of the Arctic Ocean. Density modeling of the entire system of profiles was performed for creating an integrated geophysical model and its subsequent geological interpretation. Density modeling is performed in two ways and checks by the gravity forward solution in the GM-SYS program module (Geosoft, Oasis Montaj). The first (traditional) method consists in the translation of velocity parameters to density ones based on known correlation dependences within the layered-block model. Calculations shows significant deviation of the model curve form the observed field. The model compensation is possible only by using the densities which are out of the confidence interval of known "velocity-density" dependencies. The second method appropriates modelling of gradient heterogeneous density model. It is based on a 3D gravity inversion in the spectral range (KOSCAD 3D software system) with a consequent reducing the invariance of the solution based on a priori information. Main boundaries of the seismic section and patterns of velocity variations with depth were used as a priori information. The result of the gravity forward solution has shown RMS error less than 10 mGal. The derived gradient heterogeneous Earth's crust and upper mantle density models are matched in profile intersection points. Models show significant lateral density variations that allow better dissection of DSS sections and promote further geological interpretation of deep geophysical data.