Interpretation of Bouguer long-wavelength gravity anomalies by means of 2D density modelling

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Abstract: This paper will deal with study of the structure and geodynamics of the crust in the central part of the Upper Egypt (24-28°N, 30-36°E) by means of 2D forward density modeling of long-wavelength gravity anomalies along three profiles A–A′, B–B′ and C–C′. The starting models were constructed on the basis of the existing geophysical and geological data. Based on the calculations of the crustal density models, large differences of the Moho depths in the studied region were found. On one side the Moho relief underneath the Eastern Desert is almost flat and it varies from about 28 km to 33 km. On the other side large shallowing of the Moho can be observed beneath the Red Sea region (only 12 km). Continental passive margin of the African plate is characterized by a significant deepening of the Moho from about 12 km to about 31 km. This deepening of the Moho from the region of continental rifting and the initiation of sea floor spreading in the Read Sea to continental African plate is due to a decrease of regional gravity field in this direction. The sedimentary basement has a large influence on observed gravity anomalies. Generally, the relief of the pre-Tertiary basement in the Eastern Desert along the profiles decreases from SE (about 1 km) to NW (about 4 km). The largest depths of the sedimentary basins reach more than 5 km. Variation of gravity effect of the sediments is larger than that of the Moho. An anomalous body with density contrast -80 kgm^{-3} along the profile C–C′ (km 150-200) was interpreted. Its maximum thickness was modeled up to 4 km. The maximum amplitude of the proposed anomalous body is -12 mGal.

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Key words: Bouguer gravity anomalies, 2D density modeling, crust, central part of Upper Egypt