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Structural mapping of northern Red Sea area, Egypt, using high resolution geophysical data

Salah Saleh (1), Ahmed Saleh (2), and M. Mekkawi (3)

(1) National Research Institute of Astronomy and Geophysics (NRIAG), 11421- Helwan, Cairo, Egypt, Cairo, Egypt, (2) National Research Institute of Astronomy and Geophysics, (NRIAG), 11421- Helwan, Cairo, Egypt, (3) National Research Institute of Astronomy and Geophysics (NRIAG), 11421- Helwan, Cairo, Egypt

Bouguer and high-resolution aeromagnetic maps were compiled for northern Red Sea region including Gulf of Suez and Gulf of Aqaba. This study provides a tectonic framework of the Precambrian faulted basement rocks and their orientation exposed or buried beneath the generally sedimentary rocks of the study area. The data analysis techniques applied included, normalized derivatives, 3D Euler deconvolutions and feature extraction calibrated using well logs data. Results of these techniques show that the study area has been affected by some major sets of structural systems, mainly trending in NNW, NW and NE directions along Red Sea, Gulf of Suez and Gulf of Aqaba. Moreover, some E-W and N-S structural trends were observed in Sinai and in western side of the River Nile (Eastern Desert). Also, many principal basement zones, structural and seismic active tectonic trends previously recognized were confirmed in this study.
Furthermore, interpretations of both 3D magnetic modeling and 3D analytical signal techniques confirm the depths to the magnetic sources resulted by the 3D Euler technique. Whereas the basement could be observed on the ground (nearly 50 m over the ground) and become deeper than 5 km in some parts along the northern Red Sea region, indicating that, the Red Sea rift is subjected to strong tectonic activations. The aeromagnetic and Bouguer anomalies derived from the tilt derivative and horizontal derivative maps (TDR and H-TDR) were good identifiers the accommodation zones segmenting the Red Sea Rift. Finally, a complete set of processed geophysical maps for the northern Red Sea is presented in a hope that they can be useful for tracing the structural relationship of the entire region. The results are in agreement with the regional geophysical interpretation and the bathymetric expressions.

Key words
Red Sea Rift, Gulf of Suez, Bouguer and aeromagnetic anomalies, 3D Euler deconvolutions, analytical signals and normalized derivatives