

## **Delineation of Subsurface Tectonic Structures Using Gravity, Magnetic and Geological Data, in the Sarir-Hameimat Arm of the Sirt Basin, NE Libya**

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**Abstract :** The study area is located in the eastern part of the Sirt Basin, in the Sarir-Hameimat arm of the basin, south of Amal High. The area covers the northern part of the Hamemat Trough and the Rakb High. All of these tectonic elements are part of the major and common tectonics that were created when the old Sirt Arch collapsed, and most of them are trending NW-SE. This study has been conducted to investigate the subsurface structures and the sedimentology characterization of the area and attempt to define its development tectonically and stratigraphically. About 7600 land gravity measurements, 22500 gridded magnetic data, and petrographic core data from some wells were used to investigate the subsurface structural features both vertically and laterally. A third-order separation of the regional trends from the original Bouguer gravity data has been chosen. The residual gravity map reveals a significant number of high anomalies distributed in the area, separated by a group of thick sediment centers. The reduction to the pole magnetic map also shows nearly the same major trends and anomalies in the area. Applying the further interpretation filters reveals that these high anomalies are sourced from different depth levels; some are deep-rooted, and others are intruded igneous bodies within the sediment layers. The petrographic sedimentology study for some wells in the area confirmed the presence of these igneous bodies and defined their composition as most likely to be gabbro hosted by marine shale layers. Depth investigation of these anomalies by the average depth spectrum shows that the average basement depth is about 7.7 km, while the top of the intrusions is about 2.65 km, and some near-surface magnetic sources are about 1.86 km. The depth values of the magnetic anomalies and their location were estimated specifically using the 3D Euler deconvolution technique. The obtained results suggest that the maximum depth of the sources is about 4938m. The total horizontal gradient of the magnetic data shows that the trends are mostly extending NW-SE, others are NE-SW, and a third group has an N-S extension. This variety in trend direction shows that the area experienced different tectonic regimes throughout its geological history.

**Keywords :** sirt basin, tectonics, gravity, magnetic

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