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Gravity and magnetic investigation at the Gabes-Tripoli Basin

G.Reeh

Petroleum Research Center, P.O.Box 6431 Tripoli, Libya.

g_reeh1@yahoo.com

The study area is located in the Libyan offshore which cover the Gabes-Tripoli Basin and bounded on the North by the Isis Jerafa Ridge and on the South by the Jefara extensional fault system, on the West, the basin extends to offshore Tunisia, on the East to Tripoli Misurata Basin, and linked to a Triassic tectonic phase which provide an extensional rifting with a NW-SE trend, (Jafara fault system), to the South and the Isis Jarafa Ridge to the North. Analysis of the power spectra indicates the presence of two discrete magnetic sources at different depths, shallow group at a maximum depth of 3.5 to 5.5 km and a deeper group at a depth of about 7 to 10 km. The magnetic interpretation provides a thorough documentation of the distribution nature, size and depth of magnetic source. 2D forward modeling of the gravity data was performed along profile AA', and crosses at right the major structural trends in the area. The model was constrained by wells, and seismic data. To avoid end of line effects the model extended from a distance of minus infinity (-30,000km) and continue to plus infinity (30,000km).The gravity and the magnetic data were subjected to several analytical and FFT frequency-based analysis, filtering and image enhancements including first vertical derivative, horizontal gradient and analytic signal. In addition, Goussev filter was applied on the magnetic data. The results revealed two sets of linear anomalies. The first set of anomalies is trending northwesterly and closely associated with the prominent, younger structural trends in the area. The second set appears to be older in geological age than the first set, and probably related to the Precambrian Pan-African deformation, whose trend was reactivated during the Mesozoic extension. Trend surface analysis shows that, the regional gravity trend consists of a smooth gradient with gravity increasing seaward to the northeast. This gradient has gentler slope in the west. The source of this regional gravity gradient is interpreted as a seaward shallowing of

the Moho.