

SP10

Geophysical Investigation of the Subsurface Structures of the Usangu Basin Based on Gravity and Aeromagnetic Data

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Summary

The Usangu basin is among the rift basins that have been developed along the western arm of the Cenozoic East African rift system (EARS) during the Pliocene-Pleistocene epochs. The basin is stationed at the Mbeya triple junction and seismically active zone with high heat flow as emanated by geothermal activities. These activities triggered the formation of different basement structures and their response on sedimentary portion. To investigate these structures and the variation of sediment thickness along the basin, the magnetic and gravity data in conjunction with SRTM data were used.

Abstract

The Usangu basin is among the rift basins that have been developed along the western arm of the Cenozoic East African rift system (EARS) during the Pliocene-Pleistocene epochs. The basin is stationed at the Mbeya triple junction and seismically active zone with high heat flow as emanated by geothermal activities. These activities triggered the formation of different basement structures and their response on sedimentary portion. To investigate these structures and the variation of sediment thickness along the basin, the magnetic and gravity data in conjunction with SRTM data were used. DEM shows only few lineaments on the basin flanks with no any structures on the centre of the basin, this means that the basin consists of young and poorly compacted sediments aging from Pliocene to Pleistocene epochs. The lineaments depicted are the Usangu and Chimala border faults. Magnetic and gravity data show three sets of both normal and strike slip faults, majority trend NE-SW, other trends NNE-SSW while few show WNW-ESE or NW-SE trend. On the southwest of the basin there are lot of faults with complex patterns, the reason being due to concentration of important tectonic and seismic activities on the area. Located Euler deconvolution and gravity models used to calculate the depth to the basement show that the basement is shallow at the north less than 1.5 km and deepen southwards through 1.5 km-3 km to 3 km-4.5 km at the centre, the range of depth favours the formation of hydrocarbons. This makes the basin to be potential for hydrocarbon exploration. The general thickness of sediments in the basin is 3 km-4.5 km reaching up to 4.5 km on depocentre. Also these data show the troughs, depression and intrabasinal basement trend the same direction as the basin, and the basin has two grabens.

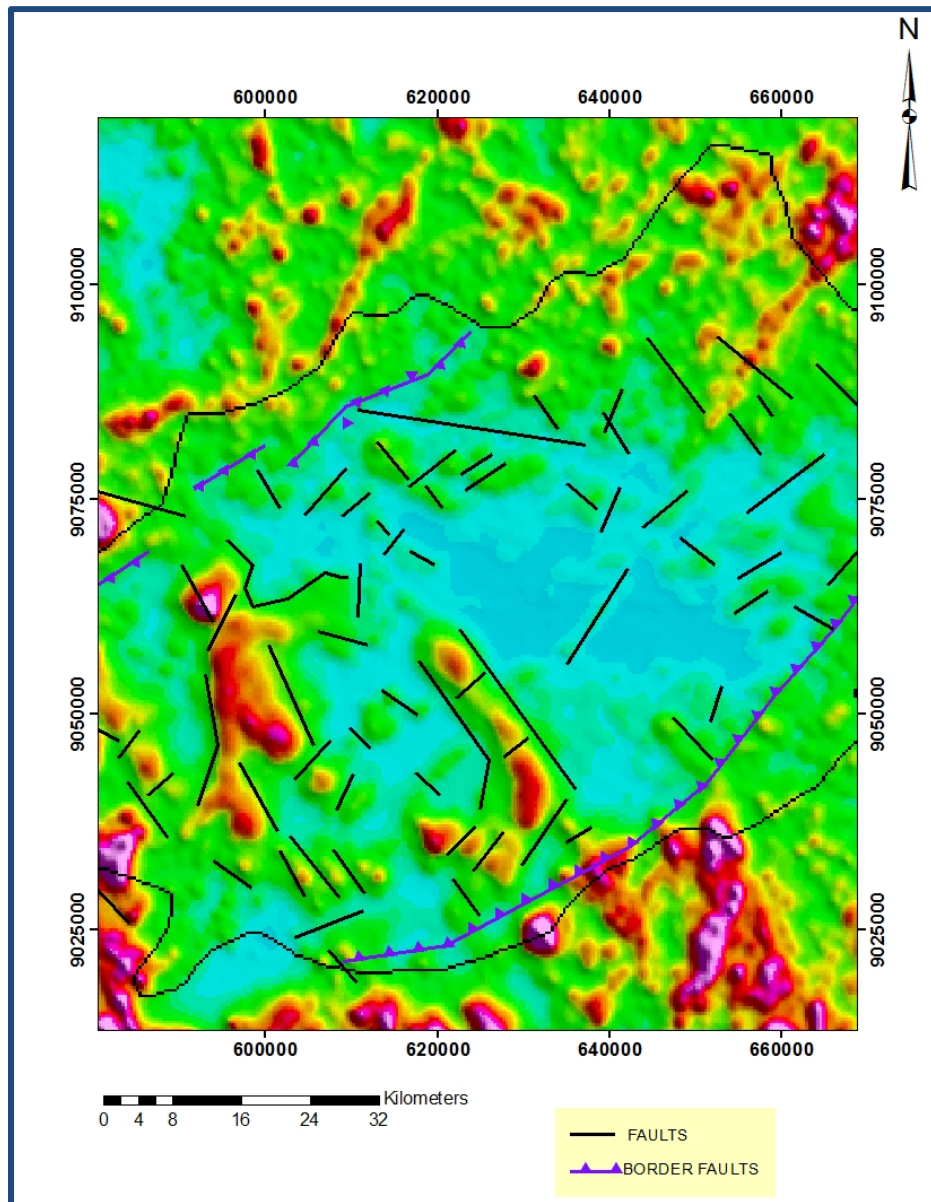


Figure 1 Goussev filtered magnetic anomaly map of the concealed basement of the Usangu Basin with main structural features in the area. Thick black lines are the basement involved faults. The thick violet lines are border faults.

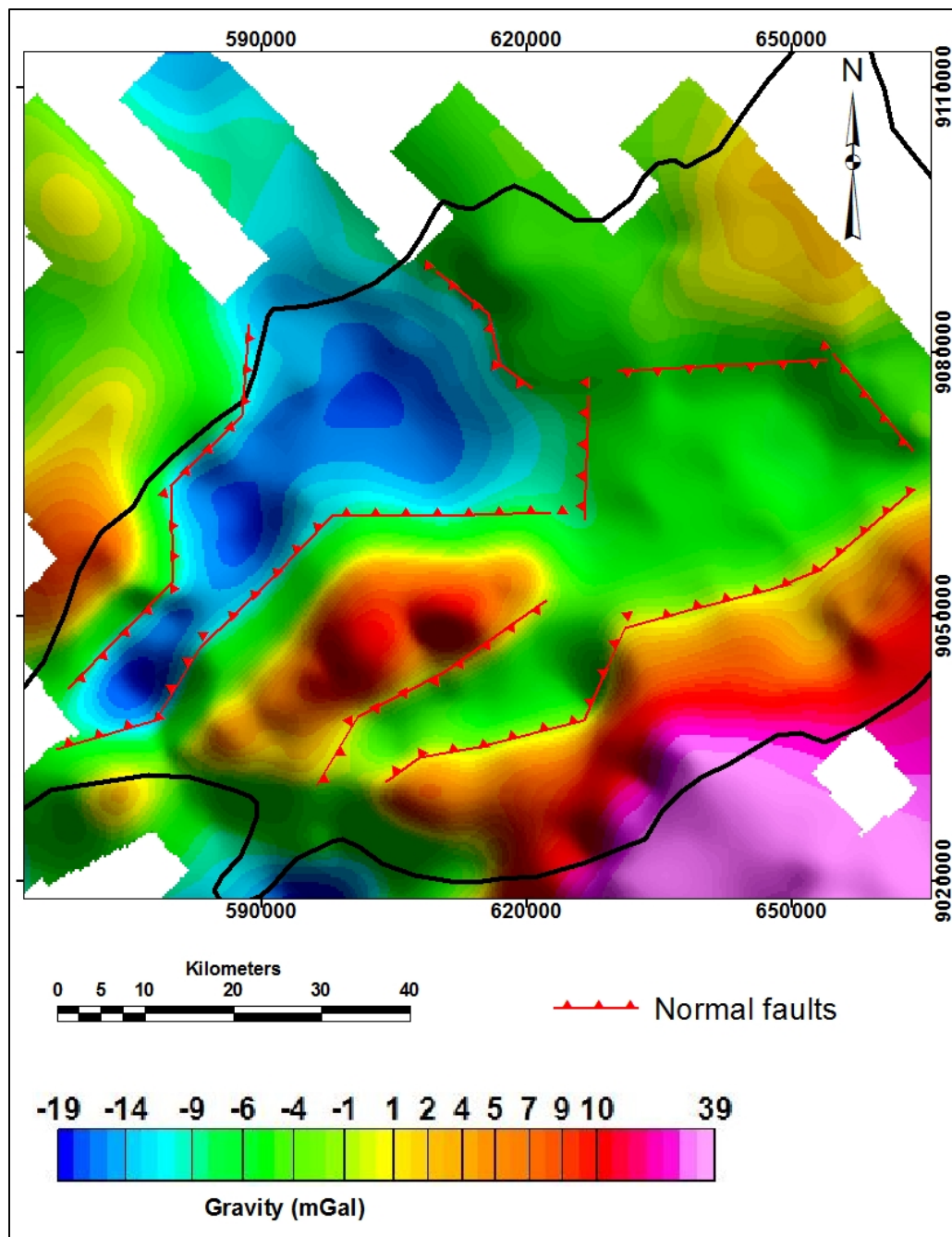


Figure 2 The 8th order polynomial Bouguer residual anomaly map of the Usangu basin. Note the central graben with normal faults (red lines) bounding the troughs and depocentre from uplifted basements. The black polyline is the basin outline.