Interpretation of Airborne Gravity Gradiometry Data for Bahrain

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ABSTRACT

High-resolution, low-noise airborne gravity gradiometry (AGG) data have been acquired and interpreted for onshore and offshore the Kingdom of Bahrain. The objective of the interpretation was to gain an improved understanding of the structural and tectonic elements of both the sedimentary section and the basement. Depressions and sub-basins have been imaged and may be targeted by follow-up exploration. The interpretation of the airborne gravity gradient and magnetic anomaly data included 2D and 3D gravity and magnetic modelling, detailed 2D magnetic depth estimates along the flight lines and an integrated structural interpretation of the gravity, gravity gradient and magnetic data and enhancement grids. The results include interpreted lineaments, a depth to basement map, density variations expressing apparent lithological changes and an interpretation of the extent and thickness of the Hormuz salt layer. The modelled shallow density variations are expected to help develop improved velocity models for the mitigation of near-surface effects. Analyzing the gravity data led to the interpretation of a tectonic scenario for the sedimentary cover. The interpreted pattern indicates distinctive structural trends. It is interpreted as a result of subsequent tectonic events. The structural interpretation derived from magnetic data was aimed at outlining major tectonic lineaments which cut crystalline basement. The interpreted pattern indicates north-south, northeast-southwest and northwest-southeast trends. The morphology of the basement surface indicates a linked series of relatively deep and steep-sided grabens, separated by structural ridges and interconnected by a suite of transverse faults. The current configuration of the basement surface is expected to be a result of younger Phanerozoic tectonic events, which largely overprint older north-trending anticlines, parallel to the neighbouring Ghawar and Qatar anticlines.