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Application of the pattern recognition technique to locate subsurface magnetic anomaly

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An integrated analysis of geology and geophysical datasets through delineating magnetic anomaly sources and determination of the width and depths of various subsurface magnetic anomaly sources within the study area was undertaken in this study. The processes were carried out through series of horizontal and vertical geomagnetic cross-sections across the 58.70 by 56.8km areas of the Omu-Aran Schist belt, within the South-western Precambrian Basement Complex of Nigeria. The principal objective is to use an uncomplicated pattern recognition technique to locate these magnetic anomalies that support mineralisation potential in the study area. The subsurface structural pattern of this area was adequately mapped using the Oasis Montaj 2014 source parameter imaging function integrated with other geophysical methods that automatically calculates depths to the various magnetic anomaly from the gridded aeromagnetic data obtained from the Nigerian Geological Survey Agency. These anomaly sources as delineated, comprising arrays of north-north-east and south-south-west trending subsurface structures that influence the geologic features controlling the mineral potential in the north-east, north-west and south-western zones in the study area with very low and high values of the magnetic intensity. Various geological source models such as; rock contacts; dykes; sills; cylinders, pipes and spheres of the magnetic anomaly were delineated in the area. The broader dome-shaped structure that overlain a buried block of inferred meta-sedimentary rocks in this area suggest that subsurface mineralize distribution in the Omu-Aran Schist subsurface crusts may perhaps be influenced by its location in the highly mineralized Nigerian South-western Basement Complex coupled with the rich mafic and ultramafic granitic-migmatite basement terrain Ore rock bodies.

Keywords: Pattern recognition, depths to magnetic anomaly source, width of the anomaly