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Integrated Geophysical Mapping of Structures beneath Ijero – Aramoko Area, Southwestern Nigeria: Implications for Control of Mineralization.

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The prospective nature of the Ijero – Aramoko Ekiti area of southwestern Nigeria as having occurrence of rare-metal pegmatite containing economic concentrations of columbite -tantalite ore minerals (coltan) has prompted the need to use geophysical techniques in mapping the structures i.e. fault / fracture zones and rock contact that may host these minerals in the study area. The pegmatites are important sources of precious and semiprecious stones (such as beryl, aquamarine, tourmalines). In this study, geophysical methods such as airborne/ground magnetic, electrical resistivity (dipole-dipole), electromagnetic (very low frequency) were used to delineate structures possibly hosting the mineralized bodies in the area. The aeromagnetic data was analyzed in order to improve the quality of the data for better understanding of its subsurface geology vis – a – vis using Butterworth filter, downward continuation filter, analytical signal and first vertical/horizontal derivative filters. Magnetic susceptibility filter was used to infer bodies of relatively high magnetic content. Magnetic sources position and their depth were determined using Euler deconvolution with solution of structural index (n) =1, 2 and 3. The depths of the magnetic sources were equally estimated from the radial average power spectrum as ranging from 50m to 180m. From the Butterworth and downward continuation maps, prominent magnetic anomalies of relatively low magnetic values (-120.8nT - 21.1nT) characterized the Northern region while the Southern region is characterized with relatively high amplitude anomalies (71.9nT - 128nT). This affirms contrasting rock types in the basement i.e. undifferentiated schist, pegmatite and Meta volcanic rock. On the derivative maps i.e. vertical and horizontal, anomalies marked as faults in the downward continuation are shown more clearly. In the case of ground magnetic survey specifically ground magnetic, dipole-dipole and EM VLF methods, three traverses namely Tr1, Tr2, and Tr3 were established across some mapped localized mineralized bodies. On their VLF pseudo-sections, major lineament features indicative of fracture / faulted zone were delineated which coincide with dykes mapped on the magnetic profiles. The dipole-dipole pseudosection revealed zones of relatively low resistivity at depth range of 2m - 50m, information

which could aid mine design and exploitation of the minerals. The results of this study have helped in identifying additional prospective zones within the study area.

Key words: rare-metal pegmatite, fault / fracture, dyke, Butterworth filter, downward continuation filter, analytical signal and first vertical/horizontal derivative filters, Euler deconvolution.

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