

# Combined High-resolution Aeromagnetic and Radiometric Mapping of Uranium Mineralization and Tectonic Settings in Northeastern Nigeria

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## Abstract

Geological lineaments, depths to the basement, uranium concentrations, and remobilization in parts of the Upper Benue Trough, covering about  $55 \times 55 \text{ km}^2$  (longitudes  $11^\circ 30' - 12^\circ 00' \text{E}$  and  $10^\circ 30' - 10^\circ 30' \text{N}$ ), Northeastern Nigeria were investigated using integrated High-Resolution Aeromagnetic Data (HRAD) and radiometric data. This was with a view to identifying the potential zones of uranium occurrence in the area. The HRAD was processed to accentuate anomalies of interest and depths estimate of 150–1941 m were obtained from source parameter imaging technique. The results from the superposition of the horizontal gradient magnitude, analytical signal amplitude, first vertical derivative, and 3D Euler solutions of the HRAD revealed that the study area was dissected by linear structures that trend ENE–WSW, NE–SW, E–W, NNE–SSW, WNW–ESE, and NW–SE; among which the ENE–WSW and NE–SW trends dominated. Analyses of radiometric data showed that uranium ores in the study area were possibly remobilized epigenetically from the granitic rocks, and were later deposited into sedimentary rocks (Bima formation). Burashika group (Bongna hills) and Wawa area of the study area showed vein-type deposits, while the anatectic migmatite in the northeastern region and the uranium rich Bima formation showed both fault/fracture and contact types of deposition. It was also observed the northwesterly and southeasterly, dominant dip direction, dipping faults dip in the same direction as the paleocurrent direction (direction of depo-

sitions of sediments), and trend in a direction perpendicular to the hypothetical direction of uranium deposition. The study concluded that the studied area is dissected by several linear structures and the studied area possibly contains deposits of uranium ore, which are likely to be found in: the Bima Sandstones of Wade, Shinga, Bima hill, Wuyo, Teli, Bryel, Dali, Barkan, Gasi, Kunkun, Boragara, Deba, and Gberundi localities; the anatectic migmatite at Kubuku, Whada, and Hyama; and the Bongna hills and agglomerates around Burashika, Kawaba, and Galu.

**Key words:** uranium, radiometric, aeromagnetic, sandstone, fault, vein deposit.

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