Estimation of Curie Isotherm and Heat Flow of Eastern Chad basin, Nigeria from Spectral Analysis of Aeromagnetic Data

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Abstract

Spectral analysis of aeromagnetic anomalies was applied to estimate depths to the curie-temperature isotherm and heat-flow measurements in the eastern part of the Nigerian Chad Basin. The result of the analysis shows that depths to the centroid and magnetic bodies range from 11.55 to 18.32 km and 1.65 to 5.12 km respectively. The depth to the Curie temperature isotherm in the area varies between 21.45 km at Mafa-Bama area and 31.52 km at Maiduguri-Gwoza area below sea level. The result also shows that the Curie temperature isotherm within the basin is not a horizontal level surface, but is undulating, and the geothermal gradients associated with it range between 17.45 and 25.64°C/km while the corresponding mantle heat flow is about 46.00 mWm-2 and 67.60 mWm-2. It is good to note that areas of high heat flow correspond to high geothermal gradient within the study area. An inverse relationship exists between calculated curie depths and heat flow within the study area such that high-heat-flow regions correspond to low Curie depths regions. These results correspond to the depths inferred by extrapolating geothermal gradient and heat-flow values, suggesting that the Curie point depth analysis is a useful tool in estimating regional thermal structure.