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Magnetic Sources Depth Estimation from Digitized Aeromagnetic Data Acquired From Basement Complex Formation, South-Western Nigeria Using Spectral Analysis

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Abstract

Two dimensional spectral analysis of airborne magnetic data over Ibadan area were carried out in order to estimate the magnetic basement depth. The study area is bounded by latitude $7^{\circ}00'$ ***N to*** $7^{\circ}30'$ ***N and longitude*** $3^{\circ}30'$ ***E to*** $4^{\circ}00'$ ***E. The spectral analysis technique is used to determine basement depth. The results of interpretation show that the magnetic sources are mainly distributed at two levels. The mean shallow depth and deeper depth are 0.881km and 7.630km respectively. The shallow depth of 0.881km might probably due to intrusive within the sediment while deeper depth of 7.630km is attributed to underlying basement.***

Keywords: spectral Analysis, Aeromagnetic anomalies, basement, shallow depth, deeper depth

1.0 Introduction

Magnetic method is a geophysical technique that exploits the appreciable differences in the magnetic properties of minerals within the main objective of characterizing the earths subsurface. In order to cover a large expanse of land, airborne magnetic survey is required [1]. Airborne magnetic data is the gathering of magnetic data by small aircraft over a large expanse of land (which may be or not accessible) and interpreting the data using several interpretation techniques. It is a means of arriving at ore deposit within a geographic area [2]. The aeromagnetic signals from near-surface sedimentary geologic units and cultural (man- made) features have much lower amplitudes and much shorter wave-lengths than the aeromagnetic signals from deeply buried crystalline geologic units within the bedrock. In this study, Fourier band-pass filtering was used to isolate and enhance the anomaly wavelengths associated with the shallow (or deep) sources. Spectral Analysis has proved to be powerful and convenient tools in the processing and interpretation of potential field geophysical data. It seeks to describe the frequency content of signal, random process or system based on a finite set of data. The observed field anomalies were studied by first transforming the data from space to frequency domain and then analyzing their frequency characteristics [3, 4].
Since the magnetic anomalies can be easily treated as space series amenable to Fourier analysis and synthesis without affecting intrinsic features of these anomalies. It is particularly in the case of source depth prediction for the layered structures that the spectral analysis of magnetic data appears to have been most effective [3, 5, 6].

2.0 Description of the Study Area

The study area is Ibadan area, in the south-western part of Nigeria. It is bounded by latitude 7 to $7^{0}30^{1}$ North and longitude $3^{0}30^{1}$ and $4^{0}00^{1}$ East. It is an area of about 3,025 square kilometers situated at the south western part of Nigeria (Figure 1).

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