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MAGNETIC SURVEYING
AND
ITS APPLICATION TO
TWO CASE STUDIES IN KENYA

by

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A B S T R A C T

Model studies were carried out to determine the shape of the magnetic anomalies and depth of burial of simple magnetic sources giving rise to these anomalies. The sources were approximated by monopoles, dipoles, and vertical rectangular prisms extending infinitely downwards. The anomaly expressions for these magnetic sources are listed. In addition total magnetic field curves for the same sources are given. The curves are for low magnetic latitudes appropriate for use in Kenya. It is found that the depth of burial is given by the wavelength of the observed anomaly multiplied by a simple factor determined from the model curves. For a monopole the multiplying factor is $\frac{2}{(8+9 \tan^2 I)^{\frac{1}{2}}}$ where I is the inclination of the geomagnetic field. In case of a dipole the multiplying factor is found to be 1 for low magnetic latitudes. The multiplying factor for a vertical rectangular prism depends on the dimensions of the prism. A table of multiplying factors for some prisms of different dimensions is given.

Analysis of ground total magnetic field survey carried out at Mrima Hill carbonatite, Coast Province, Kenya, indicates that the sources of the magnetic anomalies are at the interface between the weathered rocks and the underlying carbonatite. Using the above model of a dipole, depths to the carbonatite were estimated. Such estimates suggest maximum depths in the range of 50 to 110m.

The aeromagnetic data obtained from airborne survey carried out in Eastern Kenya by Compagnie Generale de Geophysique on behalf of BP-Shell Petroleum Development of Kenya Ltd. has been analysed with particular emphasis on depth estimates to the Basement System. Depths to the basement were estimated using a vertical rectangular prism model. The depths to the Basement System are in the range of 1.7 to 3.2 km. In addition the survey has delineated the edges of the deepest part of a sedimentary basin. The western and northern margins of the basin are faulted. These deep faults are concealed by thick sediments. A basement high at Garissa and numerous small intrusions along the Galana valley are revealed in the aeromagnetic survey.