DEPTH ESTIMATION OF VERTICAL DYKE BY APPLYING A SIMPLE EQUATION

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ABSTRACT

The depth to a magnetic source is a piece of information of great value in geological/geophysical interpretation of subsurface structures. Total magnetic intensity profiles due to dykes with various depths, widths and inclination angles of magnetic field are calculated. Calculations are based on a ready used computer program issued by Geophysical Software Solution (pdyke) Ltd. These magnetic profiles have been used to estimate the depths to these bodies by applying the present procedure of depth determination. The inclination angles used are 10, 20, 30, 40, 45, 50, 60, 70 and 80 degrees.

A new procedure of depth estimation to the apex of dyke-like sources from magnetic data has been achieved through the application of a derived equation. The procedure consists of applying a simple filtering technique to the total magnetic intensity data profiles due to dyke-like bodies. A background trending line is drawn for the filtered profile and the output profile is considered for further calculations.

Two straight lines are drawn along the maximum slopes of the filtered profile flanks. Then, the horizontal distances between the two lines at various amplitude levels are plotted and the resulted relation is a sloping line. The constant values of the equation of the least square fitting to the slope line and with the maximum value of the filtered profile multiplied by an empirical factor has been used to determine the depth to dyke-like source. Low percentage errors have been obtained from the application of the present procedure to a large number of dyke-like bodies, indicating the successful of the method.

To illustrate the success of the present procedure of depth estimation; the well-known published magnetic anomaly over the Pima copper mine in Arizona where the actual depth is equal 64.008m, has been used to check the present equation. The magnetic anomaly is digitized at interval of 45.45m and the total magnetic intensity is calculated and subjected to the above mentioned filter. The maximum slope lines of the filtered profile are defined with horizontal distances at various amplitudes. The least square fitting equation to the slope line resulting from the horizontal distances - amplitudes relation is used and the estimated depth according to the present equation is 64.85m and with percentage error of 1.3%.

Keywords*: depth estimation, dyke, geophysics, Iraq, magnetic anomaly.*