

## **DEPTH ESTIMATION OF SOURCE BODIES USING 2D MAGNETIC GRADIENT RATIOS**

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Depth estimation remains an important interpretation goal of the exploration geophysicist, especially when cover of uncertain thickness is present. There are many methods of estimating depth using magnetic data ranging from simple 1D (profile) analysis to complex 3D inversion, each with respective strengths and weaknesses. The method discussed here involves analysis of standard 2D magnetic grids.

The dipolar nature of magnetic anomalies is exploited, with the location of the nearest pole in relation to the magnetic sensor the parameter estimated. For sphere-like sources the result plots the centre of the body, where-as for bodies with extensive strike in 1D (pipe) or 2D (dyke) the result plots at the pole nearest the sensor (the depth to top).

Reduction to pole (RTP) filtering is performed on the standard 2D total magnetic intensity grid to make the anomalies symmetrical and centred over source bodies (assuming induced magnetism). The 1<sup>st</sup> order total horizontal gradient (THG) and vertical gradient (1VD) of the RTP grid are then generated. The ratio of 1VD/THG is then calculated and gridded with contouring used to highlight the isograd with a value of 1 (THG=1VD). The depth estimate is calculated by dividing the shortest diameter of this isograd by 2 and subtracting the ground clearance. Dip information can also be interpreted.

Forward modelling of simulated data illustrates the method, proves the concept and discusses weaknesses. Several different scenarios identify the role of source topology. A real world example using open file magnetic data with known depths from drilling is then presented.