Utilization of Beta Angle for Detecting Edges in Potential Field Methods

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Gravity and magnetic methods are potential field methods in exploration geophysics. Gravity method measure lateral variation in densities whereas magnetic method measures the lateral variation in magnetic susceptibility. One of the complications of interpretation of magnetic data is the displacement or skewness as a result that the geomagnetic field is not vertical in general. Depth, lateral variation of physical property, dipping angle, thickness and magnetic field inclination are important parameters affecting the shape and orientation of the anomalies. They make the qualitative interpretation specially for regional scale surveys (marine or airborne) very difficult. The magnetic anomaly over the causative body depends on latitude because of the dipolarity nature of the geomagnetic field in addition to the remnant magnetization of every magnetic source. Sources and edges detection is the first and one of the most important qualitative interpretation step of potential field methods in geophysics. A lot of methods were developed to delineate the edge of the subsurface bodies cause anomalies in gravity and magnetic based on the derivative in X, Y and Z directions. Total horizontal derivative, analytical signal and TDX revels the maximal of the source body edges. Whereas tilt angle and theta angle were developed to detect the maxima of the causative body. Beta angle has been developed to detect the source body and its edges depending on the derivatives in X, Y and Z directions. Beta angle is the angle between the analytical signal and the derivative in Z direction. It is narrower than tilt angle and marks the body edges sharper. Beta angle shows the magnetic anomalies with sharp edges. Beta angle has a range from $-\pi/2$ to $\pi/2$. Beta angle has been applied to airborne magnetic data and the result compared with THD, AS, Tilt angle, TDX and theta map. Beta angle map can delineate the different magnetic anomalies sources with sharp edges

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