



Edge detection of magnetic anomalies using analytic signal of tilt angle (ASTA)

k. Alamdar, A.H. Ansari, and A. Ghorbani

(1) Department of mining and metallurgical engineering, Yazd University, Yazd, Iran.(kamal.alamdar@gmail.com)

Abstract: Magnetic is a commonly used geophysical technique to identify and image potential subsurface targets. Interpretation of magnetic anomalies is a complex process due to the superposition of multiple magnetic sources, presence of geologic and cultural noise and acquisition and positioning error. Both the vertical and horizontal derivatives of potential field data are useful; horizontal derivative, enhance edges whereas vertical derivative narrow the width of anomaly and so locate source bodies more accurately. We can combine vertical and horizontal derivative of magnetic field to achieve analytic signal which is independent to body magnetization direction and maximum value of this lies over edges of body directly.

Tilt angle filter is phased-base filter and is defined as angle between vertical derivative and total horizontal derivative. Tilt angle value differ from +90 degree to -90 degree and its zero value lies over body edge. One of disadvantage of this filter is when encountering with deep sources the detected edge is blurred. For overcome this problem many authors introduced new filters such as total horizontal derivative of tilt angle or vertical derivative of tilt angle which Because of using high-order derivative in these filters results may be too noisy. If we combine analytic signal and tilt angle, a new filter termed (ASTA) is produced which its maximum value lies directly over body edge and is easier than tilt angle to delineate body edge and no complicity of tilt angle.

In this work new filter has been demonstrated on magnetic data from an area in Sar- Cheshme region in Iran. This area is located in 55 degree longitude and 32 degree latitude and is a copper potential region. The main formation in this area is Andesith and Trachyandezite. Magnetic surveying was employed to separate the boundaries of Andezite and Trachyandezite from adjacent area. In this regard a variety of filters such as analytic signal, tilt angle and ASTA filter have been applied which new ASTA filter determined Andezite boundaries from surrounded more accurately than other filters.

Keywords: Horizontal derivative, Vertical derivative, Tilt angle, Analytic signal, ASTA, Sar-Cheshme.