



## **Interpretation of magnetic anomalies produced by archaeological “quasi thick bed bodies” under oblique magnetization and terrain rugged relief**

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The most used interpretation models in magnetic prospecting are the “thin bed”, “sphere”, “horizontal circular cylinder”, “horizontal plate” and “thick bed”. Recognition of the concrete interpretation model from the observed magnetic data may be performed by different ways: (1) visually, (2) on the basis of some a priori information, and (3) by the use of advanced wavelet packet analysis (Eppelbaum et al., 2011). Many authors (e.g., Telford et al., 1990; Khesin et al., 1996; Parasnis, 1997) consider the “thick bed” model as the most complex interpretation target.

Quantitative analysis of magnetic anomalies caused by the “thick body” model for complicated environments (oblique magnetization, rugged terrain relief and an unknown level of the total magnetic field) was presented in detail in Khesin et al. (1996). A characteristic peculiarity of such a model is its large vertical thickness. Many years of precise magnetic survey application in Israeli (e.g., Eppelbaum, 2000, 2005, 2010; Eppelbaum and Itkis, 2000, 2003; Eppelbaum et al., 2000; 2001, 2003a, 2003b, 2006, 2010a, 2010b; Itkis and Eppelbaum, 2009) indicates that in archaeological sites usually occur so called “quasi thick bed bodies” – some intermediate models between the horizontal plate and thick bed. Archaeologically, remains of ancient walls, fortresses and roads, some buried spiritual remains, etc. could represent such objects. Application of the developed interpretation methodology for “thick bed” (Khesin et al., 1996) on model examples and real data shows that physical-geometrical parameters of the “quasi thick bed body” may be found with a high accuracy. The model of inclined “quasi thick bed bodies” were also successfully tested. The applied methodology - improved tangent method – employs not only x and y coordinates of maximum and minimum points, inflection points and their differences, but also the first horizontal derivative in inflection points (where the first derivative has its extremums). These values can be readily obtained from the anomaly plot as tangents of the inclination angles of the tangents to the curves at the inflection points. This fact, along with the acceptable accuracy of the method, favors a wide application of the method.

In some cases is necessary to perform magnetic observations over the “quasi thick bed body” at various levels. It may be realized by the conventional way – multi-location of magnetometer sensor at levels of 0-3m, and by the way of advanced remote operated vehicles application (Eppelbaum, 2008).

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