

Interpretation of Magnetic Anomalies Using a Genetic Algorithm

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A b s t r a c t

A genetic algorithm (GA) is an artificial intelligence method used for optimization. We applied a GA to the inversion of magnetic anomalies over a thick dike. Inversion of nonlinear geophysical problems using a GA has advantages because it does not require model gradients or well-defined initial model parameters. The evolution process consists of selection, crossover, and mutation genetic operators that look for the best fit to the observed data and a solution consisting of plausible compact sources. The efficiency of a GA on both synthetic and real magnetic anomalies of dikes by estimating model parameters, such as depth to the top of the dike (H), the half-width of the dike (B), the distance from the origin to the reference point (D), the dip of the thick dike (δ), and the susceptibility contrast (k), has been shown. For the synthetic anomaly case, it has been considered for both noise-free and noisy magnetic data. In the real case, the vertical magnetic anomaly from the Pima copper mine in Arizona, USA, and the vertical magnetic anomaly in the Bayburt–Sarıhan skarn zone in northeastern Turkey have been inverted and interpreted. We compared the estimated parameters with the results of conventional inversion methods used in previous studies. We can conclude that the GA method used in this study is a useful tool for evaluating magnetic anomalies for dike models.

Key words: genetic algorithm, magnetic anomaly, inversion, potential fields.

Full text is available at

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