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Interpretation of Spontaneous Potential Anomalies from Some Simple Geometrically Shaped Bodies Using Neural Network Inversion

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Abstract

A new approach is proposed in order to interpret spontaneous potential (self-potential) anomalies related to simple geometric-shaped models such as sphere, horizontal cylinder, and vertical cylinder. This approach is mainly based on using neural network inversion of SP anomalies, particularly modular algorithm, for estimating the parameters of different simple geometrical bodies. However, Hilbert transforms are involved to determine the origin location in order to reduce the parameters which minimize the ambiguity in the inverted models. The inversion has been tested first on synthetic data from different models, using only one well-trained network. The results of inversion show that the parameter values derived by the inversion are identical to the true values of parameters. Noise analysis has been also examined, where the results of the inversion produce acceptable results up to 10% of white Gaussian noise.

The validity of the neural network inversion is demonstrated through published real field SP taken from southern Bavarian Woods, Germany. A comparable and acceptable agreement is shown between the results of inversion derived by the neural network and those from the real field data.

Key words: neural network inversion, modular algorithm, Hilbert transform, spontaneous potential anomalies, semi-infinite vertical cylinder.