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Evaluation of Süleymanköy (Diyarbakır, Eastern Turkey) and Seferihisar (Izmir, Western Turkey) Self Potential Anomalies with Multilayer Perceptron Neural Networks

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Self-potential (SP) is one of the oldest geophysical methods that provides important information about near-surface structures. Several methods have been developed to interpret SP data using simple geometries. This study investigated inverse solution of a buried, polarized sphere-shaped self-potential (SP) anomaly via Multilayer Perceptron Neural Networks (MLPNN). The polarization angle (α) and depth to the centre of sphere (h)were estimated.

The MLPNN is applied to synthetic and field SP data. In order to see the capability of the method in detecting the number of sources, MLPNN was applied to different spherical models at different depths and locations.. Additionally, the performance of MLPNN was tested by adding random noise to the same synthetic test data. The sphere model successfully obtained similar parameters under different S/N ratios.

Then, MLPNN method was applied to two field examples. The first one is the cross section taken from the SP anomaly map of the Ergani-Süleymanköy (Turkey) copper mine. MLPNN was also applied to SP data from Seferihisar Izmir (Western Turkey) geothermal field.

The MLPNN results showed good agreement with the original synthetic data set. The effect of The technique gave satisfactory results following the addition of 5% and 10% Gaussian noise levels. The MLPNN results were compared to other SP interpretation techniques, such as Normalized Full Gradient (NFG), inverse solution and nomogram methods. All of the techniques showed strong similarity. Consequently, the synthetic and field applications of this study show that MLPNN provides reliable evaluation of the self potential data modelled by the sphere model.