Two-dimensional Direct Current Resistivity Inversion

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ABSTRACT

The direct current resistivity survey is one of most popular methods for shallow exploration. To determine the Earth's subsurface structure from direct current resistivity data, an inversion software can be used. One of the classical methods of the inversion algorithm is the Occam's inversion, which is a variant of the model-space Gauss-Newton method. The disadvantage of this method is that it requires a lot of computer memory to store the M x M system of equations, where M is the number of model parameters. When M becomes large, the model space becomes impractical. To make an inversion practical for large model parameters, one technique transforms the inverse problem from the model space to the data space. With this transformation, the dimension of the system of equations is significantly reduced from M x M to N x N, where N is the number of data or data parameter. This has led to a significant drop of memory required and computing time. Numerical experiments with synthetic and field data showed that the data-space Occam's inverse method applied to the two-dimensional direct current resistivity data can generate robust and accurate models. The inverted models were also compared with the models from the model-space method and the commercial software RES2DINV.

KEYWORDS: Direct current resistivity, inverse program, model-space, data-space