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AN EXAMINATION OF TWO DIMENSIONAL EARTH MODEL RESOLUTION WITH THE DIPOLE-DIPOLE RESISTIVITY METHOD

Christian Smith*, W. E. Glenn, A. C. Tripp and H. P. Ross

ABSTRACT

Algorithms for computing apparent resistivity over two-dimensional earth structures for various electrode configurations have been in use for several years. Despite the extensive use of these algorithms, no one has reported detailed studies on the resolution of two-dimensional earth structures using grounded electrode systems.

Model resolution using the popular dipole-dipole electrode array is examined. A study is made of both forward models developed during routine data interpretations and inverse models developed in an experiment design sense. The forward model interpreted from a set of data is perturbed sufficiently to illustrate the sensitivity of the data to the interpreted two-dimensional earth structure. The interpreted model is further examined by generating parameter statistics via the non-linear inversion method. Parameter resolution is dependent on the resistivity contrasts, and the complexity of the model, and is depth-limited by the resistivity, dipole length and dipole separations.

Experience is the best ingredient for dipole-dipole resistivity interpretation using two-dimensional earth structures. However, we have found that the Dar Zarrouk parameters which are mathematically rigorous only for layered, homogeneous strata can be used to estimate the depth of resolution for complex two-dimensional resistivity distributions. The Dar Zarrouk-based depth of resolution estimate is best adapted to two-dimensional sections which mimic the type H or type K one-dimensional sections.