A comparison of 3-D electrical resistivity models from different numerical solvers

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SUMMARY

Three-dimensional (3-D) modelling of magnetotelluric (MT) data is standard practice nowadays, with various 3D inverse solvers being available for commercial and scientific usage. Three approaches are commonly used to numerically solve Maxwell's equations in practice: finite-differences, finite elements, and volume integral equations. Most standard forward and inverse MT solvers/approaches have been benchmarked against each other and tested on several synthetic data/models. However, there has been few comparisons of the electrical conductivity models recovered by different solvers from real datasets.

In this presentation, we tackle this issue by generating inverse models from MT impedances taken from a subset of a large regional array in Central Mongolia using different codes: MODEM, based on finite differences; GEMMIE, based on integral equations; and FEMALY, a solver based on finite elements. In addition, we compare the recovered models with a published model, which was obtained by the finite elements code GOFEM. We will discuss the obtained models considering the underlying fundamentals of each method, the different inversion strategies, and the corresponding inversion parameters used, such as mesh discretization and regularization.

Keywords: Magnetotellurics; Electrical Resistivity; Inversion