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Direct current electrical resistivity forward modeling using comsol multiphysics

Oluseun A. Sanuade, Joel O. Amosun, Tokunbo S. Fagbemigun, Ajibola R. Oyebamiji & Kehinde D. Oyeyemi

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Abstract

Forward modeling of direct current (DC) resistivity is very important for the inversion of the resistivity data to obtain the true resistivity of the subsurface. In this study, we demonstrated finite-element forward modeling of DC resistivity method with point electric source using COMSOL Multiphysics. We employed the AC/DC module in COMSOL which often provides comparatively easy implementation of models and permits exterior boundaries to be placed at infinity, a boundary condition often experienced in most geophysical problems. The validity and effectiveness of the results of numerical simulation using COMSOL Multiphysics were evaluated by comparing the output of the numerical simulations with the calculated analytic solutions. The result reveals that the numerical simulation is in agreement with the analytic solution. This study shows that COMSOL Multiphysics can be used to simulate the distribution of electrical potentials of point source in 3D space in real life and the information from this study can be used for further studies, such as DC resistivity inversions.

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