FAST SIMULATION OF DIRECT CURRENT (DC) BOREHOLE MEASUREMENTS USING MODEL REDUCTION

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ABSTRACT

This work proposes a physics-based model reduction algorithm for the rapid inversion of direct current (DC) resistivity measurements acquired in a multilayered isotropic formation. While such scenario can be solved in 1D using semi-analytical techniques, in here we propose to approximate its direct solution by the sum of fundamental solutions in homogeneous isotropic media, with shifted point sources. This approximation enables to avoid the unwanted numerical inversion of integral transformations. Furthermore, it provides a semi-explicit formula in terms of the problem parameters (resistivities, layer interfaces and positions of transmitters and receivers), which enables a semi-explicit computation of the Jacobian matrix needed for the inversion algorithm.