



Global EM induction in the Earth: Inverse time-domain modelling based on the adjoint approach

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We present a new method of inverse global electromagnetic induction modelling which is based on the time-domain approach. The core of the inverse method is a computationally effective evaluation of gradient of the misfit function in the space of model parameters using the solution of the adjoint problem. We derive rigorous formulations of adjoint problems for three alternative choices of boundary conditions in the forward problem: external, Dirichlet and mixed BC. Then, we apply the conjugate gradient method to solve the non-linear inverse problem for the case of external boundary condition. We present results of synthetic checkerboard tests and other models used in the preparatory simulations for the upcoming SWARM mission. Improvement of the forward time-domain solver accuracy by introducing a new time-integration scheme is also discussed.