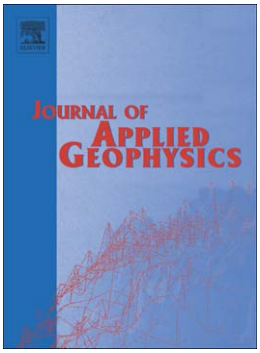

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Abstract

We implemented an edge-based finite element time domain (FETD) modeling algorithm for simulating controlled-source electromagnetic (CSEM) data. The modeling domain is discretized using unstructured tetrahedral mesh and we consider a finite difference discretization of time using the backward Euler method which is unconditionally stable. We solve the diffusion equation for the electric field with a total field formulation. The finite element system of equation is solved using the direct method. The solutions of electric field, at different time, can be obtained using the effective time stepping method with trivial computation cost once the matrix is factorized. We try to keep the same time step size for a fixed number of steps using an adaptive time step doubling (ATSD) method. The finite element modeling domain is also truncated using a semi-adaptive method. We proposed a new boundary condition based on approximating the total field on the modeling boundary using the primary field corresponding to a layered background model. We validate our algorithm using several synthetic model studies.

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