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THREE-DIMENSIONAL MODELING STUDY OF SEA EFFECTS ON EM FIELD INDUCTION USING GREATEM SYSTEM

THREE-DIMENSIONAL MODELING STUDY OF SEA EFFECTS ON EM FIELD INDUCTION USING GREATEM SYSTEM

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To understand the sea effects on electromagnetic field (EM) induction at sea-land boundary using GRounded Electrical source Airborne Transient ElectroMgnetics (GREATEM) system, we computed time-domain EM responses for 3D structures applying a 3D EM modeling scheme based on finite difference (FD) staggered rectangular non-uniform grid formulation for the secondary electric field with continuous components of tangential electric and normal magnetic fields (Fomenko and Mogi, 2002).

The 3-D response were calculated by computing secondary EM field originating by 3D anomalies which induce the primary EM field on a horizontal multi-layer structure by a grounded electrical dipole source. Time-domain responses were computed by the sine or cosine transformation from the frequency-domain data. The range of computing in frequency-domain is 10000 to 0.01 Hz and transient time responses were obtained at 0.0001 to 1 sec. The models consisted of two adjacent layers of different conductivity, where the sea is very thin sheet of a perfect conductor placed on top of a uniform half space earth medium. The EM responses are calculated for different models when the grounded electrical source is located at (10, 20 and 300m) of coastline in landward and the uniform half space earth medium resistivities vary from high resistive host rock (100 ohm m) to high conductive host rock 1 ohm m.

The 3D modeling results have shown that, the sea effect on EM field induction at sea-land boundaries using GREATEM system is function in the distance between the ground electrical source and coastline, for example the sea effect EM field induction in case the source is located at 10m or 20m of coastline in landward is higher than the case when the source is located at 300m of coastline in landward. Also the sea effect on EM field induction at sea-land boundary is function in the host rock resistivity, for example in case the host rock resistivity is 100 ohm m the effect of sea on EM field is higher than the case when the host rock resistivity is 10 ohm m.

キーワード: AEM, GREATEM, 3D EM modeling
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