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Three-dimensional resistivity modelling of GREATEM survey data from the Nojima Fault, Awaji Island, south-east Japan.

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An airborne electromagnetic (AEM) survey using the grounded electrical-source airborne transient electromagnetic (GREATEM) system was conducted over the Nojima Fault on Awaji Island, south-east Japan, to assess GREATEM survey applicability for studying coastal areas with complex topographic features. To obtain high-quality data with an optimised signal-to-noise ratio, a series of data processing techniques was used to acquire the final transient response curves from the field survey data.

The 1D inversion results were feasible in that the horizontal resistivity contrast was not much higher than the true contrast, but they were not reasonable in that the horizontal resistivity values were greatly changed. To circumvent this problem, we performed numerical forward modelling using a finite-difference staggered-grid method (Fomenko and Mogi, 2002) adding a finite-length electrical dipole source routine to generate a three-dimensional (3D) resistivity structure model from GREATEM survey data of the Nojima Fault area. The 3D model was based on an initial model consisting of two adjacent onshore and offshore layers of different conductivity such that, a highly conductive sea of depth (10?40 m) is placed on top of a uniform half-space, assuming the presence of topographic features on the inland side. We examined the fit of the magnetic transient responses between field data and 3D forward-model computed data, the latter were convolved with the measured system response of the corresponding dataset. The inverted 3D resistivity structures showed that the GREATEM system has the capability to map underground resistivity structures as deep as 500 m onshore and offshore. The GREATEM survey delineated how seawater intrudes on the land side of the fault and indicated that the fault is a barrier to seawater invasion.

キーワード: 3D EM forward modeling, GREATEM, Numerical approximations, Airborne Electromagnetic, Fault zone survey
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