Geophysical Research Abstracts
Vol. 21, EGU2019-5782, 2019
EGU General Assembly 2019

3-D Inversion using the Magnetotelluric Apparent Resistivity Tensor

Andreas Junge (1), Philip Hering (1), and Colin Brown (2)

(1) Goethe-Universität Frankfurt am Main, Fachbereich Geowissenschaften/Geographie, Frankfurt/Main, Germany (junge@geophysik.uni-frankfurt.de), (2) Ryan Institute, National University of Ireland, Galway, Ireland.

The complex magnetotelluric (MT) apparent resistivity tensor was introduced by Brown (2016). It can be decomposed into two real tensors, the apparent resistivity and the apparent resistivity phase tensors. They represent relationships between the observed electric field at a point on the Earth's surface and the associated apparent current density. The frequency dependant apparent resistivity tensor contains information about the properties of resistivity subsurface structures such as magnitude and orientation. Its array distribution outlines depth and spatial extension of the anomalies. We present a new and elegant way to visualize the tensor invariants which allows for a simplified data interpretation.

Numerical studies reveal a high sensitivity of the apparent resistivity and the apparent resistivity phase tensors to vertical and horizontal resistivity contrasts. Therefore, the tensors were incorporated in the ModEM inversion software (Kelbert et al., 2014). Its performance was tested using a canonical conductivity anomaly embedded obliquely at the transition of a conductive and resistive quarter space. The inversion results were compared to those of common MT measures, i.e. impedance tensor and phase tensor. They showed remarkable improvements in resolving the boundaries of the anomaly.