ESTIMATING REGIONAL MEAN CONDUCTIVITY PROFILES AND DETECTING GALVANIC DISTORTION USING MAGNETOTELLURIC ROTATIONAL INVARIANTS

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ABSTRACT

Having a reliable regional mean conductivity profile is useful and informative in interpreting magnetotelluric (MT) data. Traditionally, the Berdichevsky average, the average determinant [(det) which is rotational invariant property] impedance, is used to estimate the regional mean conductivity profile. Nonetheless, the det impedance is found to be biased downward by galvanic distortion. As a consequence, the Berdichevsky average may overestimate the regional mean conductivity profile. On the contrary, the sum-of-the-squared-elements (ssq) impedance is less sensitive to such an effect. Using the average ssq impedance is a sensible choice to estimate the regional mean conductivity profile. In addition, the combination of det and ssq impedances enables us to indicate the existence and strength of galvanic distortion in MT data. The local and regional distortion indicators are introduced to quantify the strength of the shear and splitting effects in galvanic distortion at individual stations and throughout the dataset, respectively. The apparent gains are defined and proven to be a good approximation of the site gain, which is generally claimed to the non-determinable distortion parameters. These findings are advantageous and able to solve several problems with MT datasets in performing 3D inversion.

KEY WORDS: MAGNETOTELLURICS / ROTATIONAL INVARIANT / REGIONAL-SCALE STUDIES / GALVANIC DISTORTION

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