Joint Inversion of Magnetotelluric and Direct-Current Resistivity Data

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ABSTRACT

The magnetotelluric method is usually used for investigating deep structures, whereas, the direct-current resistivity method can resolve near-surface structures better. Both methods are sensitive to the same physical property, the resistivity of subsurface structures. To improve interpretation accuracy, magnetotelluric and direct-current resistivity data are inverted together to resolve both near-surface and deeper subsurface structures. A two-dimensional joint inversion of magnetotelluric and direct-current resistivity algorithm was developed. In this joint inversion algorithm, the magnetotelluric forward algorithm was taken from the data space Occam (DASOCC) developed by Siripunvaraporn and Egbert (2000) and the direct-current resistivity forward algorithm was taken from RDCInv2D developed by Boonchaisuk and others (2008). Both techniques are based on the data space Occam's inversion approach, which is reliable, fast, and robust. Individual and joint inversions of magnetotelluric and direct-current resistivity data were tested and compared. The results showed that the joint inversion of synthetic data resolved the model better than the individual inversion of each method. Also, the joint inversion helped correct the static shift effect in magnetotelluric data.

KEYWORD: Magnetotelluric, direct-current resistivity, Occam's inversion