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Simultaneous inversion of temporal magnetotelluric signal change and conductivity structure using the time domain simula

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Magnetotelluric method is mainly used for estimation of subsurface resistivity structure. However, the time-domain analysis of source field is normally omitted, although its estimation should be included at the cases such as in the high-latitude zones or on the global scale. In previous research, simultaneous inversion is proposed to estimate both magnetotelluric signal and resistivity structure in the earth. Koch and Kuvshinov (2013) proposed inversion algorithm that iteratively estimates magnetotelluric signal and resistivity structure, although this inversion method cannot determine both unknowns in a seamless manner. In this study, we developed simultaneous inversion that can determine both unknowns at the same time. Because magnetotelluric signal is considered non-stationary time series, we try a direct inversion of time-domain electromagnetic field, not in the frequency -domain. It has a chance to give higher accuracy than the frequency domain inversion.

Our new inversion results applied to the synthetic model suggested that we could estimate both magnetotelluric signal and resistivity structure properly even under the condition of noise contamination in the observed data. Moreover, when the time domain and frequency domain inversions are applied to same synthetic time series, the result using time domain inversion has higher resolving capability than result using the frequency domain inversion.

Keywords: Magnetotelluric method, Time domain modelling, Simultaneous inversion