1D Magnetotelluric Time-series Simulation Using Geological Constraint

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Abstract

Magnetotelluric (MT) is a powerful method to image the subsurface. Not only it is non-invasive, but it also has a broad coverage, allowing us to obtain subsurface information from several hundred meters to several hundred kilometers. Yet, as it is a passive method, it relies heavily on the natural source, and we have limited control over the source strength. In addition, the natural signal strength is weak, and it poses a problem since it can be easily contaminated by interference from anthropogenic sources. The fact that the frequency band often overlaps between the source of interest and the interference signal makes it difficult to separate them without losing a portion of the natural signal, and thus denoising MT data has become an ongoing challenge. As denoising techniques are developing over time, going from the classic to a more advanced means to solve the noise problem, nevertheless, the problem persists. Understanding the variables that influence the data is therefore crucial, thus the necessity to carry out signal simulation. Most simulations on the Magnetotelluric method strive to denoise the cultural noise on the data, but they seldom consider the influence of the geological condition. Hence, we attempted to simulate the Magnetotelluric signal using a 1D approach where a geological model is utilized to produce the time-series signal. This can be useful not only in observing the signal-noise characteristics but also in the impact of the changes in signal variables on the transfer functions estimation of certain geological conditions.

Keywords: *Magnetotelluric, Signal, Simulation, Time-series*