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Extraction of surface impedance from magnetotelluric data

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Abstract content
 (Max 300 words)

This paper presents the analysis of South African magnetotelluric (MT) data in the time and frequency domain for the purpose of extracting representative values of surface impedance. The surface impedance is used in the derivation of geo-electric fields produced by rapid variations in the geomagnetic field, as occurs during geomagnetic storms. The magnetotelluric method uses the spectra of associated time varying horizontal electric and magnetic fields at the Earth's surface to determine a frequency dependent impedance tensor and an equivalent surface impedance. The theory of operation of MT devices will be presented, as well as typical data obtained from the MT installations in Hermanus, Vaalputs and Middelpos. The various steps in the analysis are aimed at reducing noise and outliers. In the time domain, a Hanning window is used to select data from successive periods during a day, while reducing the end effect (Gibbs' phenomenon) by tapering the series towards the start and ends of each selected time period. The spectral transformation is performed by means of a fast Fourier transformation (FFT). Spectral bands are selected by frequency domain filtering. Typical results and challenges in performing this analysis will be presented.

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MSc

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