Geophysical Research Abstracts
Vol. 12, EGU2010-3751, 2010
EGU General Assembly 2010

Noise Elimination Study for a Single Station Magnetotelluric Data

Ebru ŞENGÜL (1), Emin Uğur ULUGERGERLİ (2), and Hilal GÖKTAŞ (3)

(1) Çanakkale Onsekiz Mart University Faculty of Engineering and Architecture, Department of Geophysics, Çanakkale, Turkey (ebrusengul@comu.edu.tr), (2) Çanakkale Onsekiz Mart University Faculty of Engineering and Architecture, Department of Geophysics, Çanakkale, Turkey (emin@comu.edu.tr), (3) Çanakkale Onsekiz Mart University Faculty of Sciences and Arts, Physics Department, Çanakkale, Turkey (hilal.goktas@comu.edu.tr)

Five components of the natural electromagnetic field relating to underground conductivity distribution on Earth are measured as a time series in the Magnetotelluric (MT) method. E (Ex, Ey) and H (Hx, Hy, Hz) components of the electromagnetic field suffers from noise contamination. The noise, in general, can be classified as random and systematic noise. Random noise disrupts the pattern of data such as sudden signal peaks and/or step structures called impulsive effect. This type of noise usually is dominant in some parts of the time series. The sources of random noise vary; some of the sources are instrumental problems and atmospheric events. On the other hand, systematic noise occurs at certain frequencies and is added to the data. Industrial activities cause such type of the noise and can corrupt all the data set.

The estimation of the impedance tensor from single-station MT data is subject to this study. The proposed method uses statistical approaches focused on the noise elimination techniques. Noise elimination from MT time series is very important particularly to achieve repeatable impedance values using single station MT data. The conventional impedance estimation technique requires solution of a linear equation system (E = ZH) based on Gaussian statistical model which requires the noise of electric channels should obey Gaussian distribution and magnetic channels should be noise free. In fact, measured data never provides this ideal condition. Therefore, noise elimination techniques are very important step in data processing works in MT method.

Random noise such as spikes makes deviations in impedance values, resistivity and phase curves. Random noise should be eliminated to correct of these deviations in the data. For this purpose firstly, all data are divided into time windows. Each window consists of 512 values. After that, spikes are removed and missing data are regenerated by using interpolation technique for each window in time domain. Then, data are transformed into frequency domain by using Fourier transform. The classification process, based on the correlation of power spectral density between different components of data is carried out. Impedances values obtained from each window were stacked to get the impedance values for all data. Therefore, after this noise elimination process, a remarkable improvement has been obtained for the apparent resistivity and phase curves obtained from corrected impedance values.