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Investigation scaling behavior of earthquake-related signals in magnetotelluric measurements, Northern Algeria

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The north-central region of Algeria has been characterized by a swarm-type seismicity, after the strong Mw6.8 Boumerdès earthquake of May 21, 2003, culminating with the earthquake that occurred on July 17, 2013 of magnitude Mw=5. A magnetotelluric station was installed on December 2014 in the Medea region, 60 km south of the capital Algiers. We measured the five components of the telluric and magnetic field with a sampling frequency of 15 Hz. The seismic activity in the region provided the opportunity to observe and study the earthquake's related electromagnetic signal. The scaling properties of the recorded electric and magnetic time series were investigated. On the basis of multifractal detrended fluctuation analysis, which is a powerful method for detecting scaling in non-stationary time series, deviations from the uniform scale of the power law were identified and quantified. We investigated the time dynamics of the earthquake related electromagnetic time series measured at the magnetotelluric station. The multifractal detrended fluctuation analysis showed the different multifractality properties of electromagnetic signals before, during and after the seismic event. The results of this work show an unstable scaling behavior in electromagnetic data during the occurrence of the seismic event. These first results could be useful in the framework of seismo-electromagnetic signals studies.