Electromagnetic anomalies detection over seismic regions during an earthquake

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The definition of the statistical distribution of the ionospheric electromagnetic (EM) waves energy in absence of seismic activity and other anomalous inputs (such as the ones derived by solar forcing) is a necessary step in order to determine a background in the ionospheric EM emissions over seismic regions. An EM signal which differs from the background (exceeding a statistically meaningful threshold) should be considered as a potential event to be investigated. In this work, by means of the FIF (Fast Iterative Filtering) data analysis technique, we performed a multiscale analysis of the ionospheric environmental background, using almost the entire CSES01 (China Seismo-ElectroMagnetic Satellite) electric and magnetic field dataset (2019 - 2021), by creating the map of the averaged relative energy ($\varepsilon_{rel}$) over a 3° x 3° latitude-longitude cell, depending on both spatial and temporal scale of the ionospheric medium.

In order to make a robust discrimination between external (atmospheric, ionospheric, magnetospheric, solar activities) and internal (earthquakes, volcanoes) sources generating anomalous signals, we took into account geomagnetic activity conditions in terms of the Sym-H index.

Here we present the results obtained for the August 14, 2021 Haitian earthquake (7.2 Mw) and the September 27, 2021 Crete (Greece) earthquake (6.0 Mw).