

البحث الثالث

Title

Integrating Pre-Earthquake Signatures From Different Precursor Tools

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Authors

Essam Ghamry, Emad K. Mohamed, Mohamed S. Abdalzaher, Mohamed Elwekeil, Dedalo Marchetti, Angelo De Santis, Mostafa Hegy, **Adel Fathy**

English Abstract

Potential earthquake precursors include, among others, electromagnetic fields, gas emissions, Land Surface Temperature (LST), Sea Surface Temperature (SST), and Surface Air Temperature (SAT) anomalies. These observables have been individually studied, before earthquakes, by many researchers. The ionospheric studies concerning earthquakes (EQs) using magnetic data from Low Earth Orbit (LEO) satellites are increasingly being used to detect ionospheric anomalies before large EQs. Also, LST, SST, and SAT values retrieved from Moderate Resolution Imaging Spectroradiometer (MODIS) Terra and Aqua satellites and Modern-Era Retrospective analysis for Research and Applications Version 2 (MERRA-2) are considered as physical precursors before EQs. In this work, we jointly analyze magnetic, MODIS, and MERRA-2 data in space and time around the epicenters before the selected EQs in Mexico, Japan, Chile, and Indonesia. Our analyses present interesting findings where anomalies in temperature and magnetic field, preceding the considered EQs, are confirmed through different methods. Particularly, we utilize the Fast Fourier Transform (FFT) and the Discrete Cosine Transform (DCT) for analyzing magnetic data over the designated EQs regions. We use the magnetic data acquired by Swarm satellites in the top side ionosphere along with MODIS and MERRA-2. Five case studies are described to prove the effectiveness of our analyses. Precursory anomalies were observed using these methods in different anomalous days from the considered four regions of interest

around the epicenter. It is concluded that these methods could be effective and reliable in detecting anomalies preceding the upcoming EQs.