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Statistical analyses of anomalies of the ionospheric total electron content related to M≥5.0 earthquakes in the Mediterranean Sea during 1999 to 2017

Pei-Jung Lee and Jann-Yenq Liu
Graduate Institute of Space Science, National Central University, Taoyuan City, Taiwan (jany719@gmail.com)

To clarify and verify the pre-earthquake ionospheric anomaly (PEIA), statistical analyses are implemented on the relationship between the total electron content (TEC) in the global ionosphere map (GIM) and 436 M≥5.0 earthquakes in the Mediterranean Sea during 1999-2017. A median-based method together with z test is employed to determine the criteria and/or characteristics of TEC anomalies related to earthquakes. The receiver operating characteristic (ROC) curve is further used to compare the TEC anomaly-based method with some competitive alternatives for predicting the earthquakes under study. We found, based on possible TEC anomalies, that the observed PEIAs are significantly earthquake-related. Moreover, the result of logistic regression analyses show that the PEIA strength is associated with the magnitude of earthquakes.