ROC curve analyses on the ionospheric TEC of M>=6.0 earthquakes in Japan during 1998-2015

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To verify the pre-earthquake ionospheric anomaly (PEIA), statistical analyses are implemented on the relationship between the total electron content (TEC) of global ionosphere map (GIM) and M>=6.0 earthquakes in Japan during 1998-2018. A median-based method together with z test is employed to find the criteria and/or characteristics of TEC anomalies related to earthquakes. It is found that the GIM TEC over the Japan significantly increases 1-3 days before the earthquakes. The receiver operating characteristic (ROC) curve is used to compare the TEC anomaly-based method with some competitive alternatives for predicting the earthquakes under study. We find, based on possible TEC anomalies, that the observed PEIAs are significantly earthquake-related. Moreover, the results of regression analyses show that the PEIA strength is associated with the magnitude of earthquakes.

Keywords: pre-earthquake ionospheric anomaly (PEIA), total electron content (TEC), earthquake, receiver operating characteristic (ROC)