Wavelet Study of ionospheric anomalies prior to the two earthquakes in Sumatra Island

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ABSTRACT

On 10 January 2012, at 18:36 UT a M7.2 earthquake of depth 20.5 km struck at the off west coast of Northern Sumatra (2.452°N, 93.209°E). Three months later, in the same Strike Slip fault zone on 11 April 2012, at 08:38 UT a terrible earthquake of M8.6 having depth 22.9 km occurred at the off west coast of Northern Sumatra (2.311°N, 93.063°E). Prior to these seismic activities, the ionospheric Total Electron Content (TEC) was studied by an Integrated Wavelet Analysis Method (IWAM). IWAM is a combination of Continuous Wavelet Transform (CWT) and Cross Wavelet Transform (XWT) method. The purpose of CWT is to detect TEC anomalies whereas XWT aims at diagnosing ionospheric perturbations by establishing the dynamic relationship between the anomaly variability of TEC and geomagnetic index for the same span of observations. GIM maps were retrieved on extreme perturbation days. Also a correlation has been found between these two earthquakes by the Cross Wavelet Technique. The results obtained by IWAM reveal that signatures in the ionosphere appeared a few days before these two earthquakes.

Key words: Ionosphere, TEC, Earthquake, Wavelet transform