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Some effects of earthquakes at North Sumatra to the total electron content in the Ionosphere

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Total Electron Content (TEC) is an important ionospheric and space weather parameter used for characterizing the state and dynamics of plasma in the ionosphere. As a result, this study was carried out to examine the possible relationship between the variations of the TEC in the ionosphere and the earthquakes and to identify the effects of earthquakes to the TEC in the ionosphere. The analysis of ionospheric TEC variations were made using the Global Positioning System (GPS) station installed at Wireless and Radio Science Centre (WARAS), Kolej Universiti Teknologi Tun Hussein Onn (KUiTTHO), Johor (Latitude $1^{\circ}52' N$, longitude $103^{\circ}48' E$). Five cases of strong earthquakes at Indonesia in 2005 with $M > 6.0$ were selected as case studies. The TEC variations analysis of the GPS TEC collected by the GPS receiver in the year of 2005 were made to identify any TEC variations associated with earthquakes. Pronounced TEC variations around the time of earthquakes were analyzed with respect to the TEC variations during non-earthquake period. From the analysis, it was found that there appears to be rapid changes in TEC within 0 to 6 days before the earthquakes. Besides that, the TEC variations for all the cases show that the TEC gradually recovered to normal within 1 to 3 days after earthquakes. As a conclusion, strong earthquakes are reported to have caused disturbances in the ionosphere that can be measured with GPS as short-period changes in the TEC. The ionospheric TEC variations with average $\Delta TEC = 10$ TECU can be considered as a possible earthquake precursory.