

Investigation of Ionospheric Variations to Large Sumatra Earthquakes using GPS Data

Mardina ABDULLAH^{1##}, Widdy MUBARAK¹, Alina Marie HASBI¹, Norbahiah MISRAN¹

¹Universiti Kebangsaan Malaysia, Malaysia

[#]Corresponding author: mardina@eng.ukm.my ⁺Presenter

This study aims to investigate the ionospheric variations before and after large earthquakes in Sumatra using dual-frequency Global Positioning System (GPS) receiver measurements. The large earthquake with $M > 7$ selected in this investigation are the events of Aceh on December 26, 2004 ($M = 9.1$), Simeulue on 28 March 2005 ($M = 8.6$), Bengkulu on 12 September 2007 ($M = 8.5$) and Padang on 30 September 2009 ($M = 7.5$). In this study, total electron content (TEC) variations have been analyzed using Global Ionospheric Map (GIM) data provided by the CODE (Center for Orbit Determination in Europe) in IONEX (the IONosphere Map Exchange) format. The temporal analysis was conducted over a period between 7 days before and five days after the earthquake events. Results show that positive and negative TEC anomalies with respect to the upper and lower bounds were observed a few days before the large earthquake events. Only the TEC anomalies that were observed during quiet geomagnetic and solar periods were identified and considered as earthquake related anomalies. The GIM during the periods of the identified anomalies showed that the TEC variation above the epicentral region are in the range of + 10 TECU with respect to other regions within 500 km from epicenter. The detail of these ionospheric variations and their physical mechanisms will be discussed in the presentation.

Keywords: Ionosphere; earthquake; GPS; total electron content .