Geophysical Research Abstracts, Vol. 8, 05812, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05812

Detection of Ionospheric Perturbation Using Ground GPS Receiver at Malaysia Associated To Northern Sumatra Earthquake on 26 December 2004

Y.H. Ho(1), A.F.M. Zain(2), M. Abdullah(3), S. Abdullah(2) and M.J. Homam(2)

(1) Faculty of Electronics & Computer Engineering, National Technical University College of Malaysia, Ayer Keroh, Melaka, Malaysia, (2) Wireless and Radio Science Centre, Tun Hussein Onn University College of Technology, Batu Pahat, Johor, Malaysia, (3) Faculty of Engineering, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia

It was recently established and acknowledged by the scientific community that a violent earthquake will set the sky shaking as well as the land. There exists electromagnetic coupling between the processes within the earth's crust and tropospheric and anomalous variations within the ionosphere. This can be explained by the propagation of pressure waves in the atmosphere, generated by the ground displacement near the source or due to Rayleigh waves. The wave amplitude increase exponentially as it propagates towards the ionosphere, and can reach several tens of meters for $M_s > 6$. At ionospheric heights, these low frequency acoustic waves interact with the ionospheric plasma and induce variations in the electron density. Attenuation of seismic pressure waves in the upper atmosphere and ionosphere will also lead to an increase of thermal energy and make ionospheric perturbations due to energy dissipation. Calais & Minster [1] have observed post-seismic disturbance on Total Electron Content (TEC) measurements by using dual-frequency GPS receivers. The Earth ionosphere variations are considered after the earthquake associated with the long-period Rayleigh waves that occurred on 26 December, 2004, in Northern Sumatra, Indonesia (M_s = 9.0). The ionospheric parameters were computed using the GPS network maintained by Jabatan Ukur dan Pemetaan Malaysia (JUPEM). The analysis of ionospheric status was carried out 24 hours after the earthquake. In this paper we focus on the relative variations in ionospheric parameters (Total Electron Content) with respect to a quiet period. Differential ionospheric parameters are made by computing the percent change of seismic-time parameters relative to ionospheric parameters computed for

quiet conditions. Results show the positive phase started immediately after the seismic event. This could be explained by the direct perturbation of ionospheric electron content due to seismic wave. The second TEC enhancements appearing later ($\sim$ 8 hours after seismic event) and reach their maximum during 1500 UT, whose change ratio exceeds 25%. This could be explained by the heating of the ionosphere by the energy dissipation. After 1500 UT, the entire ionosphere gradually recovered to normal.