

## Detection of ionospheric GPS-TEC and NmF2 anomalies associated with large earthquakes

# Masahide Nishihashi[1]; Hau-Kun Jhuang[2]; Katsumi Hattori[3]; Jann-Yenq Liu[4]

[1] Geosys. and Biosys. Sci. Div., Graduate School of Sci. and Tech., Chiba Univ.; [2] Inst. of Space Sci., NCU in Taiwan; [3] Chiba University; [4] Institute of Space Science, National Central University, Taiwan

<http://www-es.s.chiba-u.ac.jp/geoph/ulf/>

Many anomalous electromagnetic phenomena possibly associated with large earthquakes have been reported (e.g. Hayakawa and Molchanov, 2002). Recently, scientists found an apparent reduction in GPS-TEC within 1 - 5 days prior to beyond M6.0 earthquakes in Taiwan. However, those studies did not match simultaneous data sets of other sites to confirm the observed ionospheric anomalies are related to local earthquakes. In this study, we retrieved GPS-TEC data sets, routinely published in the global ionosphere maps (GIM). Simultaneous data of ionosonde records and GPS-TEC data sets of various locations such as Taiwan and Japan were examined to check whether the anomalies observed in Taiwan during the 1999 Chi-Chi earthquake (Mw7.6) and Chia-Yi earthquake (M6.4) episodes are local or global effects.

The result shows that the anomalies in Taiwan three days before the Chi-Chi earthquake (18 September), and one and three days before the Chia-Yi earthquake (19 and 21 October) are local phenomena. It means that the ionospheric-disturbed areas were localized around Taiwan, and did not spread all the way to Tokyo in Japan. We conclude that the disturbed areas are at least less than about 2200km in radius and may be much smaller. These results suggest that possible ionospheric disturbances preceding large earthquakes exist after removing global changes.