

Ionospheric disturbance preceding the 2000 Tottori Earthquake

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Ionospheric disturbances preceding large earthquakes have been reported recently. Liu et al., (2000, 2001) detected ionospheric disturbances possibly associated with 1999 Chi-chi Earthquake in Taiwan with use of ionosonde and GPS data. The Ionospheric disturbance associated with earthquake is anomalous change of electron density in the Ionosphere. With use GPS data, total electron content (TEC) along the path between a GPS satellite and a receiver is determined by difference of delay times of two frequencies (1.57542 and 1.2276 GHz).

The aim of this paper is to clarify the ionospheric disturbance associated with 2000 Tottori Earthquake by means of GPS observation. There are about 1000 GPS signal receivers all over Japan, which are operated by Geographical Survey Institute. In this paper, we use 76 stations near the epicenter of the Tottori Earthquake. The analyzed interval is about one year from August, 2000 and P code signal has been used. The data have been analyzed by GPS software, which is 'GAMIT', estimation on delay caused by ionosphere and detection of cycle slips have been performed. The total electron content (TEC) highly depends on the solar activity. It means there is a daily variation. In order to extract anomalous changes possibly associated with the earthquake, the daily variation should be reduced as much as possible. Therefore, we subtract the median value over the previous 15 days from the data to analyze. It is called as differential TEC.

The results indicate that TEC over the 76 sites increase remarkably a few days before the earthquake and it decrease just before the occurrence of the earthquake. But both the sum of Kp index and Dst indices, which indicate the geomagnetic activity, are also active. It means that it is very difficult to eliminate the influence of geomagnetic activity.

Finally, the operation of the above analysis, (1) GPS data transfer from GSI and (2) analysis with use of GAMIT, are almost automated. It helps the future statistical investigation or long interval analysis to clarify the relationship among TEC disturbances, earthquakes, and normal geomagnetic activities.

References

Liu,J.Y. Chen,Y.I Pulinets,S.A. Tsai,Y.B. Chuo,Y.J.: Seismo-ionospheric signatures prior to M6.0 Taiwan earthquakes, *Geophys.Res.Lett.*,27,19,3113-3116,2000

Liu,J.Y. Chen,Y.I. Chuo,Y.J. Tsai,H.F.: Variation of ionospheric total electron content during the Chi-Chi earthquake, *Geophys.Res.Lett.*,28,7,1383-1386,2001