# Ionospheric total electron content anomaly related to the 2007 chuetsu-oki earthquake

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Recently, there are many reports on earthquake-related electromagnetic phenomena. Anomalous TEC (Total Electron Contents) decrease is one of the most promising phenomena preceding large earthquakes. In this study, TEC anomaly variation in time and space is investigated at the time of the 2007 Chuetsu-oki earthquake (M6.8). In this study, GPS-TEC is adopted and it is computed with using the GEONET and IGS GPS data in Japan area. GAMIT is used for TEC computation. In order to remove daily variation of TEC, 15 days backward running average TECmean(t) and standard deviation sigma(t) at specific times are computed. The normalized TEC∗(t) is defined as follows: TEC∗(t) = (TEC(t)-TECmean(t))/sigma(t).

It is found that TEC∗decrease beyond 2sigma criterion 3, 4, and 6 days before the earth quake near the epicenter (Kashiwazaki2 station) in time. The duration of negative anomalies is more than a few hours. The anomaly of 3 days before is the largest in magnitude and duration. In space, negative anomalies of TEC∗are found to be extent all over Japan in these three days.

Furthermore, GIM (Global Ionosphere Maps are also used for TEC anomalies; we call it GIM-TEC. In similar manner, GIM-TEC∗is derived. The variation of GIM-TEC∗is consistent with those of TEC∗on 3 days before the earthquake.