

Effects of heavy weather conditions on the total electron content in the ionosphere: the case of typhoons

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Many researchers have reported that the total electron contents (TEC) are perturbed by earthquakes. It is known that the acoustic wave and/or atmospheric gravity wave excited by the ground perturbations cause the variations of TEC. This means that the variation of TEC can be excited by the other heavy weather conditions, such as Typhoon. In fact, in association with typhoon, the following perturbations are reported; foF2 anomaly (Rice et al., 2012), the electric field variation in high altitude of the ionosphere (Isaev et al., 2006), and TEC variation (Voeykov et al., 2008). Therefore, GPS-TEC variation above typhoons were determined in order to examine the effect of typhoons on the ionospheric electron density. GPS-TEC are derived from GEONET receivers installed by the Geospatial Information Authority of Japan. Since GEONET has constructed quite dense network of GPS receivers, the horizontal distribution of the TEC perturbation can be determined.

In this study, we selected strong typhoons (> Category 5). For example, Typhoon PRAPIROON (the 21st typhoon in 2002) generated in the south of Japan. Typhoon PRAPIROON moved northward and hit Kanto, Tohoku regions. When Typhoon PRAPIROON was crossing Japan, the enhancement of the power spectrum of TEC variations was observed. As the intensity of the typhoon was weaker, the intensity of the power spectrum also decayed. However, the intensity of the power spectrum was larger in the western side of typhoon eye, which is opposite of the wind intensity.

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