

## Study of Sudden Increases in Total Electron Content Induced by Solar Flares Using Observations and Models

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Sudden increases in total electron content (SITEC) induced by intense solar flares were studied using GPS networks and models.

SITEC is one of sudden ionospheric disturbances induced by solar flares, which emit extreme ultraviolet and X rays in short time interval. The recently developed imaging technique using TEC data from GPS receiver networks has been applied to study SITEC [e.g., Afraimovich et al., 2001; Zhang and Xiao, 2003, 2005], and have clarified some of global-scale characteristics of SITEC phenomena. However, seasonal and local time dependencies of SITEC are still unknown.

In this study, we investigated 197 SITEC events associated with solar flares larger than M5 X-ray class during January 2000 and May 2005 global TEC data from SOPAC GPS networks. The global TEC maps revealed that the SITEC value is linearly dependent on the cosine of solar zenith angle (SZA) with negligible residuals in almost all the flare events. It was found that the residual values of SITEC tend to be larger in the winter hemisphere than in the summer hemisphere.

The similar characteristics were also seen in the dayside distribution of the O/N<sub>2</sub> density ratio and the photo-ionization rate around the F<sub>2</sub>-peak calculated using the MSISe90 model and the EUVAC model. This indicate that the SITEC phenomena induced by intense solar flares depend on not only the SZA, but also the background atmospheric composition.