

Ionospheric studies using high-resolution GPS total electron content observations

TSUGAWA, Takuya^{1*} ; NISHIOKA, Michi¹ ; SAITO, Akinori² ; OTSUKA, Yuichi³ ; ISHII, Mamoru¹

¹National Institute of Information and Communications Technology, ²Graduate School of Science, Kyoto University, ³Solar-Terrestrial Environment Laboratory, Nagoya University

Two-dimensional total electron content (TEC) observations using dense GPS receiver networks have been applied to studies of various ionospheric disturbances since mid-1990s. For the purpose of monitoring and researching the ionospheric disturbances, we have developed high-resolution TEC maps using dense GPS receiver networks. We have been collecting all the available GNSS receiver data in the world to expand the TEC observation area. These GNSS data are provided by IGS, UNAVCO, SOPAC, and other regional data centers. Currently, we are providing global and regional maps of absolute TEC, detrended TEC, and rate of TEC change index (ROTI). These data and quick-look maps are archived and available in DRAWING-TEC website (<http://seg-web.nict.go.jp/GPS/DRAWING-TEC/>).

These high-resolution GPS-TEC maps have been applied to studies of various ionospheric disturbances. Sudden increase in TEC caused by solar flares were studied using global TEC observations. Regional TEC observations have revealed new characteristics of large- and medium-scale traveling ionospheric disturbances (LSTIDs and MSTIDs). Recently, clear concentric waves and short-period oscillations were observed after huge earthquakes/tsunamis and massive tornadoes, indicating that acoustic and/or gravity waves propagate upward from the lower atmosphere and reach the ionosphere.

These GPS-TEC observations will contribute the next SCOSTEP program VarSITI, particularly to the ROSMIC (Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate) project.

Keywords: ionosphere, GPS, TEC, thermosphere