Geophysical Research Abstracts, Vol. 8, 03496, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03496

Use of GNSS-derived TEC maps with high spatial and temporal resolution to detecting different ionospheric effects

A. Krankowski (1), I.I. Shagimuratov (2)

(1) Institute of Geodesy, University of Warmia and Mazury in Olsztyn, POLAND (kand@uwm.edu.pl; Fax:+48-89-5234768), (2) WD IZMIRAN, Kaliningrad, RUSSIA

Since currently the IGS/EPN community provides GPS observations in nearly real time, the TEC data based on them can be also obtained. In contrast to the ionosonde network, the GPS network is wide and continuously expanding. The very dense GPS network in Europe (70 - 90 stations) permits obtaining TEC maps with high spatial and temporal resolution. Recently, TEC maps have been produced with 5 min intervals and with spatial resolution of 150 - 300 km. This high spatial and temporal resolution represents all local and regional features of TEC distribution.

In this paper the use of GNSS-Derived TEC maps with high spatial and temporal resolution to detecting different ionospheric effects is presented. These effects are associated with solar flare, solar eclipses and seismic events. As an example of the first effect, the analysis of occurrence of ionospheric electron content of the last large solar flare that occurred near 11 00 UT on November 28, 2003 (class X17) are presented. Sudden increases of TEC started about 11.00 UT over the whole European region. TEC increased ranging from 5 to 16 TECU on time interval of 10 min. The percentage of TEC enhancement was about 10-30. The recovery stage lasted more than 2-3 hours. It was found out that the linear relationship between TEC enhancement and solar zenith angle exists.

The TEC maps can be used effectively to observe the response of the ionosphere to the solar eclipses. This effect will be presented on the base of the two last events: 11 August 1999 and 3 October 2005. The depression of TEC during eclipses was registered over a large space area. The delay of the minimum TEC values with respect to the maximum phase of the eclipse varied from a few minutes to 20 minutes. The

decrease was a few TEC units. The TEC maps with 5 min intervals provide detailed information on dynamics of TEC behavior during eclipse.

GPS observations of the European permanent network were also used to identify seismo-ionospheric precursors of the Baltic Sea (21 September 2004) and of Indonesian (26 December 2004) earthquakes. The ionospheric precursor could be observed between 5 days to a few hours prior to the earthquake. The ionospheric effect of the Baltic Sea earthquake had a positive sign with an enhancement of a few TECU relative to the non-disturbed state of ionosphere. The anomaly had also a duration of a few hours. The spatial size of these anomalies was about 1000-2000 km. For Indonesian earthquake the ionosperic effect occurred as the equatorial anomaly modification. At the final stage of the earthquake preparation zone revealed 2 modifications in the TEC distribution: 1) positive, for 2 days before, as the day time amplification of equatorial anomaly, 2) negative, in previous day in the evening and night hours of local time, as specific transformation of the TEC distribution with the abnormal trough occurrence.