

## **INTERPLANETARY MAGNETIC AND ELECTRIC FIELDS: DETERMINANTS FOR THE DEVELOPMENT OF IONOSPHERE SUPERSTORMS?**

ELVIRA ASTAFYEVA and Pavel Tatarinov

Institute of Solar-Terrestrial Physics SB RAS, 126 Lermontov street, Irkutsk, 664033, Russian Federation, [elliada@iszf.irk.ru](mailto:elliada@iszf.irk.ru)

Dawn-to-dusk electric fields associated with the passage of southward directed interplanetary magnetic field (IMF)  $B_z < 0$ , along with changes of solar wind parameters (velocity, density, ram pressure) are known to be the primary cause of geomagnetic storms. For this study we selected events with sharp decrease of IMF  $B_z$  below -12-15 nT of duration ~3 hours and with the consequent drop of Dst index to <-120-150 nT. To study ionosphere response to the storms, we used data of the CHAMP and SAC-C satellites and data of satellite altimeters TOPEX and Jason-1. The most prominent ionospheric effects produced by intense geomagnetic storms at middle and low-latitudes, such as the dayside ionosphere uplift and anomalously strong TEC increase within the crests of the EIA, were recorded during only a few geomagnetic storms for the previous decade. In connection with that, a question has been opened: what are the most important factors for the drastic ionosphere changes to be developed? We observed enhance of the equatorial TEC (up to ~50-60%) with concurrent traveling of the EIA crests for a distance up to 15° of latitude during the “Halloween storms” of 29-31 October 2003 and during intense geomagnetic storms of 21 October 2001, 6 November 2001, 7-8 September 2002 and 20 November 2003. Large enhancements in the equatorial and mid-latitude TEC were observed also during events of 30-31 March 2001, 19-20 April 2002 and 7-8 November 2004. However, TEC response to other strong  $B_z$  negative events was not so well pronounced: generally, the storm-time effects added up to formation of the dual-peak EIA structure with normal position of the crests and to increase of the near-equatorial TEC up to 80 TECU. Based on observations of ionosphere TEC response to more than 15 geomagnetic storms, a combination of intensive dawn-to-dusk electric field and southward IMF  $B_z$  seems to be the decisive factor for development of the ionosphere superstorms. In some cases, these effects strengthen (particularly, above ~715 km of altitude) by ~18-20 UT.

ionosphere super-storms, TEC, geomagnetic storms, IEF, IMF

Elvira Astafyeva, Institute of Solar-Terrestrial Physics SB RAS, 126 Lermontov street, Irkutsk, 664033, Russian Federation, [elliada@iszf.irk.ru](mailto:elliada@iszf.irk.ru)