

EFFECTS ON GEOMAGNETIC SUPER STORMS ON THE IONOSPHERIC REGION USING A GPS TECHNIQUE (INVITED)

Y. Sahai^{*}, A.J. de Abreu^{*}, P.R. Fagundes^{*}, R. de Jesus^{*}, G. Crowley[†], C.
Brunini[‡], M. Gende[‡], V.G. Pillat^{*}, J.R. Abalde^{*} and J.A. Bittencourt[°]

^{*}Universidade do Vale do Paraíba (UNIVAP)
Sao Jose dos Campos, SP, Brazil

[†]Atmospheric & Space Technology Research Associates (ASTRA) LLC
San Antonio, TX, USA

[‡]Facultad de Ciencias Astronómicas y Geofísicas
Universidad Nacional de La Plata
1900, La Plata, Argentina

[°]Instituto Nacional de Pesquisas Espaciais (INPE)
Sao Jose dos Campos, SP, Brazil

Key words: Equatorial Ionosphere, Scintillation Activity, ExB Drifts

Abstract. In the present investigation, the effect of several super storms on the ionospheric region covering the South American sector (Brazil and Argentina) has been studied using a GPS technique. The super storm periods include geomagnetically quiet, disturbed and recovery phases. Considering super storms with $|Dst| > 250nT$, four periods with six super storm events have been analyzed. The four periods analyzed are 0508 April 2000 (one super storm event; $|Dst|_{max} = 287nT$ at 23:00 UT on 06/04 and 288 nT at 01:00 UT on 07/04), 2731 October 2003 (two super storm events; $|Dst|_{max} = 353$ at 01:00 UT on 30/10 and 383 nT at 23:00 UT on 30/10), 1923 November 2003 (one super storm event; $|Dst|_{max} = 422nT$ during 20:00 and 21:00 UT on 20/11), 0611 November 2004 (two super storm events; $|Dst|_{max} = 373nT$ at 07:00 UT on 08/11 and 289 during 10:00 and 11:00 UT on 10/11). We present both vertical total electron content (VTEC) and phase fluctuations (TECU/min), which are a good indicator of spreadF irregularities with a few km size. Also, we present isofrequency plots for the four periods from the two ionospheric sounding stations in Brazil at Manaus ($2.9^{\circ}S, 60^{\circ}W$; dip latitude $5.8^{\circ}N$), Palmas ($10.2^{\circ}S, 48.2^{\circ}W$; dip latitude $6.6^{\circ}S$) and S.J. Campos ($23.2^{\circ}S, 45.9^{\circ}W$; dip latitude $18.6^{\circ}S$). We have compared the observed TEC at different GPS observing sites during the four periods with the TIMEGCM model results. The model results show both similarities and differences from the observed results. Large variations (both positive and negative storm phases) in the VTEC during the main and recovery phases compared to quiet day variation were ob-

served in several super storm events studied. The phase fluctuations indicate the presence of plasma bubbles extending to the Argentinean sector during the postsunset prereversal period of super storms on the nights of 2930 and 3031 October 2003, and 0708 November 2004. The phase fluctuations were observed during both postsunset prereversal and postmidnight periods in the super storm on 06 April 2000. No phase fluctuations were observed on the nights of 2021 November 2003, and 0910 and 1011 November 2004 during the super storms (main and recovery phases). Salient features from these studies will be presented and discussed.