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STORM-TIME TOTAL ELECTRON CONTENT AND ITS RESPONSE TO PENETRATION ELECTRIC FIELDS OVER SOUTH AMERICA REGION

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Abstract.

Its well known that storm-time penetration electric fields play an important role in the plasma distribution on low- to mid-latitude ionosphere and these fields can modify the plasma properties at these regions. In this work the November 09-10, 2004 intense magnetic storm will be analyzed and TEC maps will be presented and co-related with plots of the Interplanetary Electric Field (IEF) and zonal electric field at ionosphere. The mechanism of penetration electric field is verified from the relationship between IEF and ionospheric zonal electric field. The parameter ϵ (epsilon) is a coupling function related to the magnetopause reconnection power and will be calculated and analyzed in order to elucidate the transference of energy from solar wind to magnetosphere due to reconnection and its relationship to penetration electric fields. The TEC maps were calculated with the UNB-IMT (University of New Brunswick Ionospheric Modelling Technique) using GPS data. The ionospheric response to energy input from solar wind will be showed. Since is a function of IMF (Interplanetary Magnetic Field) B_z component, its maximum value occurs at the maximum observed level of penetration electric field. The penetration electric field at the geomagnetic equator is obtained from vertical drifts using the relationship $V\_d = E/B$ (V_d is the vertical drift at the geomagnetic equator, E is the zonal electric field at the geomagnetic equator and B is the geomagnetic field at that point). The vertical drifts for this intense geomagnetic storm were obtained from Jicamarca radar and the results for the period analyzed show the highest daytime vertical drifts ever measured by the radar (120 m/s). The results of this work allow an analysis of the electrodynamics involved in the mechanism of penetration electric fields and its effects over low- latitude ionosphere. Besides, this work intends to establish a link between ionospheric phenomena and the magnetospheric and interplanetary parameters that influence those phenomena. This relationship is necessary to provide an overall view of the ionospheric dynamics during geomagnetic storms.