IONOSPHERIC AND GEOMAGNETIC RESPONSE TO CHANGES IN IMF

Subhash C. Kaushik[1], **Hari Mohan Rajput**[2] , **Sonia Sharma**[3]

[1] ***Department of Physics, Government Autonomous Post Graduate College, Datia, M.P. 475 661, India. Email: subash_kaushik@rediffmail.com***

[2] ***As (n) above, but Email: rajput_hm@rediffmail.com***

[3] ***As (n) above, but Email: sonia_ s@rediffmail.com***

ABSTRACT

During the daily variations of the F region electron density distribution greatly affects the propagation of radio waves through the ionosphere. These radio waves are mostly confined the frequency range of 3 kHz –30 kHz, where the extremes corresponding its signals in the very low frequency (VLF) and high frequency (HF) bands respectively. The Interplanetary Magnetic Field (IMF) has been found to play a very important role in the solar- terrestrial relationship. Investigators have revealed that three features of IMF, namely the IMF sector boundary crossings, the variability of the north- south (B_Z) component and the polarity reversals of radial (B_X) or azimuthal (B_Y) component, have great influence on Sun –Weather relationship, geomagnetic phenomena and many other ionospheric phenomena including the E and F region drifts. Further a magnetic cloud is a transient ejection in the solar wind defined by relatively strong magnetic field, a large and smooth rotation of the magnetic field directions and low proton temperature. These magnetic cloud events (MCE's) are the manifestations of the coronal mass ejections (CME's) being responsible for initiating large and intense geomagnetic storms. In this paper we describe these magnetic cloud events and intense geomagnetic storms recorded by various geomagnetic observatories with Dst values ≥-300 nT. We further discuss the effects of these intense geomagnetic storms on near Earth space. During storm phase, which definitely indicates the presence of the sheath region existing ahead of a magnetic cloud. As a result of above period anomalous strong amplitude scintillation on 244 MHz radio signals transmitted from a geostationary *FLEETSAT* (73^0 E) were observed at equatorial and low latitude stations in Indian region. In this work we used hourly values of IMF data obtained from the NSSD Center. The analysis mainly based on looking into the effects of B_Z and B values. The IMF on the E and F region mid day (10-14 hours) and mid night (2200-0200 hours). The high-resolution data IMF B_Z and solar wind data obtained from *IMP*-8 satellite was available during the selected period. The interplanetary electric field in the east west direction (E_{YY}) is calculated as $E_{YY} = V_{SW} * B_Z$. The data is separated in to different sets corresponding to (i) northward IMF (passage of positive magnetic clouds), (ii) southward IMF (the passage of negative magnetic clouds), (iii) day time, (iv) night time and their combination to study the relation between interplanetary electric field and equatorial ionospheric electric field at various background conditions. From the various results published on the effects of these events on ionosphere and magnetosphere and the observations presented here at equatorial and low latitudes, it is reported here that during the great magnetic storms sufficiently large magnetospheric electric fields are produced that penetrate to low and equatorial latitudes due to insufficiently shielding by space charge at inner edge of plasma sheet. Both penetrating magnetospheric electric field and electric field generated by ionospheric disturbance dynamo (IDD) further produce unusual ionospheric electric field electron density irregularities. Both A_P and A_E show rise before the forward turnings while the D_{st} index shows a classic storm time decrease. The analysis indicates that the magnitude of all the responses depends on B_Z component of IMF.

SESSION GP1 OR H03