

Geomagnetic storm effects in equatorial ionization anomaly and equatorial spread-F over a low latitude station

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Equatorial spread-F and Equatorial Ionization Anomaly (EIA) are very important geophysical phenomena. These two important processes are very much associated with the geomagnetic disturbances (geomagnetic storms) of varying magnitude. Equatorial belt of strong spread-F extends right through the Appleton anomaly crest latitudes during high sunspot years. Intense scintillations do occur in presence of the plasma density irregularities that are associated with the spread-F, these may disrupt trans-ionospheric radio communication. Steep rise of the F-layer in the post sun set period and strong ionization anomaly that develops subsequently, associated with the equatorial spread -F. In view of the important effects on radio communications it is important therefore to study the effects of the geomagnetic storm on ionization anomaly and on the occurrence of spread-F. Data over Ahmedabad (23.1 oN, 72.4 oE, dip 33) and at Kodaikanal (10.2 oN, 77.5 oE, dip 5) are analyzed for the study of geomagnetic storm effects of high, medium and low solar activity periods. Ionospheric data for more than 120 geomagnetic storms (covering different solar epochs 1989-1991, 1994-1996 and for the 1999-2001) of varying magnitude have been analyzed. A total of about 60 storms ($Dst < -50$ nT) of different strength occurred during the period of 1999-2001 only. About 55% of storms were found to develop through a multi-step growth in the ring current, that is, a multi-step decrease in Dst , in the main phase of the storms. About 35% magnetic storms were linked with magnetic clouds. About 60% of intense and very intense magnetic cloud-associated magnetic storms were found to develop through a multi-step increase in the ring current. About twenty geomagnetic storms of different strength, at least one from each class of storms (weak, medium and strong), have been analyzed to study the interplanetary parameters of these storms and their effects on spread-F and on strength of EIA. Few events has been studies very extensively as magnetic storms of 6-7 April 2000 which was caused by shock compression and another very important event of 22-24 September 1999. The anomaly strength is characterized by the echoes of foF2 at Ahmedabad and Kodaikanal. The temporal variations in the foF2 over Ahmedabad and Kodaikanal together with incidence of spread-F at two locations are studied for several geomagnetic storm effects during above mentioned period covering different seasons and solar activity period.