SOLAR INFLUENCE ON EARTH'S IONOSPHERE

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The passage of coronal mass ejections (CMEs) is known to produce dramatic changes in the Earth's ionosphere, the mechanisms of which are being investigated using different techniques. In this paper we present the changes observed in the global ionosphere during the passage of the CMEs of 07-11 November 2004 using data and modeling. The observed changes include the (1) direct response of the high latitude ionosphere to the CME pulses, (2) development of a rare super double geomagnetic storm, (3) development of strong daytime eastward prompt penetration electric field (PPEF) events in the longitudes that were in daytime sectors during the main phases of both super storms, (4) strong F3 layer with large density depletions around the equator in the longitudes of the PPEF events, and (5) large positive/negative ionospheric storms at low-mid latitudes in eastern/western longitudes that were in the morning/afternoon sectors during the main phase onset of the first super storm. Using the physics based model SUPIM, we evaluate the relative importance of diffusion, daytime eastward PPEF and neutral wind on equatorial plasma fountain and positive ionospheric storms. The results show that the plasma fountain rapidly develops into a super fountain and the equatorial ionisation anomaly (EIA) crests shift to higher than normal latitudes during the PPEF event both in the presence and absence of neutral wind. However, the super fountain becomes stronger with less poleward turning of the plasma flux vectors and EIA crests become stronger than normal in the presence of an equatorward wind. The equatorward wind reduces (or stops) the downward velocity component due to diffusion and raises the ionosphere to high altitudes of reduced chemical loss. These mechanical effects of the equatorward wind accumulate the plasma brought by the super fountain, and hence strengthen the EIA crests and produce positive ionospheric storms; the wind need not be a storm-time wind though stronger wind can lead to stronger ionospheric storms.

Positive ionospheric storms

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