Direct bearing of PP electric field on TEC in low latitudes: Decoupling low latitude TEC enhancements from equatorial fountain

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The effect of storm time penetration electric fields (over and under-shielding) on low latitude ionospheric total electron content (TEC) has been a subject of considerable recent interest. We present evidence of direct bearing of high latitude PPEF of both kind on low latitude ionosphere though GPS-TEC variations vis--vis ionosonde observations in two major geomagnetic storms viz. May 15 and August 24, 2005. A number of GPS receivers covering large range of latitudes in Indian zone have been employed for TEC estimation. The main phase of the storm commenced in daytime in Indian zone for both the storms. The dawn-to-dusk convection electric field of high latitude origin penetrated to low and equatorial latitudes simultaneously as corroborated by the magnetometer data from the Indian zone. The low latitude TEC doubled within one hours of main phase with simultaneous rise in HmF2 and foF2. This marks the direct response of low latitude F region to suddenly enhanced local ExB drift which produces enhanced TEC in effect of PPEF in low latitudes. The enhancement followed by decrements in TEC formed the peaks in TEC as seen in time series of GSP data. The large peaks in TEC are formed almost at the same time over a given latitude belt, suggesting a common mechanism behind their synchronized existence. After two hours into the storm, the travelling atmospheric disturbances (TADs) and enhance equatorial fountain compete to form next peaks in TEC in low altitudes. To delineate the contribution of dusk-to-dawn PP field and sudden reversals in that, with other electrodynamical responses in low latitudes, we have taken a modeling study, which uses the SAMI2 model. First such results would be shown.

Keywords: Penetration Electric Fields; Disturbance Dynamo; GPS-TEC; Low latitude; Equatorial Fountain.

References