Dusk Side Enhancement of Equatorial Zonal Electric Field Response to Convection Electric Fields During St. Patrick's Day Storm

Tulasi Ram SUDARSANAM[1#+], K K AJITH[1], V S GOWTAM[1], Yuichi OTSUKA[2], Tatsuhiro YOKOYAMA[3]

[1] Indian Institute of Geomagnetism, India, *[2] Nagoya University, Japan*, *[3] National Institute of Information and Communications Technology, Japan*

[#]Corresponding author: s.tulasiram@gmail.com [+]Presenter

The equatorial zonal electric field responses to prompt penetration of eastward convection electric fields (PPEF) were compared at closely spaced longitudinal intervals at dusk to pre-midnight sectors during the intense geomagnetic storm of March 17, 2015. At dusk sector (Indian longitudes), a rapid uplift of equatorial F-layer to >550 km and development of intense equatorial plasma bubbles (EPBs) were observed. These EPBs were found to extend up to 27.13^{o}N and 25.98^{o}S magnetic dip latitudes indicating their altitude development to ~1670 km at apex. In contrast, at few degrees east in the pre-midnight sector (Thailand-Indonesian longitudes), no significant height rise and/or EPB activity has been observed. The eastward electric field perturbations due to PPEF are greatly dominated at dusk sector despite the existence of background westward ionospheric disturbance dynamo (IDD) fields, whereas, they were mostly counter-balanced by the IDD fields in the pre-midnight sector. In-situ observations from SWARM-A,C and C/NOFS satellites detected a large plasma density depletion near Indian equatorial region due to large electrodynamic uplift of F-layer to higher than satellite altitudes. Further, this large uplift is found to confine to a narrow longitudinal sector centered on sunset terminator. This study brings out the significantly enhanced equatorial zonal electric field in response to PPEF that is uniquely confined to dusk sector. The responsible mechanisms are discussed in terms of unique electrodynamic conditions prevailing at dusk sector in the presence of convection electric fields associated with southward IMF Bz and the onset of a substorm