## PERIODIC ESF PLUME STRUCTURES AND THEIR ASSOCIATION WITH TEC DEPLETIONS AND ENHANCEMENT

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Abstract: An ESF event with periodic multiple plume structures is identified on 21st March 2007 wherein the associated GPS vertical TEC (VTEC) showed depletion and enhancement. The VTEC depletion is as expected associated with the S4 index enhancement. Indian MST radar located at low latitude station Gadanki (13.50N, 79.20E, magnetic latitude 5.50N) start showing striated or elongated blob like multiple plumes of irregularities between 19.9 and 02.0 hrs IST just after ~10 min of onset at Thumba (8.70N, 770E, 0.10S) ionosonde. The spectral width and Doppler velocity information distinguishes various phases of irregularity development: for example initial phase, decay phase etc. GPS TEC observations from Gadanki show periodic multiple depletion and scintillation in satellite (PRN 20) between 21.5 and 23.0 hrs IST which can be associated with the periodic multiple plumes on radar power map. On occasion, the longitude value for the satellite path varies from 77.70E to 78.10E which is 20 west of Gadanki. The TEC enhancement is found to occur when the satellite elevation is more than 550 and the ionospheric pierce point (IPP) of the ray path is within 4.10N geomagnetic latitude and 77.70E geographic longitude. In order to compare the VTEC variations with the other observations the VTEC values are shifted in time that is calculated based on the spatial separation of the longitude of TEC measurement with that of Gadanki and considering an eastward drift of the plasma structures of ~80m/s. The Doppler velocities inside the plasma structure are predominantly upward during the interval when the TEC depletion is observed and downward during the interval when the TEC enhancement is observed. The base of the F layer (h'F) over Thumba is found to be nearly same when VTEC

enhancement and descending structures are observed at low altitude (200-250 km) region by VHF radar. In addition to this the spectral width remains high on occasion of TEC depletion and low on occasion of TEC enhancement. The weak scintillation in satellite (PRN 23) between 22.25 hrs IST and 23.25 hrs IST reveals that the Fresnel scale size irregularities are in decay phase. The absence of scintillation in PRN 23 after 2300 IST but their presence on the radar power map may correspond to the initial phase of generation of 3 m scale irregularities, as observed in spectral width values, but not developed to Fresnel scale sizes or below the threshold for scintillation.