

Observations of Depletions and Enhancements in Total Electron Content and UHF Scintillations near the Crest of Equatorial Ionization Anomaly in the Indian Zone at Udaipur

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A GSV 4004A GPS Ionospheric Scintillation and TEC Monitor of M/S GSV Silicon Valley, USA has been installed at Udaipur (MLAT 15.3), near the crest of the equatorial ionization anomaly. The system (GISTM) provides true amplitude, single frequency carrier phase measurements and total electron content (TEC) measurements from up to 11 GPS satellites in view simultaneously and provides outputs in 22 receiver channels. The GISTM provides the real-time values of the amplitude scintillation index, S_4 , and the phase scintillation index, σ_ϕ , in the UHF range (at L1 and L2 frequencies, 1572.42 and 1227.6 MHz respectively) computed over periods of 1, 3, 10, 30, and 60 seconds, averaged over one minute. Additionally, the 4 pairs of TEC and TEC rate values computed every 15 seconds are also provided. Thus the equipment is ideally suited for the study of ionospheric scintillations and TEC.

The paper aims at presenting the results on the depletions in TEC that owe their origin to the equatorial spread F, and are a manifestation of the equatorial plasma bubbles. On a number of nights, for which solar and geomagnetic quiet conditions prevailed, depletions in the TEC have been observed. The depletions in TEC have been found to be co-occurring with the enhanced S_4 index of the UHF scintillations. Typical depth of the depletions was found to be a few TEC units, which could be 15-20 TECU in case of a strong spread F. Location of the ionospheric pierce point latitudes of the depletions in TEC have been found to be nearly along the same longitude, implying their field aligned character and equatorial origin. Detailed features of the depletions and statistics of depletions would be presented.

In addition, a new feature of low latitude TEC is presented, that concerns with the observations of isolated and localized TEC enhancements in the nighttime. These enhancements had no correlation with S_4 index. On a few occasions, the enhancements in TEC were found to be co-occurring with the depletions in TEC.