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Multi-instrument observations of ionospheric irregularities over Indian sector during November 2011

Abstract:

This paper reports on the multi-instrument study about VHF amplitude scintillations (250 MHz) recorded at an Indian low-latitude station, Vaddeswaram (Lat. 16.310N, Long. 80.30E, dip 180N) and the vertical drifts and variations of h'F observed using a digital ionosonde from an Indian equatorial station, Trivandrum (Lat. 8.50N, Long. 770E, dip 0.50N), equatorial electrojet (EEJ) strength measured using magnetometers and global ionospheric total electron content (TEC) variations obtained using the IGS receivers during 5th - 8th November 2011. It is interesting to note that with the higher E x B drifts, long duration range spread F at Trivandrum and scintillations at Vaddeswaram are observed. The plasma depletions in TEC obtained using the SCINDA receivers are observed initially at Tirunelveli (Lat. 8.50N, Long. 770E, dip 0.50N), an equatorial station and then at Kolkata (Lat. 22.580N, Long. 88.380E, dip 320N), an anomaly crest station. A proper anomaly is seen in TEC along with wide band plasma bubbles starting from 730E to 900E longitudes in the Indian sector during post-midnight period on 6th November. A secondary peak is observed around 1600 hrs LT in EEJ strength followed by a higher upward drift velocity (more than 60 m/s) with a significant raise of the F region up to 470 km over the magnetic equator on 6th November, indicating that the pre-sunset EEJ might have played a crucial role on the post-sunset F-region electrodynamics in initiating the ionospheric irregularities, scintillations and wide-band plasma bubbles. In addition, a secondary peak in EEJ is observed in the Indonesian longitude sector around 1610 hrs LT on 6th November, and, interestingly, the equatorial atmosphere back scatter radar at Kototabang (0.20N, 100.030E, dip 100S), Indonesia shows field aligned irregularities (FAI) at F region altitudes only on that day.