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On the nighttime enhancement in ionospheric electron density over the equatorial region

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Understanding the evolution of nighttime ionospheric electron density remains an elusive aspect in spite of the extensive research over the past several decades. At nighttime, during the absence of ionization, the ionospheric electron density is generally expected to decay gradually, but it does not behave as predicted by the simple notion and show enhancement occasionally. This phenomenon is called ionospheric nighttime enhancement (INE), and it depends strongly on location, season, and level of solar and geomagnetic activity. This paper focuses on the INE events over the equatorial region of the Indian sector. The Global Positioning System (GPS) derived total electron content (TEC) measurements obtained from two InSWIM (Indian network for Space Weather Impact monitoring) stations have been used. The collocated ionosonde has been used to obtain the information on the bottomside ionospheric parameters. The ionosonde measurements show that the plasma drift is downward under such events which reveals the essential role of the westward electric field in forming the INE. The 2D-TEC maps generated from the Satellite-Based Augmentation System (SBAS)-GAGAN have also been utilized to investigate the motions of equatorial ionization anomaly (EIA) crest during the occurrence of INE events. Results show the existence of well-developed EIA until late evening during the events of INE.