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Study on the structure and dynamics of the equatorial plasma bubbles using geostationary satellites

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1 Extended Abstract

It is well known that at the equatorial and low latitude regions, the ionospheric scintillations in radio signals are essentially caused by the ionospheric plasma density irregularities of centimeters to hundreds of kilometers of scale sizes. The analysis of scintillation patterns, based on satellite spaced- receiver technique, is a well accepted methodology to estimate the zonal drift velocity of ionospheric irregularities. For the calculation using GPS satellite measurements, the apparent drift of the satellite imparts uncertainties in the drift estimation. In the case of geostationary satellites, the fluctuations in the amplitude of the trans-ionospheric signal from geostationary satellites, on the other hand, mainly represent the movement of the irregularities in the ionosphere. It is then possible to collect valuable informations on size and horizontal movement of irregularities even from a single station with a simultaneous recording of ionospheric scintillations using the radio signals from two nearby geostationary satellites.

In this paper, estimates the morphological features of the plasma irregularities at the Indian equatorial and low latitude region using the geostationary satellites have been discussed. As part of Indian network for Space Weather Impact Monitoring (InSWIM) program, three GNSS receivers are installed along the east-west direction at a distance of 40 m and 60 m respectively at Trivandrum (8.4°N and 76.9°E). These GNSS receivers continuously monitor L1 and L5 scintillations of the SBAS satellites (GSAT 8 (PRN 127) and GSAT 10 (PRN 128)). The cross correlation analysis of the scintillation signals received at the three receivers gives the time lag between the signals. It is well known that these movements are caused by the zonal component of the neutral wind and the electric fields. The above analysis was used to obtain the eastward drift of the irregularities. Power spectrum analysis also has been performed to understand the characteristic features of irregularities. A systematic analysis of these scintillation signals over a long time period period has yielded a comprehensive understanding of the irregularity structures over the Indian equatorial and low latitude regions.