

Ionospheric plasma bubble and gps scintillation measurements in south Brazil

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This work reports the results of a campaign of GPS scintillation and airglow (630 nm) observations carried out from March 08 to March 19, 2002 at the INPE's Southern Space Observatory - SSO (29° S, 53° W, 18.4° S dip latitude) in Brazil, in order to confirm the occurrence of ionospheric plasma bubbles over SSO and to study their vertical evolution and consequent north-south extension. The ionospheric plasma density irregularities that mostly contribute to GPS scintillation have a typical scale size of about 400 meters and they are associated with the plasma bubbles. On March 09 and 11, São Luís VHF backscatter radar, located at the magnetic equator and at a 44° W, observed the occurrence of plumes, however scintillation was not observed at the SSO. The absence of scintillations at SSO during equatorial plume events can be related to the magnetic meridional separation of this location with respect to Sao Luis. Large S4 scintillation index values ($S4 \sim 1$) were observed during the campaign, indicating a high background ionospheric plasma density over SSO that is located close to the equatorial anomaly crest. During six campaign nights, simultaneous airglow observations using a photometer looking at zenith were performed at SSO and airglow depletions indicative of plasma bubbles were observed concurrently with GPS scintillation (only S index4 values computed for the highest elevation satellite were used). The simultaneous GPS scintillation and airglow depletion observations confirmed the occurrence of plasma bubbles over SSO that is located at about 19.5° south magnetic latitude possibly at the poleward side of the equatorial Anomaly southern crest.

Publication:

34th COSPAR Scientific Assembly, The Second World Space Congress, held 10-19 October, 2002 in Houston, TX, USA., meeting abstract, id.1779

Pub Date:

2002

Bibcode:

2002cosp...34E1779R

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