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Occurrence and zonal drifts of small-scale ionospheric irregularities over an equatorial station during solar maximum

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A statistical study of L-band amplitude scintillation and zonal drift velocities of ionospheric irregularities with approximately 400 m of scale size during solar maximum is presented. Ground-based global positioning system (GPS) data acquired at the equatorial station of Sao Luis (2.33° S, 44.21° W), Brazil, during the period of March 2001 to February 2002 are used in the analysis. The variations of scintillations and zonal velocities with local time, season, and magnetic activity are reported. We found that for the near overhead ionosphere (elevation angle higher than 45°) a broad maximum in the occurrence of scintillation is seen from October to February (spring and summer months). In general weak scintillations (S4 level lower than 0.4) dominate (over 80 percent) during the equinox and summer. Many of the scintillations occurred during pre-midnight hours and were sampled in the west sector of the sky over Sao Luis. The zonal velocities of the irregularities are seen to be larger during the summer, but during the equinox the deceleration is faster and the scintillations tend to cease earlier. During geomagnetically disturbed nights, scintillations are ascribed to the prompt-penetration of magnetospheric electric-fields and disturbance dynamo effects.

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