

Ionospheric amplitude scintillation behavior over the low latitude station of São Luís during the September 6 to 10, 2017 magnetic storm

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The September 6 to 10, 2017 magnetic storm was caused by an X9 solar flare followed by a CME and the maximum Sym H magnetic index reached a value of -146 nT at 01:08 UT on day 08, after a Bz southward incursion of -31.21 nT at 23:31 UT on day 07 and the Kp magnetic index reached 8. The solar wind increased from 400 km/s to about 600 km/s around 24 UT of day 06 and to about 800 km/s in the following night of 07/08. During the recovery phase of this storm there was another Bz southward incursion of -17.46 nT at 11:55 UT on day 08 when Sym H reached -115 nT at 13:56 UT and Kp reached the value of 8.33. In this work the ionospheric amplitude scintillation at São Luís (02.5° S, 44.3° W, dip lat -04.67°) was studied using data from an AFRL/INPE VHF receiver and a CIGALA/CALIBRA Septentrio receiver, both installed at São Luís. The vertical plasma drift during daytime hours was determined using the magnetometer data from Belém (1.5° S, 48.5° W, dip lat -1.12°) and Petrolina (09.4° S, 40.5° W, dip lat -13.45°) and that during the evening prereversal enhancement period was calculated using ionogram data from the São Luís digisonde. Compared to the geomagnetically quiet days of September 2017, both VHF and GNSS S4 scintillation indices presented an increase during the night of 07/08 when there was a strong increase in the vertical plasma drift due to a prompt penetration under-shielding electric field of eastward polarity (E_y) of about 17 mV/m magnitude. In contrast to this, on the night of 08/09 the ionospheric scintillation was completely inhibited as is a typical response to a disturbance dynamo electric field of westward polarity. During the following nights scintillation events were again gradually observed. Another E_y increase was observed at about 12 UT (09 LT) on day 08 when no scintillation was normally observed since it was daytime. The zonal drift determined by the VHF receiver around 24 UT (21 LT) was about 100 m/s and 150 m/s eastward on the nights of 05/06 and 06/07, respectively. However, during the night of 07/08 of the storm, the zonal drift reversed to westward with a velocity of about -80 m/s. After the storm period the zonal drifts became eastward.

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