

GPS observations of ionospheric responses during the major storm of Nov. 7-10, 2004

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By using an ionospheric total electron content(TEC) and scintillation monitor, the measurements of the TEC and signal amplitude scintillation from GPS satellites have been carried out at Wuhan(114.36E, 30.53N, magnetic latitude 19.4) since 2003 to investigate the ionospheric irregularities and TEC fluctuations at the region of the equatorial anomaly. In this paper ionospheric effects of the magnetic storm of November, 2004 are analyzed by using GPS observations. Results of data analyses show that the ionospheric storms during this magnetic storm mainly exhibits the long duration positive phase storm, and the positive deviations of TECs occur mainly during two main phases of the storm on November 8 and 10 with the largest deviation of about 50 TECU and with duration time over 12 hours. Another primary effect of the storm on the ionosphere is the remarkably enhanced activity of amplitude scintillations and its enhanced intensity during the main phase. The maximum value of the S4 index exceeded 1.0. There occurred the plasma bubbles characterized by the TEC deep depletion and TEC fluctuations initiated from the equatorial region at the same time when strong amplitude scintillations occurred. A comparison between amplitude scintillations and associated TEC fluctuations were made. A statistic analysis shows there is a remarkable positive correlation between standard deviation of the change rate of TEC, the ROTI index, and the S4 index. Through a regression analysis it is obtained that the ratio of ROTI and S4 is 9.64.