



The latitudinal structure of night-time ionospheric TEC and its empirical orthogonal functions model over north American sector

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We collected total electron content (TEC) data in the longitudinal sector of 60° W – 90° W during 1999-2015 to investigate the latitudinal variation of nighttime middle and high latitude ionosphere. The mid-latitude trough is one of the important features of the nighttime ionosphere. The statistical analysis provides unprecedented detail of the local time, seasonal, solar activity, and geomagnetic activity variations of the total electron content in the latitude range of 40° N – 75° N, focusing on the variation of mid-latitude trough. The results show that the trough minimum position has significant local time, seasonal, and geomagnetic activity dependences but slight solar activity dependence. In addition, an empirical model of the TEC in the middle to high latitudes was constructed by empirical orthogonal function analysis. The empirical model can reconstruct latitudinal profiles of TEC and well reproduce the dependence of the mid-latitude trough on local time, seasonal, solar cycle, and geomagnetic activity. In addition, we also analyzed the geomagnetic activity dependence of TEC at different latitudes and different local time sectors.